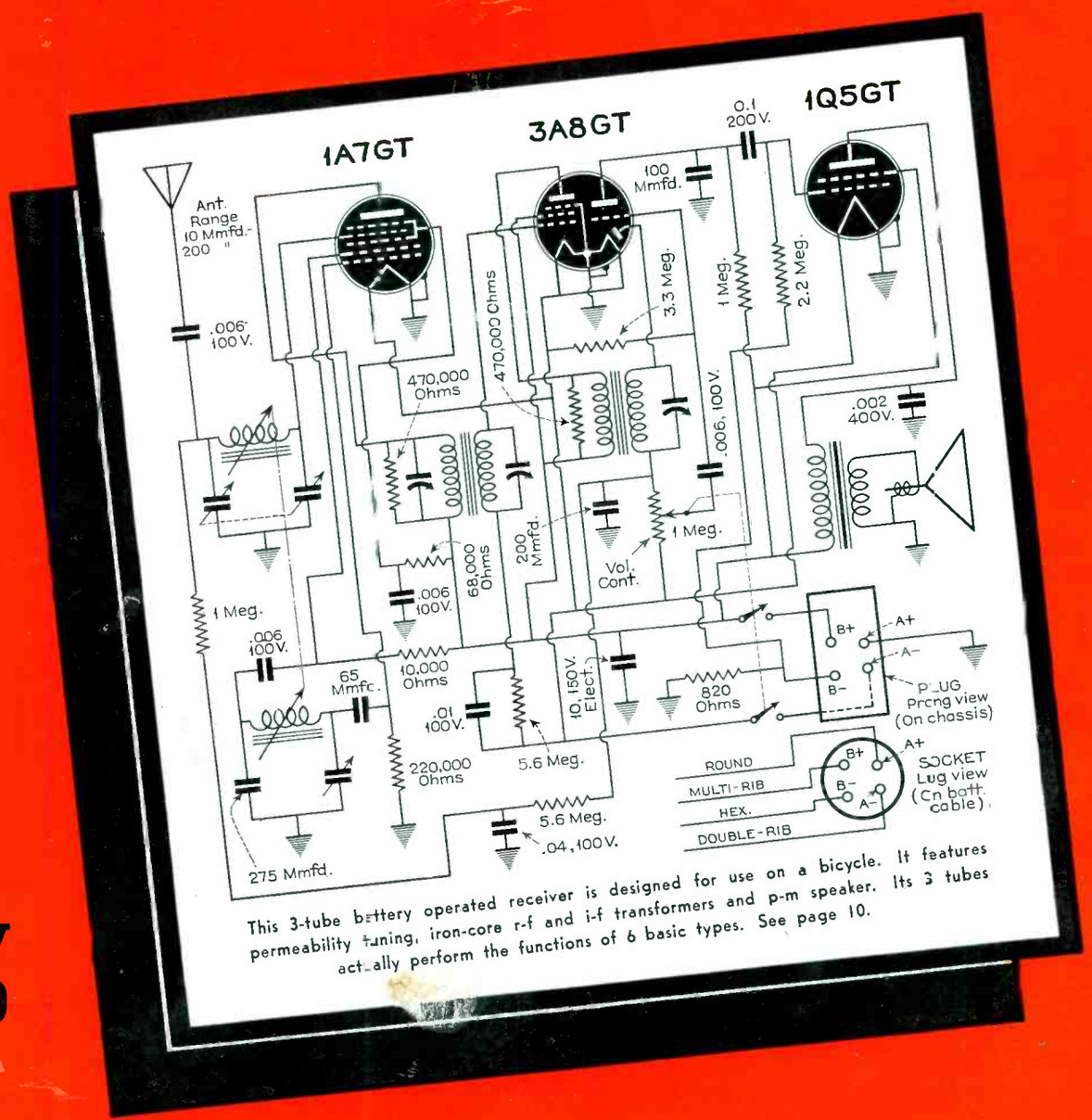
A MONTHLY DIGEST OF RADIO AND ALLIED MAINTENANCE

SERVICE



This 3-tube battery operated receiver is designed for use on a bicycle. It features permeability tuning, iron-core r-f and i-f transformers and p-m speaker. Its 3 tubes actually perform the functions of 6 basic types. See page 10.

July 1940

RADIO — TELEVISION

*FP (Fabricated Plate)

TRADE MARK REG. U. S. PAT. OFF.

CONDENSERS made by P.R. MALLORY & CO., Inc.

MALLORY..

Put the Come-back Odds 2000 to 1 in Your Favor

With over 5,000,000 FP Condensers in use as original equipment . . . the field returns on 1,000,000 . . . purchased by representative manufacturers were accurately checked. The answer has made radio history. Out of 1,000,000 FP Condensers made by Mallory only 512 were returned as defective. That's just 5/100th of 1%!

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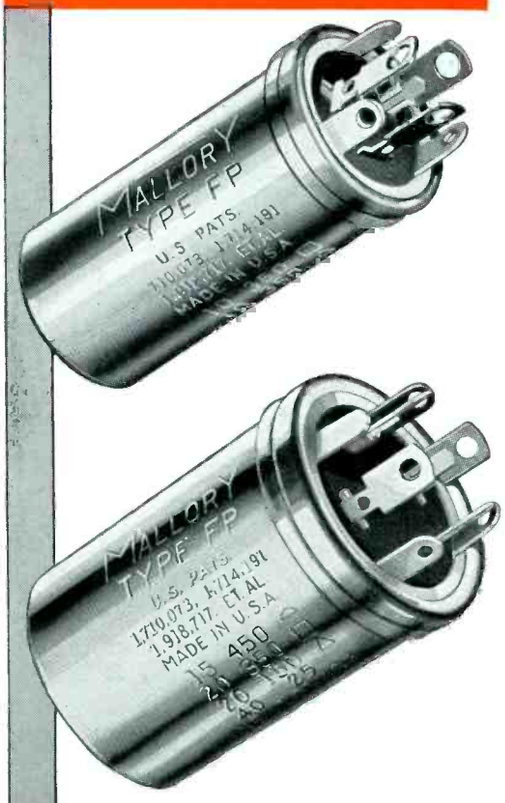
For all your other condenser replacement needs Mallory's full line offers similar opportunities for full profit and complete customer satisfaction. Get details on the entire line from your Mallory Distributor today.

P. R. MALLORY & CO., Inc.
INDIANAPOLIS INDIANA
Cable Address—PELMALLO



*Not etched construction

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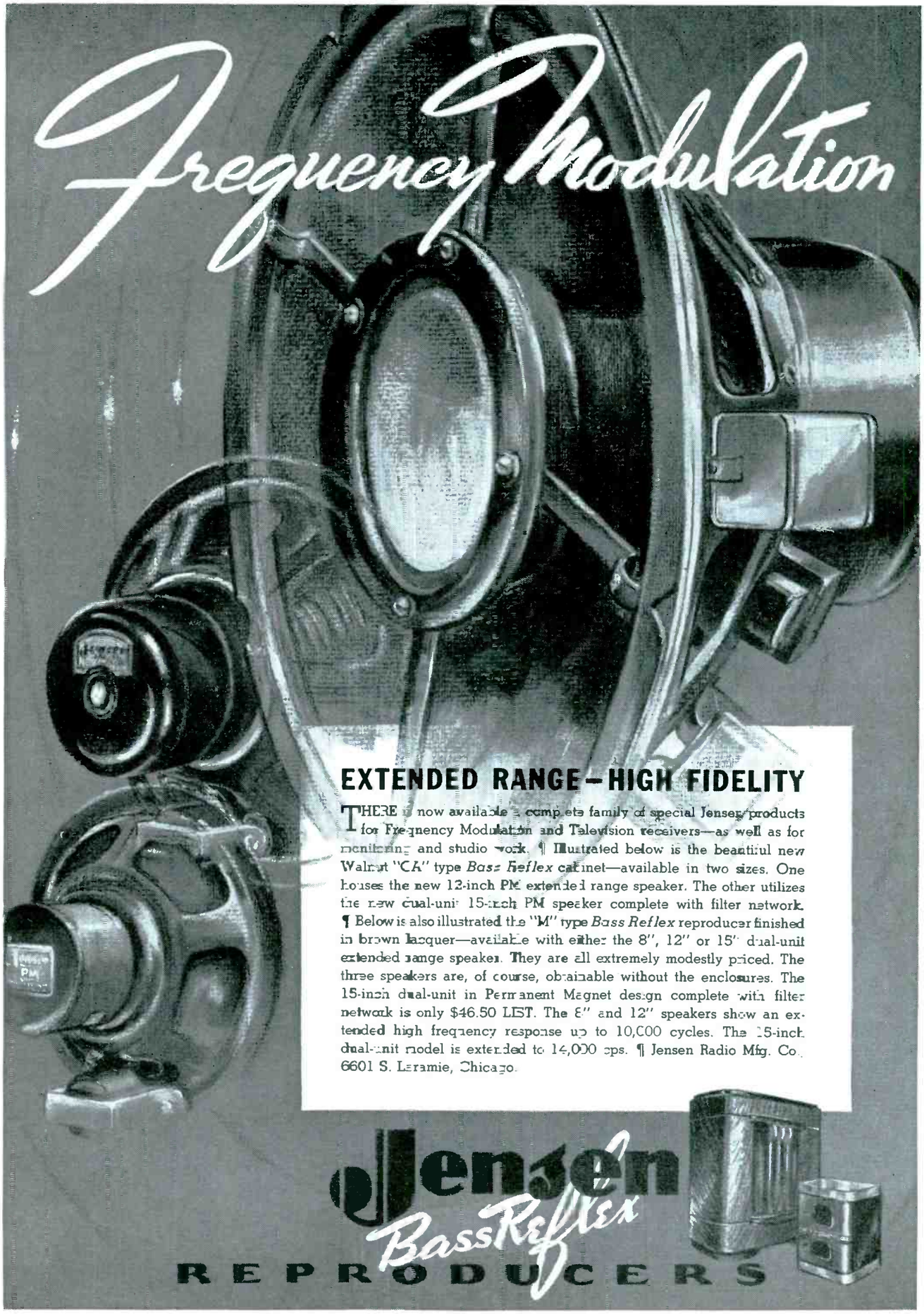
Include VIBRATORS • VIBRAPACKS • CONDENSERS • VOLUME CONTROLS • ROTARY SWITCHES • SINGLE AND MULTIPLE PUSH BUTTON SWITCHES • RESISTORS RADIO HARDWARE



VOL. 9, NO. 7 - JULY, 1940

SERVICE

ROBERT G. HERZOG, Editor

A Monthly Digest of Radio and Allied Maintenance

Reg. U. S. Patent Office

NEXT year, the National Radio Trade Parts Show will again be held at the Stevens Hotel in Chicago. The dates: June 10th through 13th. If you missed this year's successful show, start making plans to be present next year. It's an experience which is better than worthwhile.

■◆■

BELL pushing seems to be a forgotten method of getting business. We know of several people who have receivers in their homes that need a bit of attention. Oh, yes, the sets work after a fashion, but they could stand a bit of inspection and repairs. Yet, as is a common failing, these people just don't get around to looking up a Service Man. If, however, a business-like, well appearing Service Man should push the doorbell some evening, we are sure that he would be more than welcome. Similar cases must exist by the thousands throughout the country. On your toes, boys.

■◆■

EACH month we present to the readers of SERVICE at least one profitable business building idea. This month's offering, on page 20, discusses a successful tieup with the local movie house for the purpose of attracting better class customers. We have dozens of these proved ideas from successful Service Men throughout the country, and as time goes on we will unfold them to you. It is up to you then to give action to the words and reap a golden harvest.

■◆■

ON PAGES 6, 7, 8 and 9 of this issue we present a series of charts of battery replacements, of practically every manufacture, for the various battery portables which have been placed upon the market within the last three years. The remainder of these charts will be published in an early issue.

We have attempted to make the listings as complete and accurate as possible in the face of pages of conflicting data. We feel safe in saying that ours is the most complete and the most accurate of any such compilations. To help the industry maintain these listings accurately, we are prepared to offer our full cooperation to such battery manufacturers who desire it.

CONTENTS

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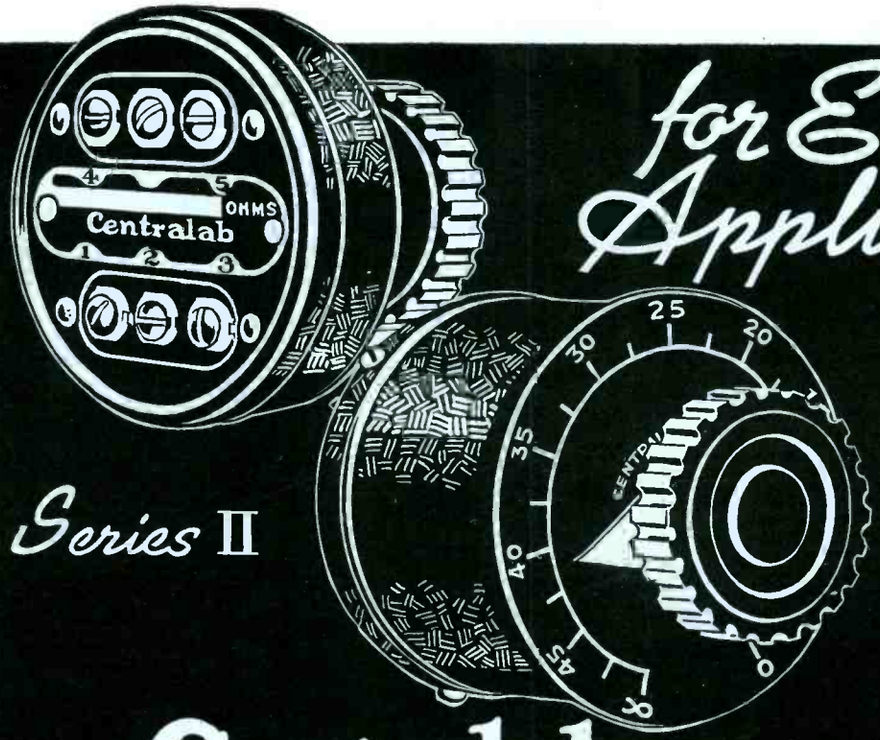
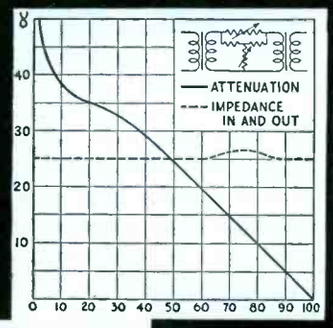


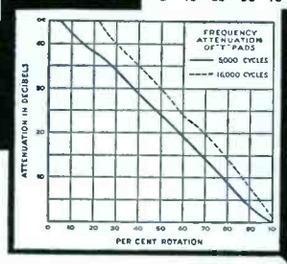
for Every Application

Series II

Centralab

SOUND PROJECTION CONTROLS





CENTRALAB SERIES II

Controls are the finest for input circuits in broadcast stations, public address systems, and recording apparatus of new or old design. Will prove faultless in the most critical service.

The curve chart above shows the change in impedance and attenuation plotted against clockwise rotation for a "T" pad attenuator. The impedance characteristic (dotted line) is substantially the same at any setting. The attenuation curve (solid line) varies from infinity at zero rotation to zero Db. at full rotation. No insertion loss.

Electrostatic and electromagnetic shielding provided by a black finished steel case. Bakelite screw type terminal strip on back of case. All resistance elements insulated from shaft and bushing. Single hole mounting. Mounting bushing ¾" long with 2 locknuts and lockwashers. Case diameter 2¾". Depth back of panel "T" Pad — 2⅜"; Gain Control — 1⅜". Maximum load dissipation 1 watt.

For detailed information, write for technical booklet.

ECONOMY P/A CONTROLS

These controls are intermediate to the series II line and the older series I types. As their name implies, they are economy controls designed primarily for inexpensive sound equipment, where original cost is a limiting factor. They are designed for all types of fading and mixing systems. All units have soft aluminum shaft 2¼" from end of ⅜" brass bushing. Small diameter bakelite case same dimension as Standard Radiohm. Non-rubbing contact for smooth, quiet operation. Limited to input applications. Maximum power rating for all units one watt.

CENTRALAB: Division of Globe-Union Inc.
MILWAUKEE, WISCONSIN

WHAT HAS HE GOT THAT I HAVEN'T GOT?

DID you ever stop to wonder how some servicemen get more business and make more money than you? Here, perhaps, is the answer. The most successful men in *any* business are those who have learned never to pass up *anything* that will help them to accomplish an important job *in less time.*

This practice of taking advantage of every aid to *better work in less time* is often the only thing that stands between success and failure. In the radio service business, the man who uses all the information he can get to make trouble-shooting quicker and surer is the one who forges ahead. *He's* the man who has always had a complete set of RIDER MANUALS. He knows how foolish it is to depend on his own memory or intuition when complete, authoritative data can be at his fingertips for only 3c a day.

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VOLUME XI
HAS MANY *New* FEATURES

Includes data on FM receivers released up to press time.

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New Vest Pocket Supplement contains much useful information for on-the-spot reference.

You NEED RIDER MANUALS

RADIO

SERVICE
A Monthly Digest of Radio and Allied Maintenance

TELEVISION

BATTERIES FOR PORTABLES

By ROBERT G. HERZOG
EDITOR

BATTERIES, batteries, batteries and more batteries. Since the advent of the battery portable there has been a veritable flood of battery types of every size and shape. Yet to the Service Man it would seem that just that size and shape which his customer requires is missing in the particular brand that he carries.

No Two Alike

Although there are numerous comparative types listed in Table I on the following page, no two similar types, made by different manufacturers, are identical in size. There is often as much as a quarter of an inch or more difference in one or more of the dimensions. In listings published by some of the battery manufacturers themselves there is often as much as a half-inch difference in one or more dimensions of types listed as comparative.

In the listings of comparative packs, in Table II, there is as much as a half-inch difference between comparative types in one or more dimensions.

Battery listings bid fair to become more and more complicated, especially as a result of the special types of tiny batteries and packs required to accommodate the latest "camera" portables.

Battery Drain

In the interest of low-battery drain all the portables use over-biased power tubes. This practice, while increasing the percentage of harmonics, seems justified as the quality is quite acceptable. Power outputs vary from 100 milliwatts for sets with 1A5G pentode to 275 milliwatts developed by the 1Q5G (or GT) or the 3Q5G beam power tubes. A few recent models still use the 1C5G with an output of 200 milliwatts. Many employ the 1T5G, which has a filament drain of only 0.05 amp, with an output of 170 milliwatts.

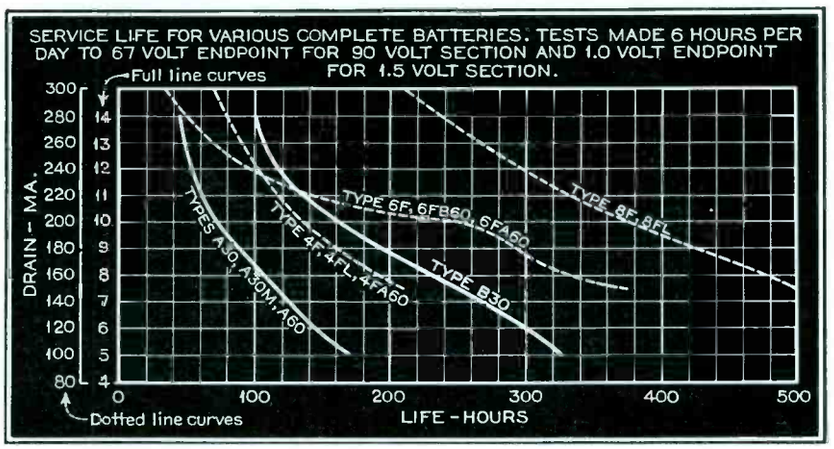
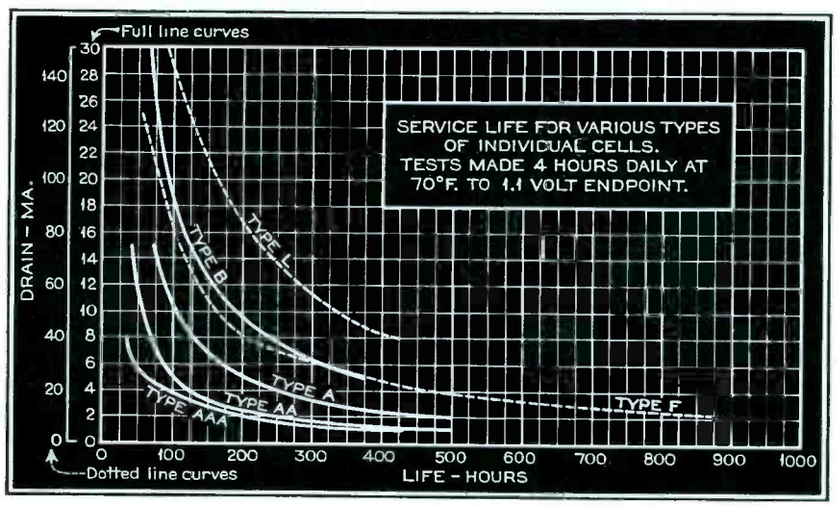


Fig. 2. The life of a battery is a function of the conditions under which the battery is used. The curves above give the life of various units specified conditions.

Fig. 1. Battery manufacture has advanced to the stage where the makers can predict the approximate life if the conditions of operation are known. Life charts of single cells are shown for specified conditions.



Practically all the portables draw between 9 and 12 milliamperes B current with no signal, the current increasing by a few milliamperes with strong signals.

The typical 4-tube set draws 250 ma for the filaments, on one-and-a-half volts, or (using the 3Q5G) 50 ma on seven-and-a-half volts. Those models which employ the 1T5G draw only 200 ma on one-and-a-half volts or 50 ma on 6 volts. A five-tube set draws 300 ma on one-and-a-half volts, 50 ma on nine volts.

The A-battery life is the same for circuits which have the filaments connected in series as it is for those which are connected in parallel, in spite of the lower current drain and higher voltages required for the former. This is so because the batteries are made up of a multiple number of cells which are connected in series in one case and in parallel in the other. The total power available is the same for the one-and-a-half volt and the six-volt batteries.

Battery Life

Battery life is a direct function of the conditions under which the battery

COMPARATIVE NUMBERS OF BATTERIES FOR PORTABLES

Acme	Advance	Bond	Bright Star	Burgess	Eveready	General	National Union	Philco	Rayovac	Usalite	Willard	Winchester
1½ VOLT A UNITS												
111	2	102	10M	D	950	D	D	D	2	1094	D	—
—	—	—	—	—	—	—	—	—	P24A	—	—	—
—	—	—	461	—	—	—	—	—	—	—	—	—
—	—	—	—	2F	—	—	—	—	—	—	—	—
114	247	4826	462	4F	742	4FI	A830	P94	P94A	634	4FI	4816
—	—	—	—	—	—	4HI	—	—	—	—	4HI	—
—	—	—	—	—	—	4LI	—	—	—	—	4LI	—
115	—	—	—	—	—	—	—	—	—	—	—	—
116	—	4824	660	6F	743	6FI	A831	P96	P96A	637	6FI	4814
118	147	4829	860	8F	741	8FI	A833	—	—	635	8FI	4819
—	447	—	—	—	—	3LI	—	—	—	—	3LI	—
—	—	—	—	—	—	—	—	—	—	644	—	—
118FM	547	—	865	8FL	745	8CFI	—	—	P98L	645	—	—
123M	—	—	465	4FL	—	—	—	—	P94L	642	—	—
—	—	—	—	FX	—	—	—	—	—	—	—	—
4½ VOLT A UNITS												
123	647	4928	361	G3	746	3H3	—	—	P83A	683	3H3	4919
6 VOLT A UNITS												
114S	—	—	—	—	—	—	—	—	—	—	—	—
—	2476	—	646	F4PI	—	4F4	—	—	P694A	639	4F4	—
—	—	—	—	F4PIX	—	—	—	—	—	636	—	—
—	—	—	661	—	—	—	—	—	—	—	—	—
118S	817	4827	866	2F4	718	8F4	A834	—	P698A	638	8F4	4817
—	—	—	—	—	—	—	—	—	—	643	—	—
118S6	747	—	868	2F4L	747	8CF4	—	—	P698L	646	—	—
7½ VOLT A UNITS												
115S	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	561	G5	—	5H5	—	—	P85A	687	—	—
45 VOLT B UNITS												
—	—	—	—	—	727*	F30A	—	—	BB30P	—	—	—
330	267	3017	30–03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
—	—	—	—	—	—	—	—	620	—	620	—	—
430	—	—	30–55	A30	—	V30A	—	—	430P	621	V30A	—
—	—	—	—	—	—	—	—	—	—	622	—	—
530	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	30–50	A30M	—	—	—	—	—	—	—	—
—	—	—	—	A30X	—	—	—	—	—	—	—	—
830	284	—	30–33	M30	482	—	B861	—	P5S30	640	—	—
—	—	—	—	Z30	738	V30AA	—	—	P7R30	—	V30AA	—
—	—	—	—	—	733	V30AAA	—	—	P3A30	—	—	—
—	—	—	—	W30PI	—	—	—	—	—	—	—	—

* Type 482 should be used.

Table I. Although the chart indicates that the various types of the different manufacturers may be interchanged, this is not always the case. There may be as much as a quarter of an inch difference in one or more dimensions between types. It may be said almost without exception that no two types of different manufacture are identical in size.

REPLACEMENT BATTERIES FOR PORTABLES

Model		Acme	Advance	Bond	Bright Star	Burgess	Eveready	General	National Union	Philco	Rayovac	Usalite	Willard	Winchester
ADMIRAL (Continental Radio & Television Corp.)														
33F5, 34F5, 35G6, 37G6, B34G6	AB	...	...	...	...	6FA60	...	60A4L	...	P60A4L	AB84	AB667	...	...
164-4D, 335-4Z	1A	116	...	4824	660	6F	743	6F1	A831	P96	P96A	637	6F1	4814
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
311-4D	1A	116	...	4824	660	6F	743	6F1	A831	P96	P96A	637	6F1	4814
	2B	430	...	...	30—55	A30	738	V30A	...	...	430P	621	V30A	...
319-4Z	1A	123M	...	...	465	4FL	...	3L1	...	...	P94L	642	...	...
	2B	430	...	...	30—55	A30	738	V30A	...	...	430P	621	V30A	...
331-4F	1A	114	247	4826	462	4F	742	4F1	A830	P94	P94A	634	4F1	4816
	2B	430	...	...	30—55	A30	738	V30A	...	...	430P	621	V30A	...
336-5N	1A	...	...	...	561	G5	...	5H5	...	...	P85A	687	...	...
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
AEOLIAN (Aeolian Manufacturing Co.)														
BP4, BP5, BP8	1A	114	247	4826	462	4F	742	4F1	A830	P94	P94A	634	4F1	4816
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
BP6, BP10	1A	...	...	...	...	F4PIX	...	...	...	...	...	636	...	...
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
BP36	2A	123	647	4928	361	G3	746	3H3	...	...	P83A	683	3H3	4919
	2B	830	284	...	30—33	M30	482	...	B861	...	P5S30	640	...	...
AIR CASTLE (Speigel, Inc.)														
560-1, 561-1, 561-1M	1A	118	147	4829	860	8F	741	8F1	A833	...	P96A	635	8F1	4819
611-1	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
591-1	1A	...	2476	...	646	F4PI	...	4F4	...	...	P694A	639	4F4	...
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
AIR CHIEF (See Firestone Tire & Rubber Co.)														
AIR KING (Air King Products Co.)														
3905, 3912	AB	460-15	411	...	...	5DA60	...	60A2L	...	...	...	AB665	...	...
3906, 3910	1A	118	147	4829	860	8F	741	8F1	A833	A96	P96A	635	8F1	4819
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
3916	1A	116	...	4824	660	6F	743	6F1	A831	P96	P96A	637	6F1	4814
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
3950, 4112	1A	118S6	747	...	868	2F4L	747	8CF4	...	...	P698L	646	...	...
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
4012	AB	460-14S	659	...	...	D4A60	...	...	...	...	...	AB664	...	...
4016	1A	118S6	747	...	868	2F4L	747	8CF4	...	...	P698L	646	...	...
	2B	830	284	...	30—33	M30	482	...	B861	...	P5S30	640	...	...
AIRLINE (See Montgomery Ward)														
ANDREA (Andrea Radio Corp.)														
6G61, 6G61A, (G61)	2A	123	647	4928	361	G3	746	3H3	...	...	P83A	683	3H3	4919
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
21AF5, 21F5, (UF51)	A	118	147	4829	860	8F	741	8F1	A833	...	P96A	635	8F1	4819
	B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
ANSLEY (See Port-O-Radio)														
ARCADIA (See Wells Gardner)														
ARIA (See Wells Gardner)														
ARLINGTON (See Wells Gardner)														
ARVIN (Noblitt Sparks Industries)														
802, 803	1A	118FM	547	...	865	8FL	745	8CF1	...	...	P98L	645	...	...
	2B	830	284	...	30—33	M30	482	V30A	B861	...	P5S30	640	V30A	...
AUTOCRAT (Autocrat Radio Co.)														
90, 98	1A	114	247	4826	462	4F	742	4F1	A830	P94	P94A	634	4F1	4816
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
120	A	118S	817	4827	866	2F4	718	8F4	A834	...	P698A	638	8F4	4817
	B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
131, 132	A	...	2476	...	646	F4P1	...	4F4	...	...	P694A	639	4F4	...
	B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
161	AB	...	...	...	...	...	...	...	...	...	AB94	...	...	...
AUTOMATIC (Automatic Radio Mfg. Co. Inc.)														
P40, P41, P50, P51	1A	...	...	...	...	...	...	...	...	...	...	643	...	...
	2B	830	284	...	30—33	M30	482	...	B861	...	P5S30	640	...	...
P43, P45	1A	114	247	4826	462	4F	742	4F1	A830	P94	P94A	634	4F1	4816
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
P57, P58, P61, P72	1A	...	...	...	...	F4P1X	...	...	...	...	...	636	...	...
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
P80, P81	1A	118-S6	747	...	868	2F4L	747	...	...	...	P698L	646	...	...
	2B	830	284	...	30—33	M30	482	...	B861	...	P5S30	640	...	...
BELMONT (Belmont Radio Co.)														
403, 460	1A	118	147	4829	860	8F	741	8F1	A833	P96	P96A	635	8F1	4819
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
407	1A	123M	...	...	465	4FL	...	3L1	...	...	P94L	642	3L1	...
	2B	430	...	...	30—55	A30	...	V30A	...	...	430P	621	V30A	...
507, 513	1A	...	2476	...	646	F4P1	...	4F4	...	...	P694A	639	4F4	...
	2B	430	...	...	30—55	A30	...	V30A	...	...	430P	621	V30A	...
BLACK HAWK (See Wells Gardner)														
CARRYETTE (See Westinghouse)														
CARRYOLA (See Garod)														

COMPARATIVE BATTERY PACKS FOR PORTABLES

Voltage	Acme	Advance	Burgess	General	Philco	Rayovac	Usalite	Zenith
30	—	—	W20PI	20AAAG	—	—	—	—
51	—	—	W34	34AAAG	—	—	—	—
60	—	—	W40	—	—	—	—	—
88½	—	—	Z59	—	—	—	—	—
90	—	—	A60	—	—	BB60P	—	—
90	—	—	—	—	—	7S60P	—	—
1½-61	—	—	—	—	P41A4G	—	AB672	—
1½-63	442-4	41AD7	4GA42	41A4FL	P41A4FL	AB419	AB669	—
1½-63	—	—	8TA42	—	—	—	—	—
6-61½	—	—	F4A41	—	—	—	—	—
6-75	—	—	GB4B60	—	—	—	AB670	Z675
1½-90	460-15MS	—	2AG60	—	—	—	—	—
1½-90	860-41	—	4FA60	—	—	—	—	Z9B
1½-90	—	—	4TA60	—	—	—	—	—
1½-90	460-15	411	5DA60	60A2L	—	—	AB665	—
1½-90	—	837	—	60A4H	—	—	—	—
1½-90	—	—	6FA60	60A4L	P60A4L	AB84	AB667	—
1½-90	—	—	—	—	P60A110	—	—	—
1½-90	—	—	6FB60	—	—	—	—	—
1½-90	—	—	6TA60	—	—	—	—	—
1½-90	—	—	—	—	—	AB94	—	—
6-90	—	—	2F4B60	—	—	—	—	—
6-90	—	—	F4B60	—	—	—	—	Z659
6-90	—	—	G4B60	60B4H	—	—	—	—
6-90	460-14S	659	D4A60	—	—	—	AB664	—
6-90	—	—	—	—	—	AB684	AB671	—
6-90	—	—	—	—	—	AB694	AB668	—
6-90	—	—	—	—	P60A8F4	AB673	—	—
6-90	—	—	—	—	—	—	AB674	—
7½-90	460-15S	—	—	—	—	—	—	—

Table II. The various types listed as such, are generally interchangeable. Occasionally some slight difficulty may be experienced, however, since there are differences up to a half inch in one or more dimensions among similar batteries of different manufacture.

is used. The numbers of hours of life can vary as much as ten to one with the batteries connected to the same receiver, depending upon these conditions.

Practically every dry battery is designed for intermittent service. If the receiver is placed in a warm closet and left on, it will be only a matter of a few hours before the batteries will be completely exhausted. Similarly if the receiver is used for long stretches its life will be considerably less than if it is used for say an hour or less a day.

Battery manufacture has advanced to such a stage that if the makers know the exact conditions of use they can design a unit which will deliver the most power per dollar. They therefore recommend that replacements be made from their listings for a particular service. That is to say, a battery designed for a lantern would not necessarily be a good replacement for a radio set, although some set manufacturers seem to think so. To crowd more service into units for some purposes, compromises are made with such things as shelf life, etc. If the total life of one unit is to be say, two to five hours, it need not have a shelf life of over two years!

The retail cost to the battery-portable user under consecutive conditions of operation is somewhere between one and one-and-a-half cents per hour for most sets. This increases, naturally, as the set gets smaller, till it reaches about eight cents per hour for the new "camera" portables.

The approximate life under specified conditions for single cells and for complete batteries is shown in Figs. 1 and 2. These figures are somewhat conservative, however, since the average portable would not be used as often as indicated by these tests.

Excessive heat also shortens battery life materially. It is for this reason that manufacturers advise owners of a-c, d-c, battery portables to remove the batteries if line operation is contemplated for a considerable period.

Plug Connections

When battery portables were first introduced they all required a one-and-a-half volt A battery. Manufacturers provided these units with a two prong socket and plug arrangement to accommodate easy replacement. It was not long, however, before the portables went a-c, d-c and many required six and seven-and-a-half volt A batteries. To prevent the inadvertent connection of a volt-and-a-half set to a six-volt battery, the manufacturers of the earliest of these units utilized a three-prong socket which would in no way accept the two-prong volt-and-a-half plug. Later it was realized that a two-prong plug would suffice for any voltage, the different voltages employing prongs suitably separated.

Several sets are on the market, however, which employ six-volt A batteries using the three-prong plug. In the absence of a suitable replacement in the brand which you carry, it is only necessary for you to change the plug connection on the end of the receiver cable or to use an adaptor and sell the corresponding six-volt battery with a two-prong socket. In rare cases it may be necessary to employ an adaptor to connect some packs to special receivers.

Recently plug connections have been standardized by the Radio Manufacturers Association.

Install Proper Battery

Some manufacturers recommend that Service Men install a larger battery than that specified, wherever such a battery will fit in the receiver case. This is not necessarily the best practice. It is usually better to use that combination of A and B batteries which will run down approximately at the same time. Should either the A or B battery run down sooner, and be replaced alone, it will not be long before the other battery will require replacement. The set will thus require just twice as much attention and will be out of action twice as often as it would be if both batteries had been replaced at the same time. Upon each occasion there is no doubt that the deficiency will be discovered only after the set has been carted along somewhere with the expectation that it would give service.

It is advisable, however, to use larger As and Bs, should it be possible to increase the size of both units.

(*Continued on pages 9 and 24*)

Model		Acme	Advance	Bond	Bright Star	Burgess	Eveready	Gen-eral	National Union	Philco	Rayo-vac	Usalite	Wil-lard	Win-chester
CHEVROLET (Chevrolet Division, General Motors Corp.)														
985514	1A	114	247	4826	462	4F	742	4F1	A830	P94	P94A	634	4F1	4816
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
CLARION (Clarion Radio Co.)														
0-464	1A	118FM	547	...	865	8FL	745	8CF1	...	...	P98L	645	...	...
	2B	830	284	...	30—33	M30	482	...	B861	...	P5S30	640	...	...
0-534, 535, 539	1A	...	2476	...	646	F4P1	...	4F4	...	...	P694A	639	4F4	...
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
CLARK (See Warwick)														
CLIMAX (See General)														
COLONIAL (Colonial Radio Corp.)														
575	1A	114	247	4826	462	4F	742	4F1	A830	P94	P94A	634	4F1	4816
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
CORONADO (See Gamble Stores, Inc.)														
CROSLEY (Crosley Radio Corp.)														
27, 27BD, 27BE	1A	118S	817	4827	866	2F4	718	8F4	A834	...	P698A	638	8F4	4817
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
429, 429A, B429A	1A	118	147	4829	860	8F	741	8F1	A833	...	P96A	637	8F1	4819
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
439, 439A	1AB	442-4	41AD7	...	...	4GA42	...	41A4FL	...	P41A4FL	...	AB669	...	...
549, 549A	1AB	...	...	...	...	F4A41	...	...	...	...	...	...	...	...
5549, 5549A	1A	118S	817	4827	866	2F4	718	8F4	A834	...	P698A	638	8F4	4817
	2B	830	284	...	30—33	M30	482	...	B861	...	P5S30	640	...	...
DELCO (Delco Radio Division, General Motors Corp.)														
R1400	1A	118	147	4829	860	8F	741	8F1	A833	...	P96A	635	8F1	4819
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
R1401, R1402	1A	123M	...	...	465	4FL	...	...	...	...	P94L	642	...	...
	2B	430	...	...	30—55	A30	738	V30A	...	...	430P	621	V30A	...
DETROLA (Detrola Radio Corp.)														
282 (Pee-Wee)	1A	114	247	4826	462	4F	742	4F1	A830	P94	P94A	634	4F1	4816
	1B	...	...	...	...	A60	...	...	...	...	BB60P	...	...	...
286, 288	1A	118	147	4829	860	8F	741	8F1	A833	P96	P96A	635	8F1	4819
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
295	1A	114	247	4826	462	4F	742	4F1	A830	P94	P94A	634	4F1	4816
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
299, 289	1A	116	...	4824	660	6F	743	6F1	A831	P96	P96A	637	6F1	4814
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
303, 303A, Treasure Chest	1AB	442-4	41AD7	...	...	4GA42	...	41A4FL	...	P41A4FL	...	AB669	...	...
339, 339-1, 340-1, 341-1, 341-2, 360-1	2A	123	647	4928	361	G3	746	3H3	...	...	P83A	683	3H3	4919
	2B	830	284	...	30—33	M30	482	F30A	B861	...	P5S30	640	...	...
DEWALD (DeWald Radio Mfg. Co.)														
408	1A	114	247	4826	462	4F	742	4F1	A830	P94	P94A	634	4F1	4816
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
408R, 409	1A	118	147	4829	860	8F	741	8F1	A833	P96	P96A	635	8F1	4819
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
415	1AB	460-15	411	...	...	5DA60	...	60A2L	...	...	...	AB665	...	...
415R	1A	116	...	4824	660	6F	743	6F1	A831	P96	P96A	637	6F1	4814
	2B	830	284	...	30—33	A30X	727	F30A	...	...	BB30P	640	...	...
544, 544L	1A	118S	817	4827	866	2F4	718	8F4	A834	...	P698A	638	8F4	4817
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
545, 545LW, 545SW	1A	118S6	747	...	868	2F4L	747	8CF4	...	...	P698L	646	...	...
	2B	830	284	...	30—33	M30	482	...	B861	...	P5S30	640	...	...
EMERSON (Emerson Radio & Television Co.)														
EA338, 339, 340, 357, 363	2A	123	647	4928	361	G3	746	3H3	...	...	P83A	683	3H3	4919
	2B	830	284	...	30—33	M30	482	...	B861	...	P5S30	640	...	...
CE259	1A	114	247	4826	462	4F	742	4F1	A830	P94	P94A	634	4F1	4816
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
CE263, CE265, CX263, CE275, CT275, CX283, CX292, CX284, CX308, DC308, CX305	1A	118	147	4829	860	8F	741	8F1	A833	...	P96A	635	8F1	4819
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
DF302, DF306	2A	123	647	4928	361	G3	746	3H3	...	...	P83A	683	3H3	4919
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
DJ310, DJ311, DJ312	2A	123	647	4928	361	G3	746	3H3	...	...	P83A	683	3H3	4919
	2B	830	284	...	30—33	M30	482	...	B861	...	P5S30	640	...	...
ENDURANCE (Western Tire & Auto Stores, Inc.) (See Detrola)														
ESPEY (Espey Mfg. Co.)														
942 Series	1AB	...	...	...	...	6TA60	...	...	...	...	...	...	...	...
943, 958	1AB	460-15	411	...	...	5DA60	...	60A2L	...	...	...	AB665	...	...
040	1A	118	147	4829	860	8F	741	8F1	A833	...	P96A	635	8F1	4819
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
050	1A	118S	817	4827	866	2F4	718	8F4	A834	...	P698A	638	8F4	4817
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
052, 053	1A	...	...	...	...	F4P1X	...	...	...	...	...	636	...	...
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218

Model		Acme	Advance	Bond	Bright Star	Burgess	Eveready	Gen-eral	National Union	Philco	Rayo-vac	Usalite	Wil-lard	Win-chester

(*Continued on page 24*)

CIRCUITS

See Front Cover

By HENRY HOWARD

(Above) The Motorola Model B150 battery radio is designed for use on the handlebars of a bicycle. (Also see front cover.)

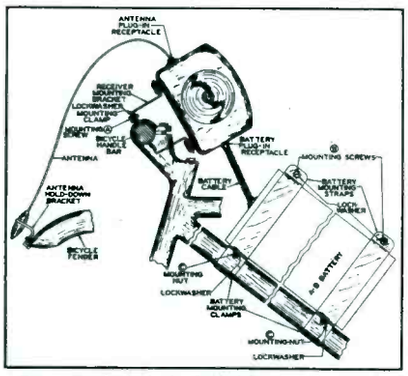


Fig. 2. (Above) Suitable brackets are provided for proper mounting of the set, and its associated battery pack, to the bicycle frame. A rod type antenna fastens to the front fender and plugs into a special receptacle on the set.

Fig. 1. (Below) The G. E. Models J805 and RJS805 utilize a p-m speaker and provide dual resistance filtering for the B supply. The set employs dual Beam-O-Scopes and incorporates a novel tone control circuit.

DESIGN engineers continue to have brainstorms, ideas or reveries and versatile imaginations as is evidenced by the concoction of circuits that follows. Nevertheless, there are many circuits of receivers made by different manufacturers that are so much alike that the blueprints might be interchanged with only a few minor changes such as resistor or condenser values.

G. E. J805, RJS805

These models are 8-tube, 3-band superheterodynes incorporating an r-f stage on all bands and having two Beam-A-Scope loops, a p-m speaker, double section resistance filter, novel tone control and wide-band untuned impedance-capacity coupling between the r-f stage and the converter. (See Fig. 1.)

Up to the present we have seen p-m speakers used mostly on a-c, d-c and auto-radio sets. It is a good sign to see them employed on high-quality sets where there should be complete freedom from 60-cycle (and harmonics) modulation which imparts that hoarse, rough characteristic to spoil an otherwise high-quality output. Plate power for the push-pull output stage is taken from the rectifier directly, or filter input. Although the hum voltage at this point is considerable, it is canceled out in the output transformer due to the balancing effect of the two push-pull tubes. This is strictly true only when the tubes are matched. In any case, it is a good policy to replace both tubes even if only a single one is found to be weak.

The first filter section consists of a 30-mfd, 350-volt condenser,an 1800-ohm resistor and a 15-mfd condenser. The push-pull screens and r-f and i-f plates are fed from this section. The second section contains an 8200-ohm resistor and 10-mfd condenser providing additional filtering for the r-f and i-f screens. (See Fig. 1.)

The antenna-loop circuit is interesting. For broadcast, the B band loop is used. For automatic, or push-button tuning, individual condensers are shunted across the loop. When an external antenna is added to the set, energy is transferred magnetically to

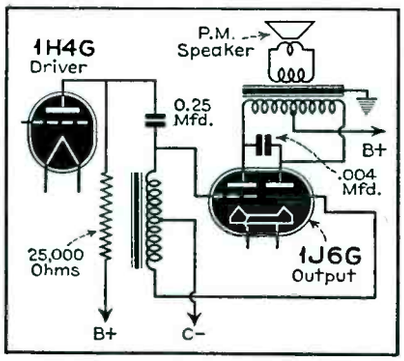
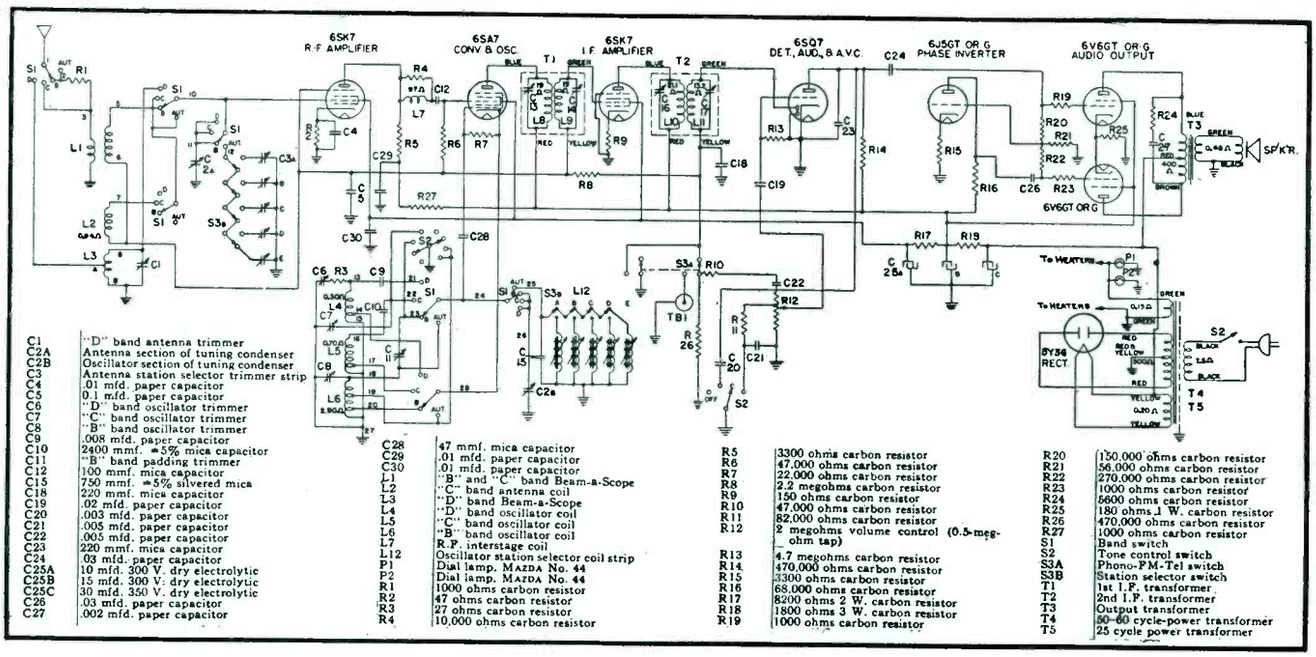
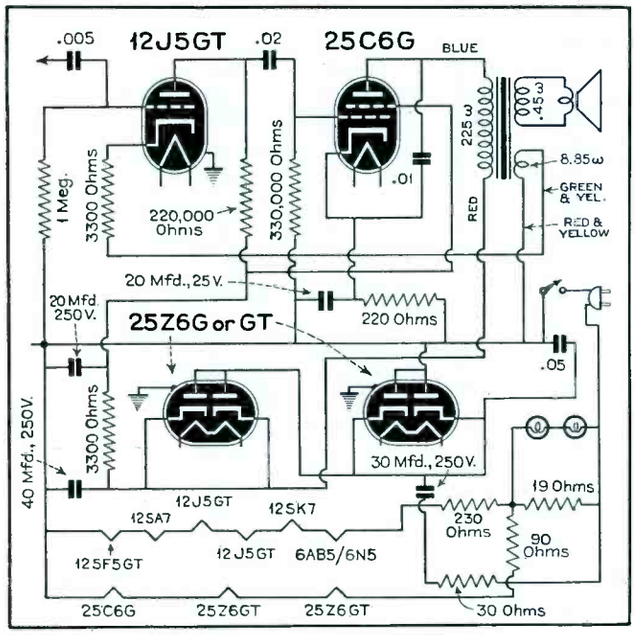


Fig. 6. (Above) The Crosley Models 548 and 5548, 5-tube farm sets, which use the 1J6G output tube, provide 2 watts of output on 135 volts of B supply.



C1	"D" band antenna trimmer	C28	47 mmf. mica capacitor	R5	3300 ohms carbon resistor	R20	150,000 ohms carbon resistor
C2A	Antenna section of tuning condenser	C29	.01 mfd. paper capacitor	R6	47,000 ohms carbon resistor	R21	56,000 ohms carbon resistor
C2B	Oscillator section of tuning condenser	C30	.01 mfd. paper capacitor	R7	22,000 ohms carbon resistor	R22	270,000 ohms carbon resistor
C3	Antenna station selector trimmer strip	L1	"B" and "C" band Beam-a-Scope	R8	2.2 megohms carbon resistor	R23	1000 ohms carbon resistor
C4	.01 mfd. paper capacitor	L2	"C" band antenna coil	R9	150 ohms carbon resistor	R24	5600 ohms carbon resistor
C5	0.1 mfd. paper capacitor	L3	"D" band Beam-a-Scope	R10	47,000 ohms carbon resistor	R25	180 ohms 1 W. carbon resistor
C6	"D" band oscillator trimmer	L4	"D" band oscillator coil	R11	82,000 ohms carbon resistor	R26	470,000 ohms carbon resistor
C7	"C" band oscillator trimmer	L5	"C" band oscillator coil	R12	2 megohms volume control (0.5-meg-ohm tap)	R27	1000 ohms carbon resistor
C8	"B" band oscillator trimmer	L6	"B" band oscillator coil			S1	Band switch
C9	.008 mfd. paper capacitor	L7	R.F. interstage coil	R13	4.7 megohms carbon resistor	S2	Tone control switch
C10	2400 mmf. ±5% mica capacitor	L12	Oscillator station selector coil strip	R14	470,000 ohms carbon resistor	S3A	Phono-PM-Tel switch
C11	"B" band padding trimmer	P1	Dial lamp, MAZDA No. 44	R15	3300 ohms carbon resistor	S3B	Station selector switch
C12	100 mmf. mica capacitor	P2	Dial lamp, MAZDA No. 44	R16	68,000 ohms carbon resistor	T1	1st I.F. transformer
C15	750 mmf. ±5% silvered mica	R1	1000 ohms carbon resistor	R17	8200 ohms 2 W. carbon resistor	T2	2nd I.F. transformer
C18	220 mmf. mica capacitor	R2	47 ohms carbon resistor	R18	1800 ohms 3 W. carbon resistor	T3	Output transformer
C19	.02 mfd. paper capacitor	R3	27 ohms carbon resistor	R19	1000 ohms carbon resistor	T4	50-60 cycle-power transformer
C20	.003 mfd. paper capacitor	R4	10,000 ohms carbon resistor			T5	25 cycle power transformer
C21	.005 mfd. paper capacitor						
C22	.005 mfd. paper capacitor						
C23	220 mmf. mica capacitor						
C24	.03 mfd. paper capacitor						
C25A	10 mfd. 300 V. dry electrolytic						
C25B	15 mfd. 300 V. dry electrolytic						
C25C	30 mfd. 350 V. dry electrolytic						
C26	.03 mfd. paper capacitor						
C27	.002 mfd. paper capacitor						



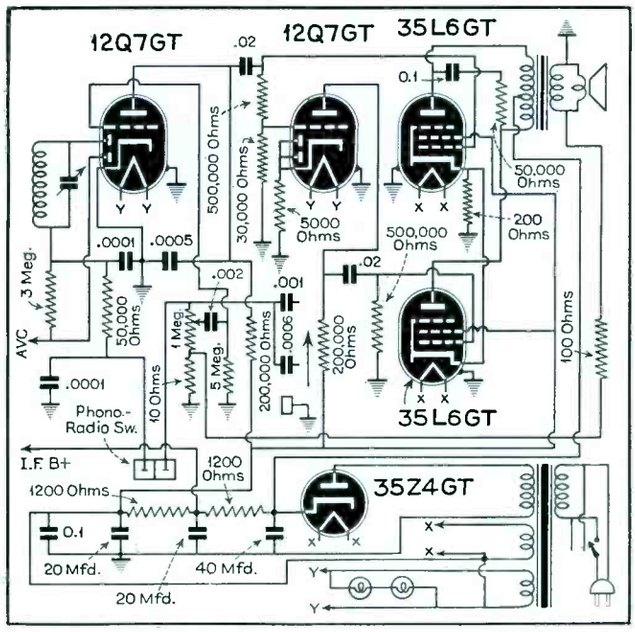


Fig. 8. (Above, left) G. E. Models HJ905 and HJ908 are transformerless a-c sets which utilize a pair of 25Z6Gs in a voltage double-circuit. The Airline 93BR719A (Fig. 9, above, right) has a 35-volt rectifier and push-pull 35L6GTs operating from a power transformer.

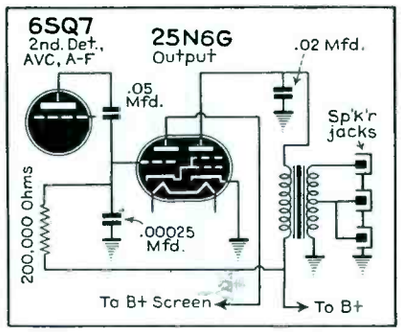


Fig. 7. Airline 93BR392A has a direct-coupled type 25N6G tube in its output stage. It employs dual p-m speakers as well.

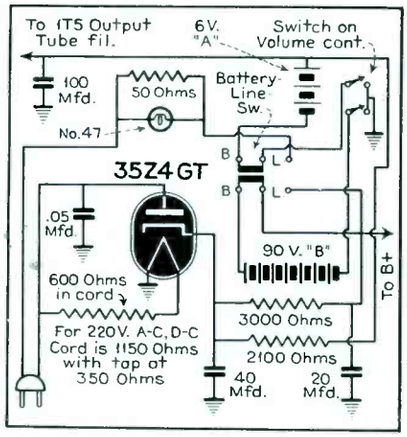
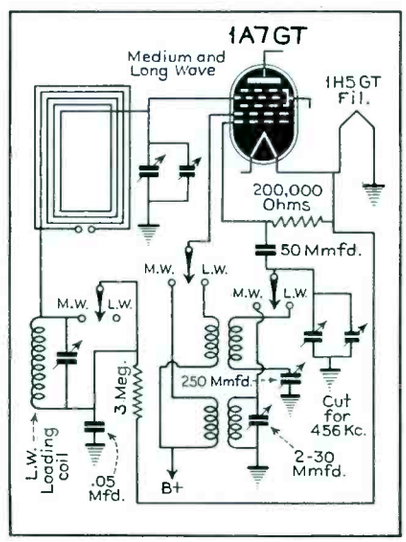


Fig. 4. (Above) DeWald 545SW and 545LW battery portables include a 35Z4GT rectifier for line operation.

Fig. 5. (Below) The DeWald 545LW provides for long-wave reception as well as for the standard broadcast band. Note the long-wave loading coil in series with the loop.



the loop. A 1000-ohm resistor prevents sharp antenna resonance. On the first (lower-frequency) short-wave band the B loop is also used, but, in this case, it is shunted by L_2 (the C band antenna coil). In the event an antenna is used, coupling is the same as before but without the 1000-ohm resistor. On the second short wave, or D band, the second D band loop is used. Here, the antenna coupling is much closer, since there is a tap directly on the loop L_3. An antenna trimmer, C, is necessary to resonate the particular antenna connected because of the direct coupling.

The oscillator push-button tuning unit has a series of permeability tuned coils which shunt a temperature stabilized 750-mmfd silver-mica capacitor. Note the coupling transformer between r-f and converter previously mentioned.

The tone control has two active positions, one cutting highs in the usual way, the other cutting lows by shorting the base compensating condenser in connection with the volume control.

Motorola B150 Bike Radio

Even to a well hardened, wide awake Service Man this set is novel. Operated by a battery pack which is easily mounted to the bicycle frame, the set has ample volume and remarkably good tone. A rod-type antenna is used which runs from the forward end of the front mudguard to the antenna receptacle on top of the set in the center of the handlebars. (See Fig. 2.)

The set is a standard superheterodyne except for the tube line-up. It features iron-core r-f transformers, permeability-tuned antenna and oscillator circuits and a 4-inch p-m speaker. The following tubes are used: 1A7GT oscillator-converter; 3A8GT[1] triple-purpose tube functioning as i-f pentode, second-detector-avc diode and high-mu first a-f triode; and 1Q5GT power output. The 3 tubes serve as 6 basic types. (See Front Cover.)

The A plus lead is grounded directly while the B minus lead is grounded through an 820-ohm resistor which serves as bias for the 1Q5GT output stage. The i-f response is flattened by a 470,000-ohm resistor across the primary of each i-f transformer. The second i-f transformer has only a tuned secondary, the primary being untuned. When servicing this bike set, alignment must be made with the antenna in place, coupling the oscillator by means of a wire parallel to the antenna but, in no case connected to it; somewhat similar to

[1] "Tubes." By John Potts, SERVICE, Jan., 1940, p. 7.

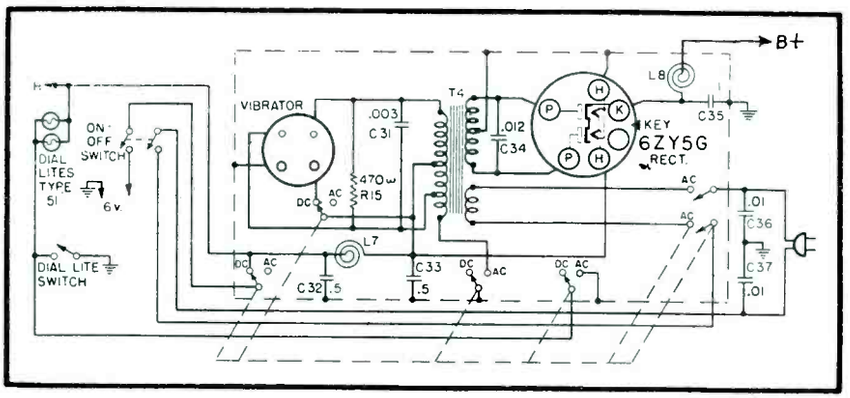


Fig. 10. The Silvertone Models 6368 and 6382 are designed for operation from either the 110-volt, 60-cycle power lines or from a 6-volt d-c source.

loop technique.

DeWald 545SW, 545LW

The DeWald portable Model 545 is available in two models also, the long wave and broadcast (545LW) or short wave and broadcast (545SW). Both include a 35Z4GT rectifier for a-c, d-c line operation. (See Fig. 4.) Note the long-wave loading coil in series with the loop. Note also the very simple battery-to-line switching arrangement using a dpdt slide switch.

Crosley 548, 5548

Crosley Models 548 and 5548 are 5-tube farm sets made for air cell battery operation and 135-volt B. A similar model, 558, uses the new 1J6G Class B output tube giving an output of 2 watts! All new tubes are used in this series of sets. (See Fig. 6.)

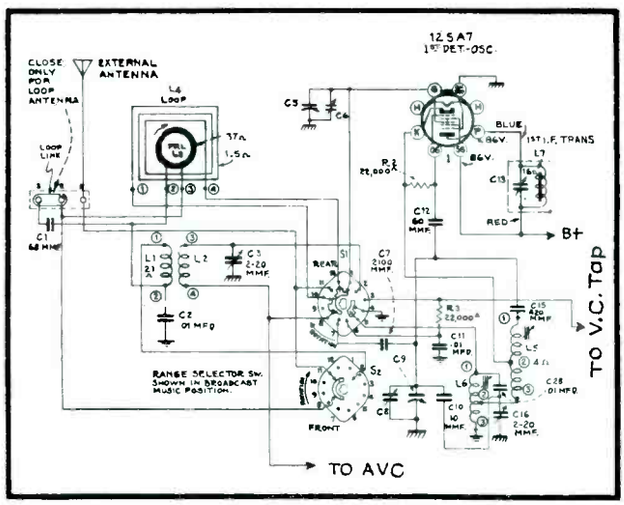
Airline 93BR392A

We next have a series of receivers with unusual AF ends. Take the Airline Model 93BR392A in Fig. 7. This is a seven-tube a-c, d-c set with three bands and dual p-m speakers. Note the 25N6G internally coupled Class A dual triode power-output stage.

G.E. HJ905, HJ908

General Electric also has some surprises in Fig. 8 showing part of models HJ905 and HJ908, large 9-tube phono combination models having no power transformer! Nine tubes are used including two 25Z6Gs in a voltage doubler circuit. Two strings of heaters are needed to accommodate all the tubes. A special tertiary winding is put on the output transformer for degenerative feedback to the second audio cathode. A 14-inch p-m speaker is used.

Fig. 11. The RCA 46X11, 46X12 and 46X13 employ a small multiturn coupling coil for loop-antenna coupling. This provides greater energy transfer at the low frequencies than the single turn used by many manufacturers.



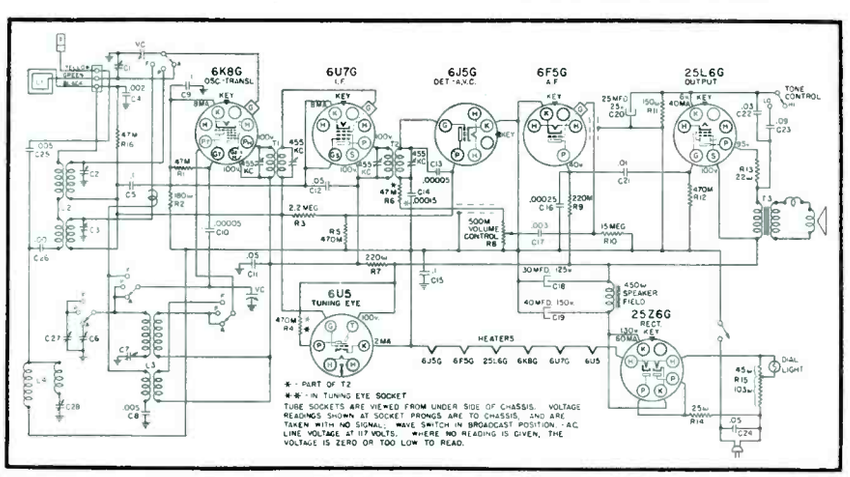
Airline 93BR719A

Wards have another unusual Model 93BR719A in Fig. 9. This set has a 35 volt, ½-wave rectifier and push-pull 35L6GTs operating from a power transformer as well as a 12-volt series of tubes for the r-f end. A 12Q7GT is used as inverter and the feedback loop runs from the high side of the output secondary to the grid circuit of the first audio instead of to cathode, as in most sets.

Silvertone 6368, 6382

The Sears Roebuck Silvertone Models 6368 and 6382 are seven-tube, three-band supers operating from either 6 volts d-c or 115 volts a-c. The power transformer has a full-wave primary winding for the 6-volt vibrator, an auxiliary primary winding for 115 volts a-c, the usual full-wave secondary winding for high voltage and a 6.3-volt heater winding. For economical operation on battery, the dial lights are arranged to light only while tuning—called Dial Flash-O-Lite. On a-c they burn continuously. The battery drain is only 2.3 amp. The 60-cycle drain is 18 watts, giving an output of 1.42 watts undistorted, 2.8 watts maximum. A p-m speaker explains the low battery current. Plate voltages are reduced about 25% on d-c cutting the power output to 0.78 watts undistorted, 1.43 maximum. The 6T7G detector-a-f amplifier is operated with cathode grounded, bias being obtained via a 15-meg grid leak, an increasingly popular system. A separate triode, acting as a diode, is used for avc. Note the switching circuit in Fig. 10.

Fig. 14. Silvertone Models 6324, 6424 and 6493 have a 2-position tone control with an unusual arrangement, in the power tube plate circuit.



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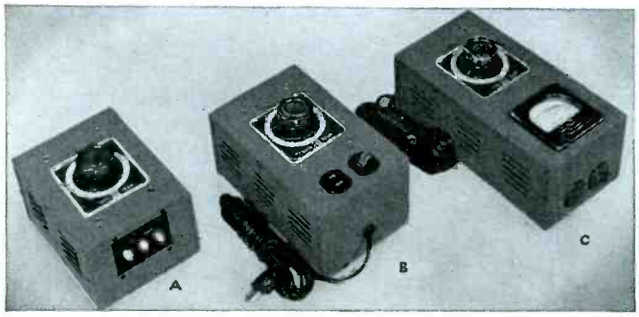
UTC LEADS THE FIELD



Varitran Controls

- ★ New roller contact . . . practically eliminates contact wear.
- ★ New glass-insulated wire . . . for positive dependability.
- ★ New large, copper, heat radiating disc . . . for cooler operation.
- ★ New copper alloy collector ring . . . eliminates pigtails and loose connections.
- ★ Core type lamination . . . for maximum ruggedness and minimum space.
- ★ New top and bottom mounting . . . for panel, chassis, or bench service.

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Maximum Amp. rating applies from 0 to 20 and 95 to 130 volts. Between 20 and 95 volts current rating tapers off to 50% of rated current at 65 v. point.

Top and bottom mounting for laboratory bench or panel mounting. All units supplied mounted with terminal strips as in Fig. A, except V-1 (Fig. B) and V-1M (Fig. C.)

Type	Input Voltage	Output Voltage	Watts	Maximum Amps.	Approx. Wt. Lbs.	Net Price
V-0	115 volts	0-130	230	2	8	$7.50
V-0-B	230 volts	0-260	230	1	10	9.50
V-1	115 volts	0-130	570	5	11	10.00
V-1-M	115 volts	0-130	570	5	12	15.00
V-2	115 volts	0-130	570	5	11	9.00
V-2-B	230 volts	0-260	570	2.5	14	11.50
V-3	115 volts	0-130	850	7.5	14	14.00
V-3-B	230 volts	0-260	850	3.75	18	18.00
V-4	115 volts	0-130	1250	11	32	20.00
V-4-B	230 volts	0-260	1250	5.5	38	25.00
V-5	115 volts	0-130	1950	17	45	32.00
V-5-B	230 volts	0-260	1950	8.5	56	37.00
V-6	115 volts	0-130	3500	30	90	60.00
V-6-B	230 volts	0-260	3500	15	90	70.00
V-7	115 volts	0-130	5000	44	120	87.00
V-7-B	230 volts	0-260	5000	22	120	95.00

Model 3A EQUALIZER

The universal characteristics of the UTC 3-A equalizer have made it the most popular item for broadcast and recording equalization. This unique unit, with which most communications engineers are already familiar is an accurately calibrated, quickly adjustable combined low and high frequency equalizer. Four controls are provided on the panel. The low frequency controls include a switch for adjusting the maximum equalization frequency to 25, 50, or 100 cycles and a calibrated T-pad for exact adjustment of the amount of equalization. The high frequency portion of this unit includes a switch to obtain resonance at 4000, 6000, 8000 or 10,000 cycles, and a similar calibrated control reading directly in DB. It is ideal for equalizing lines, pickup and recording equipment, due to its flexible nature. Dimensions of panel 3½" x 19". Depth 7½". The new model 3-A is NOW THOROUGHLY SHIELDED AGAINST INDUCTIVE PICKUP WITH UTC TRI-ALLOY SHIELDING. Net price to broadcast stations or recording studios **$85**

Linear Standard Transformers

UTC Linear Standard Transformers are available in sizes from minus 130 DB operating level to 50 kw. All standard units are guaranteed to be ± 1 DB from 30 to 20,000 cycles. The UTC LS-10 input transformer illustrated, incorporates tri-alloy magnetic filtering, which, combined with the UTC hum balanced coil structure, assures lowest hum pickup ever attained in an input transformer.

UTC has been supplying hum-balanced power supply equipment to Western Electric, Electrical Research Products, and other organizations for over four years. The use of hum-balanced construction plus the UTC high permeability cast shield reduces external flux to extremely small values. All UTC Linear Standard power supply components can be obtained in this form of construction at a 30% increase above normal list prices.

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SOUND IDEAS

By S. GORDON TAYLOR

A SOUND installation recently made in the Temple B'nai Jeshurun, a beautifully modern Synagogue at Newark, New Jersey, represents an interesting example of effectiveness combined with simplicity. It also displays how the sound man can often take advantage of existing conditions to aid him in his planning. An example, too, demonstrating that tricky installations, high power and special speaker equipment so common in larger churches are not by any means always essential to successful results.

In this installation the sound system is used exclusively for speech reinforcement. The seating area takes the form of a rectangle with its four corners cut out with balconies extending across the rear and entirely down both sides. The general arangement is that shown in Fig. 1. Above this the cathedral-like structure towers perhaps eighty feet, the walls converging into a great dome.

The common practice in such intallations of grouping directional speakers overhead was considered impractical. First it would mar the architectural beauty, but, more important, the relatively deep but low balconies would result in large shadow areas beneath. Unless placed directly overhead, sound distribution even through the unshadowed portion of the main floor would be non-uniform. If placed directly over the center of the floor those seated in the front half would experience the undesirable effect of hearing the speaker's voice coming from behind them. Added to all this, uniformity of distribution would require considerable elevation and the propagation of sound over such a distance would involve the use of relatively high power.

The solution of the problem was found in the use of a total of ten standard speakers, eight of them distributed around the walls below the balcony and two over the rear balcony. Off-hand this might suggest trouble from phase relationships, confusing multi-point sources, etc., but no trouble is experienced from these because the speakers are operated at low level. Theoretically, with some overlapping of the fields of the different speakers, such troubles cannot be completely overcome. Practically, however, it goes unnoticed. Except for a small area in the center of the main floor, each member of the congregation is serviced primarily by some one speaker. Those in the center may be simultaneously in the fields of two speakers but because these are symmetrically disposed, one on either side of him, the effect is neither displeasing nor confusing.

An important consideration in this

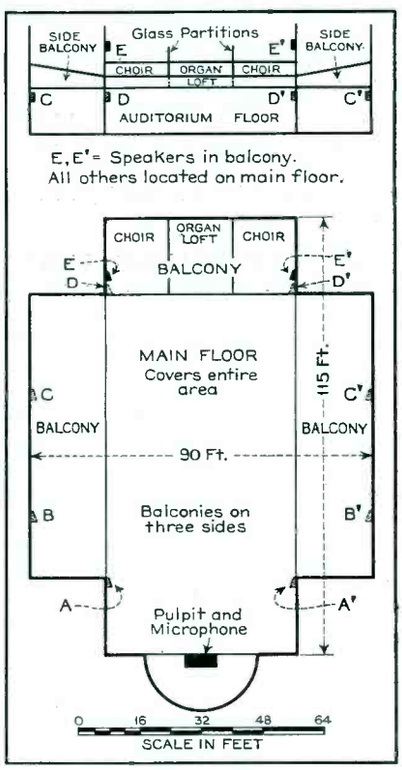

Fig. 1. (Right) Floor plan and elevation of the seating areas of the Temple with single-deck balconies at each side and rear. The speaker arrangement is shown with the eight speakers on the main floor and two in rear balcony, all directed away from the microphone by their sloping-face wall baffles. Shown below is a panorama view of interior of Temple B'nai Jeshuran as viewed from the rear. Three loudspeakers may be seen in each side view, just below the balcony. A total of 10 speakers operated at low level provide highly uniform coverage of a congregation of 2,000 persons distributed over approximately 13,000 square feet of floor space on main floor and balconies. A Lafayette amplifier, Model 480-T, rated at normal ouput of 45 watts, provides more than ample power to drive these speakers. Walls are of brick imported from Jerusalem which, surprisingly, provide excellent natural sound-absorbing characteristics.

connection is that all speakers are in angular wall baffles and are so placed that the speaker output is directed about 20 degrees toward the rear. This arrangement not only tends to reduce undesirable overlapping of adjacent speaker fields but helps to maintain the impression of sound coming from the front and helps avoid acoustic feed-back.

The use of several speakers operating at relatively low levels tends to provide uniform distribution of sound. In addition to this (and this is one of the things referred to above in the mention of existing conditions which may be utilized advantageously) by placing the speakers well up, close to the underside of the balconies, this horizontal surface and the wall serve to project the sound outward and somewhat downward, concentrating it on those seated at a distance. The elevation of the speakers above their heads, on the other hand prevents unnatural loudness in the case of those near the speakers. Add to this the further fact that those seated in the center of the floor hear sound from both sides and it becomes quite understandable why a difference in level of only a very few db is experienced as one moves from a speaker out toward the center of the floor.

An interesting phase of this installation is that no special provision had to be made for those seated in the side balconies. Tests showed that the spill-over from the downstairs speakers provided adequate level for complete comfort, although the sound reaching these listeners is necessarily practically all by reflection. The level is, of course, somewhat below that encountered on the main floor, but not so much lower as to justify the installation of additional speakers above these balconies.

This was not, however, true of the rear balcony where the choir and organ are located. This is partly due to the fact that this balcony faces the long dimension of the auditorium, and further, that glass partitions inclosing the organ loft probably tend to break up this area. In any event it was found desirable to install one speaker in each of the choir areas.

The speakers are all Jensen Type A12PM in Lafayette walnut wall baffles. Each is equipped with variable T pad which, adjusted during preliminary tests, remains fixed. These adjustments in the case of speakers B, B1, C and C1 (Fig. 1), are for normal level. The others are all set for considerably below maximum output. The balanced effect obtained in this way contributes importantly to the uniformity of level throughout the area.

The amplifier is a Lafayette Model 480T with a normal rating of 45 watts, peak 65 watts. The fact that it is never necessary to open up this amplifier more than about half-way is an indication of the efficacy of the speaker system. The amplifier, conveniently located in a passageway just off the rostrum, includes an output level indicator meter, overall gain control and both bass and treble compensator controls on the front panel.

In this location it is reasonably close to the Shure Unidyne microphone and is freely accessible at all times during services. The volume indicator simplifies adjustment for the lay operator.

An amplifier of lower output could have been used here but it was the feeling that reserve power to more than meet all possible requirements was more desirable than the economy that could have been gained through the purchase of a smaller amplifier. This is quite in keeping with the stress laid throughout on effectiveness as the primary requirement and economy as a highly impor-

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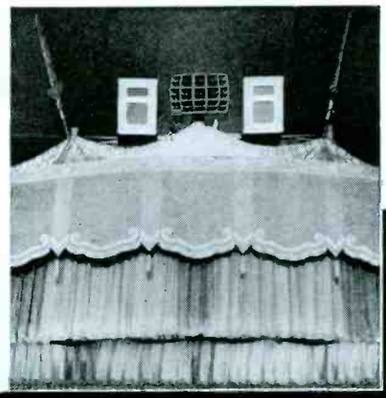

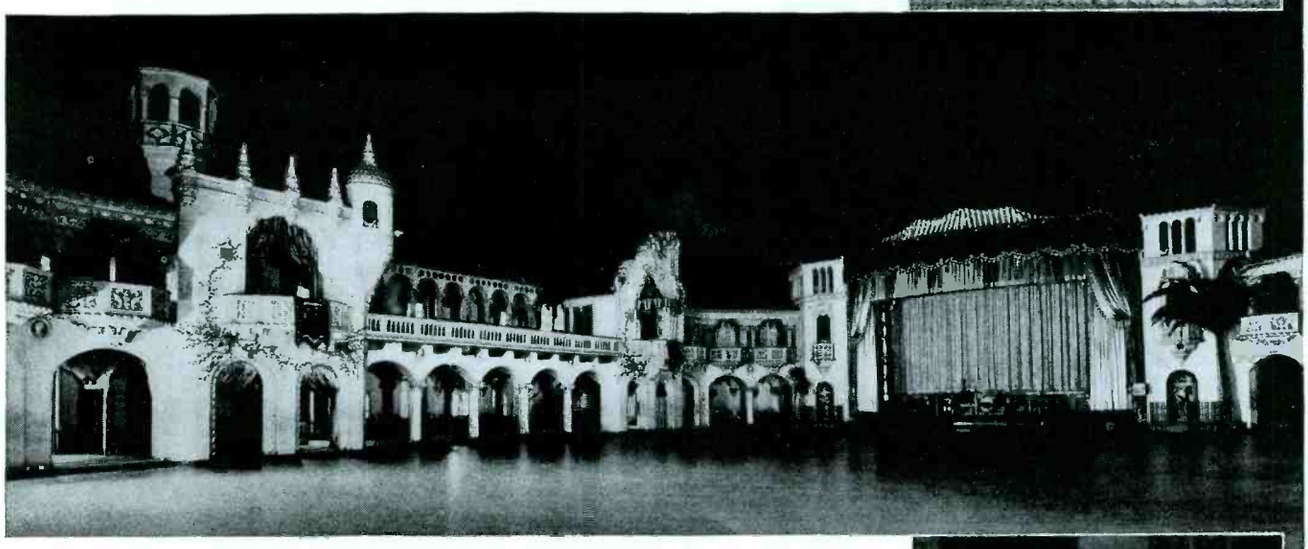

Fig. 2. Chicago's beautiful Aragon Ballroom where more than 6,000 couples dance on one giant floor. The resulting background noise, together with a unique acoustic situation created by the domed ceiling, posed a difficult problem in sound distribution for the sound engineers. They solved it by installing special sound equipment which made maximum use of both directional microphones and directional loudspeakers.

Illustration courtesy Western Electric

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RCA RIDER VOLTOHMYST

THE RCA Rider VoltOhmyst is designed to measure d-c voltages and d-c resistances over a wide range. As a d-c voltage measuring device its range of operation is from 0.05 volt to 5000 volts. Its input resistance is constant at 16 meg on all ranges up to 500 volts and constant at 160 meg on all ranges between 500 and 5000 volts.

The instrument will measure d-c voltages which are positive or negative with respect to ground, without switching leads and can be used for the measurement of d-c operating and control voltages up to 500 volts in signal-carrying circuits with the signals present. The instrument will not interfere with the operation of the circuit or element across which it may be connected. It is not necessary to reset the zero when changing voltage ranges. The accuracy of the voltmeter is within 2% of full scale.

The ohmmeter operates over a range from 0.1 ohm to 1000 meg without requiring resetting of the zero when changing ranges. The ohmmeter test voltage varies from 0.03 volts across 0.1 ohm to a maximum of 3 volts across 1000 meg. The accuracy of the ohmmeter is within 3% at center scale.

Circuit

The VoltOhmyst uses a push-pull electronic vacuum-tube voltmeter the circuit of which is shown in Fig. 1. The two tubes V1 and V2 are linked by means of a common high resistance R40. Because of this coupling, any change in the input voltage to the grid of V1 changes the cathode bias of V2 and as a result the change in the plate current of V2 in the opposite direction. The differential voltage thus developed across the load resistors R45 and R43 is applied to the meter, which is calibrated in terms of the voltage applied to the input and in terms of the resistance being measured when the instrument is used as an ohmmeter.

In addition to the push-pull action, a high degree of self-regulation is obtained as a direct result of the high value of coupling resistance R40. This is analogous to the regulating effect secured through the use of self-bias but because R40 is approximately 100 times as large as the value of cathode resistance which it is possible to use in conventional circuits, the self-regulating action is correspondingly increased. At the same time the excessive loss of sensitivity normally experienced when using such a high cathode resistance is eliminated in the VoltOhmyst because of the balanced nature of the circuit. A controlled amount of inverse feedback to obtain independence of tube characteristics is secured by means of the two resistors R41 and R42.

The voltmeter probe has a 1-meg isolating resistor built into the bakelite sleeve, thereby preventing the capacitance of the shielded cable and input circuit from reacting upon the circuit under test. Because of this construction, dynamic d-c voltage measurements can be made in circuits where a-f, i-f or r-f signals are present.

When checking the d-c voltage in circuits where a-c is present, the a-c component is attenuated by means of a filter network (constituting a series resistor having a minimum value of 8.5 meg and condenser of 0.005 mfd). Since the VoltOhmyst is essentially linear there will be no error as a result of rectification unless the peak a-c voltage after attenuation exceeds the full scale reading of the range to which the instrument is set. For all ordinary measurements the attenuation of the filter is sufficiently great so that an a-c component present will have no effect on the reading.

Fig. 1. The VoltOhmyst uses a push-pull electronic vacuum-tube voltmeter circuit. The vtvm is also used as an indicator in the ohmmeter circuits.

Fig. 2. A single adjustment of the ohmmeter zero point is all that is required for every range of the instrument.

Oscillator operation can be checked with the VoltOhmyst by measuring the rectified voltage present at the control grid of the oscillator tube. To make this measurement the voltmeter probe is placed in contact

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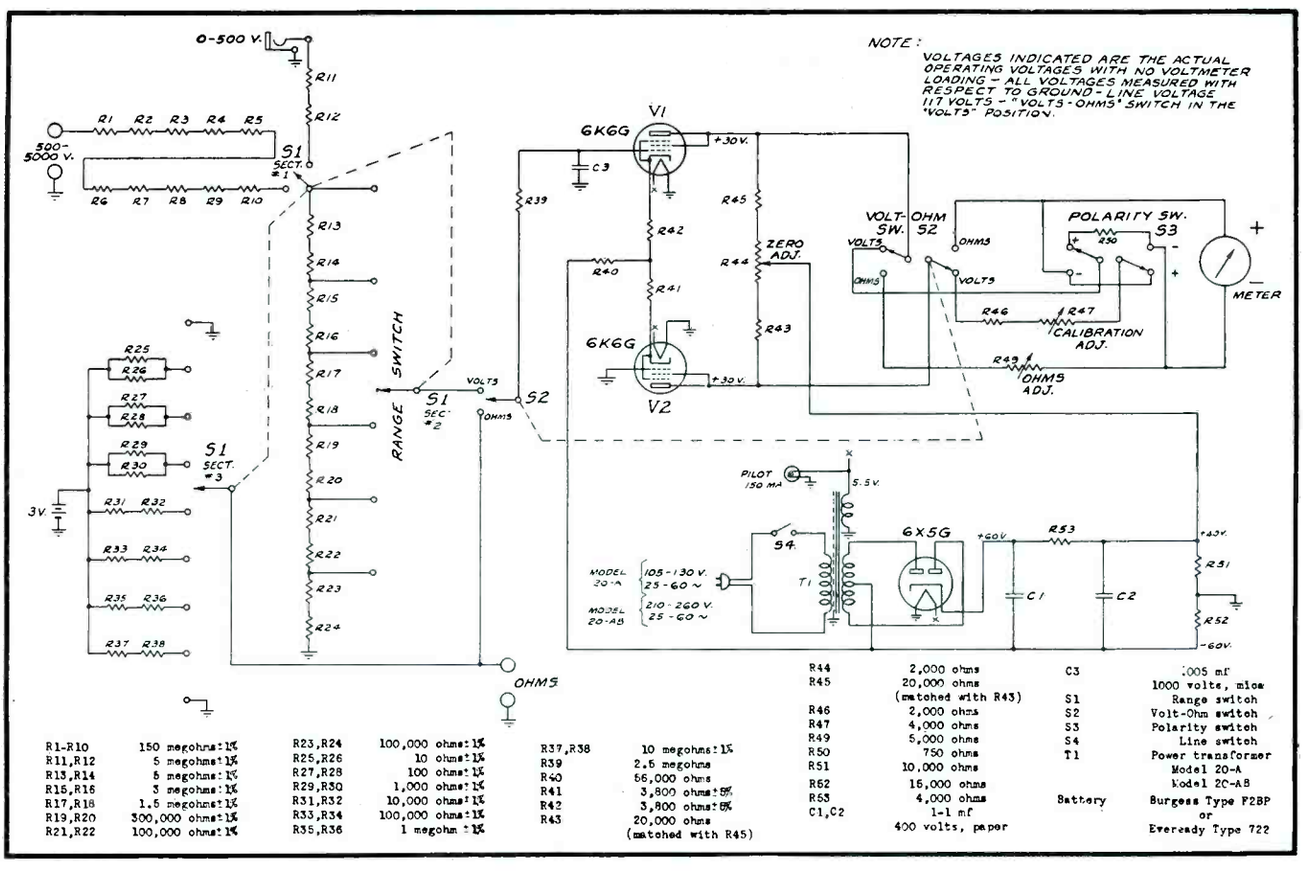

R1-R10	150 megohms ±1%	R23,R24	100,000 ohms ±1%	R37,R38	10 megohms ±1%	R44	2,000 ohms
R11,R12	5 megohms ±1%	R25,R26	10 ohms ±1%	R39	2.5 megohms	R45	20,000 ohms (matched with R43)
R13,R14	5 megohms ±1%	R27,R28	100 ohms ±1%	R40	56,000 ohms	R46	2,000 ohms
R15,R16	3 megohms ±1%	R29,R30	1,000 ohms ±1%	R41	3,800 ohms ±5%	R47	4,000 ohms
R17,R18	1.5 megohms ±1%	R31,R32	10,000 ohms ±1%	R42	3,800 ohms ±5%	R49	5,000 ohms
R19,R20	300,000 ohms ±1%	R33,R34	100,000 ohms ±1%	R43	20,000 ohms (matched with R45)	R50	750 ohms
R21,R22	100,000 ohms ±1%	R35,R36	1 megohm ±1%			R51	10,000 ohms
						R52	16,000 ohms
						R53	4,000 ohms
						C1,C2	1-1 mf 400 volts, paper

C3	.005 mf 1000 volts, mica
S1	Range switch
S2	Volt-Ohm switch
S3	Polarity switch
S4	Line switch
T1	Power transformer Model 20-A Model 20-AB
Battery	Burgess Type F2BP or Eveready Type 722

THEATRE DISPLAY

By M. HOVER

The success of this service shop can be attributed, by and large, to the employment of novel business getting ideas. Herewith is one, which, aside from attracting a favorable clientele, will do much toward increasing the shop's prestige and also promote friendly relations with the local theatre.

The Allied Engineering Services. 410 Marion Avenue, Lima, Ohio, of which the author is sales manager, placed this display in the lobby of their local theatre a few weeks before H. G. Wells' picture, "Things to Come", was featured. Another attractive display in the window of their own shop tied in with that in the theatre. This is only one of many business getting ideas which help make Allied one of the most prosperous service shops in the East.

OVER a period of years we have built up a business catering to almost every branch of the electronic art. We handle talking picture service, custom built amplifiers, recording equipment, p-a systems, and photoelectric controls. We also service x-ray equipment.

The tendency of our line is to be rather unsteady and business goes by spurts. In order to take up the slack and keep our shop busy at all times, we were confronted with the problem of building up a radio service business, preferably among clients with ample financial means who would demand precision work and be willing to pay for it.

Previous experience had shown us that ordinary forms of advertising attracted too many customers who were interested in free service, free tube testing, and maximum repair per dollar. We solved this problem by cooperating with the management of our largest theatre.

More than once each year some picture is presented which offers a tie-in with our business, such as "The Big Broadcast," "Things To Come," "Young Tom Edison," etc. With pictures of this type we assemble an elaborate lobby display, closely related to the subject of the picture. This display is placed in operation at least two weeks in advance of the picture, and in some cases has been retained through the run of the play, due to public interest.

The accompanying photograph shows a display assembled for the H. G. Wells picture, "Things to Come." An amplifier, microphone, and oscillograph were hooked up and a printed card invited the patrons to see their voices. Both ancient and modern vacuum tubes, particularly those developed for the talkies, were given considerable space. A slowly rotating mirror picked up the beam from a spotlight, passed it to a photocell control which operated a slide projector, intermittently flashing on the small screen the announcement of the coming attraction. Only a small card was used to identify the owner of the equipment, but one of our employees was in attendance most of the time to answer questions and assist in the display. *Considerable newspaper space was devoted to the unique demonstration.* About one patron out of twenty inquired as to who built the equipment and all about it. The attendant could then bring up the matter of radio service, and in many cases was able to get the telephone number and address. After that, the going was easy. The customers seemed more willing to talk business, and what was just as important, to pay for it.

At present, we are working on a tie-in with Metro's "Thomas Edison, the Man." We will display some of the original Edison motors, motion picture projectors, dictographs, telautographs, an historic lamp display, and the modern counterparts of this equipment. All this will be through the courtesy of our company, Allied Engineering Services, Precision Radio Service Our Specialty.

As a business builder this plan has been very successful.

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Remember, National Union specializes in selling through the radio service dealer and the radio parts distributor. Because of this specialization National Union understands the radio service dealers' problems. In helping Service Dealers to better business, N.U. has developed the most varied assortment of *Sales-Helps* of any company in the industry. Every piece (see illustration to right) is of time-tested, practical value. Select the sales-help that will best help you sell yourself to your community. Your N.U. Distributor will gladly cooperate with you.

1. Official Radio Service Analysis and Test Report
2. DeLuxe Radio Log
3. Price Card and Interchangeability Guide
4. Cartoon Post Card Series
5. N.U. Electric Clock
6. N.U. Radio Date Labels
7. Guarantee Form
8. Radio Tube Handbook
9. 10, 11, 13, 14, 15. Various Mailing pieces and business letters.
12. Outdoor Sign
16. Large Window Display
17. Inventory Control Carton for N.U. Stock Tabs
18. Complete Stationery Kit with Letterheads, Bill Forms, etc.
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SOUND IDEAS

(*Continued from page* 15)

tant but definitely secondary consideration.

Proving that a good job is the sound man's best advertisement, a second

Illustration Courtesy Western Electric

Fig. 3. All instrument enhancement, at the Aragon installation, takes place at a single control panel. An individual monitor speaker provides the operator's ears with a continuous check on the musical balance while his eye follows the volume level on a standard VI meter.

sound system was later installed in the large assembly hall used for entertainments and various other social activities. Here the requirements were met with a Lafayette 30-watt amplifier, two Jensen A12PM speakers, Shure crystal mike and a record player.

Ballroom

In marked contrast to the hushed stillness of the Temple B'nai Jeshurun, Chicago's Aragon Ballroom presented the ear-disturbing shuffle of twelve thousand dancing feet on a hard maple floor. Because of the size and peculiar acoustics of the Aragon, the strains of Dick Jurgens' orchestra failed, particularly in the remote sections of the ballroom, to dominate the welter of laughter, conversation and other incidental crowd noise. After months of pondering over the problem, bandmaster Jurgens finally hit upon the solution: employing a Western Electric sound system which uses directional microphones and speakers in which separate elements project the upper and lower register sounds. This directional apparatus solved the problem of achieving uniform distribution. Proper balance of the amplified music is restored by means of controllable amplifiers in which both the bass and treble tones may be varied at will. Following the initial tryout of the system, Mr. Jurgens said, "That is one of the most natural reproductions of tone I have ever heard over a sound system."

According to Walter Boom of the Boom Electric Company, which made the installation, the new system is extremely simple to operate despite its seeming complexity. All instrumental enhancement takes place at a control panel which resembles the console of a pipe organ. An individual monitor speaker provides the operator's ears with a continuous check on musical balance while his eye follows the volume level on a VI meter.

Fire Departments

FIRE departments have been slow to give up the old gong systems, but there is much to be said for the substitution of city-wide sound sys-

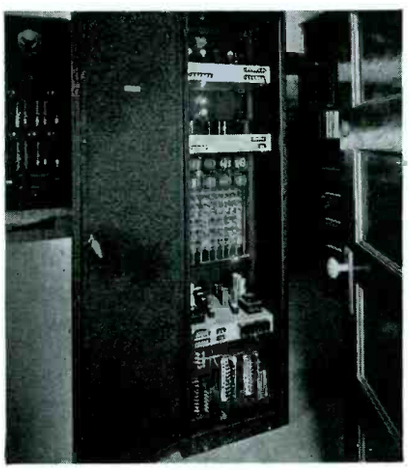

Fig. 4. In Beaumont, Texas, the local fire department features a centralized sound system with 70 speakers for its 11 stations. All of the station fire chiefs' cars are equipped with two-way radio, as are some of the larger fire apparatus. The entire system is interconnected with the police system so that reports are boradcast over the latter system as well.

tems which permit alarms to be spoken, accompanied by detailed directions for apparatus, etc. It is understood that many cities have evidenced interest in such installations, indicating possibilities of an important market.

In Beaumont, Texas, each of the 11 fire houses has been equipped with one or more sound units which not only replace the old gong for fire alarms, but permit two-way voice communication between stations and police headquarters. Work and design was under the supervision of John D. Southwell, Superintendent of the signal division.

The central system is housed in a signal building which also has a dispatcher and his console or switchboard. There are 11 fire stations in the city, all of which are equipped with an amplifier and speaker (see Fig. 5) for talk-back. In several of the larger stations extra units are in operation as well as in the homes of the fire chief, his first and second assistant, police station, officials, etc. A total of 70 Oxford 12-in p-m speakers are used. Two separate conversations can be carried on simultaneously, but should an alarm come in, the dispatcher operates a switch that breaks in and clears all lines of conversation so he may report the fire over the system without delay. At the same time the report is broadcast over the police radio. All of the station fire chief's cars are equipped with 2-way radio, as are some of the larger fire equipment.

A further use that the system is put to is in the direction of apparatus during a fire. Each piece of equipment is carefully directed and stations emptied are reinforced with apparatus from near-by stations. Reinforcements are sent up and shifts made at the scene of the fire which are directed by the chief through his radio transmitter. Later each piece of fire equipment is checked in and reports received as to the amount of water used, chemical, hose, etc. . . . A perfect system of coordination and cooperation has been worked out and is participated in by the police department.

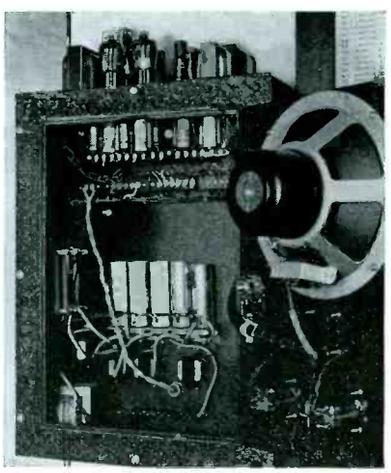

Fig. 5. Extra units, such as that shown above, are in operation in several of the larger stations as well as in the homes of the fire chief and his first and second assistants. Two two-way conversations can be carried on simultaneously but, should an alarm come in, the dispatcher can clear the lines so that he may report the fire over the entire system without delay.

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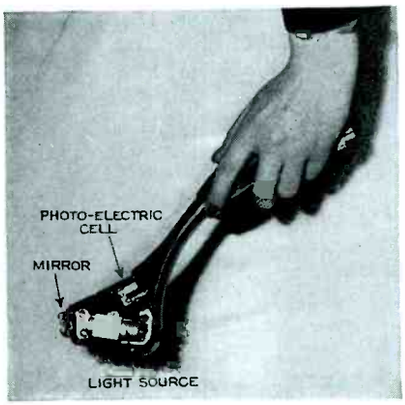
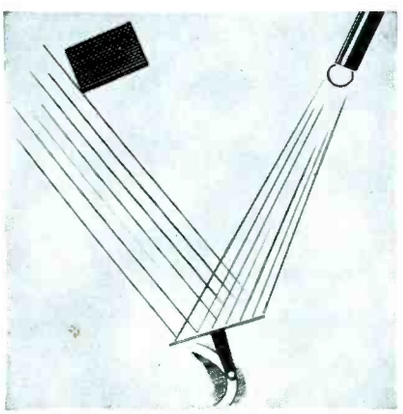
PHILCO PHOTOELECTRIC PHONOGRAPH

In an attempt to increase record life and eliminate the necessity of frequently changing the needle as well as improve reproduction, Philco engineers have developed a photoelectric phonograph pickup.

The pickup consists essentially of a floating jewel (which replaces the needle) connected to a tiny mirror, a light source and a photoelectric cell.



A photoelectric cell, a light source and a tiny mirror, properly arranged on the end of the pickup arm, comprise Philco's latest development in record reproducing equipment. A 1.8-mc oscillator lights the filament of a special bulb. The record vibrations, transferred by the tiny mirror modulate this beam to operate the photocell.



As the floating jewel moves along the curve of the record groove, the mirror swings from side to side on its axis, flashing the beam of light on and off the photoelectric cell. Since the photoelectric cell translates light into electrical energy the flow of current generated in the photoelectric cell varies in proportion to the amount of light flashed in the cell as the mirror is swung by the jewel.

To minimize the amount of energy required for the jewel to swing the mirror, it was necessary to utilize a paper-thin mirror specially designed for use in galvanometers. This is silvered with a vaporized aluminum and mounted on a tiny block which swings on an axis that floats on two flexible bearings.

To meet technical requirements as to size and weight a tiny bulb filled with gas to lighten the life of the filament was designed. It is also necessary that the beam of light at its source have no waver or flicker as this would register on the sensitive photoelectric cell in addition to the music and result in a hum in the speaker. Consequently, the household alternating current which operates the radio-phonograph had to be transformed into a steady flow of light by an oscillator which generates high frequency currents, stepping up ordinary domestic a-c from 60 to 1,800,000 cycles.

In this same connection—to insure a steady and unvarying flow of light—it was necessary to build the filament supports in the little bulb in the photoelectric reproducer of extra heavy wire to minimize any shaking on the part of the filament. Otherwise the musical reproduction would be marred by microphonic howl or noise generated by the flickering beam of light.

The tiny arm which supports the floating jewel is made of phosphor bronze of the exact thickness and length required to make that arm vibrate when a high note is reproduced. In other words, both the jewel and the jewel arm are vibrating with extra intensity in the high-frequency range, consequently an additional motivating force acts on the mirror, causing it to flash more light-signal to the photoelectric cell than if only the needle were vibrating in this range.

A special transformer is used to relay the currents generated in the photoelectric cell to the amplifier input.

The floating jewel has a rounded tip instead of the usual needle-like point.

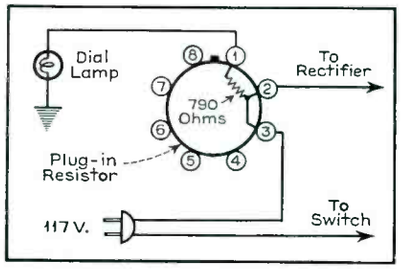
WHEN YOU CHANGE YOUR ADDRESS

Be sure to notify the Subscription Department of SERVICE at 19 E. Forty-seventh St., New York City, giving the old as well as the new address, and do this at least four weeks in advance. The Post Office Department does not forward magazines unless you pay additional postage, and we cannot duplicate copies mailed to the old address. We ask your cooperation.

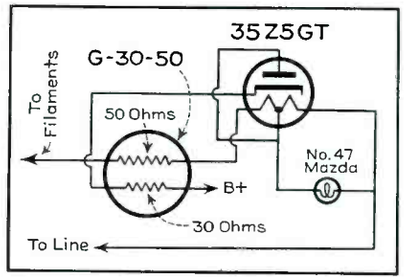
CIRCUITS

(*Continued from page* 12)

Fig. 11. In many new RCA Victor sets the dial lamp (Mazda No. 47) is operated directly from the line through a 790-ohm plug-in resistor. The resistor has a jumper which acts as a switch in



The RCA 46X1 (Fig. 12, above) and the DeWald 663, 666 (Fig. 13, below) employ unique ballast circuits.



the line circuit so with the resistor removed there is no juice. See Fig. 12.

DeWald 663, 666

Some DeWald models also have a plug-in resistor but with dual functions. See Fig. 13. In model 666 there are two surge preventing resistors, a 50-ohm unit in series with the heaters and a 30-ohm unit in the rectifier cathode.

Silvertone 6324, 6424, 6493

The Silvertone seven tube, three band, a-c, d-c superhet models 6324, 6424 and 6493 have a 2-position tone control with an unusual arrangement in the power tube plate circuit. See Fig. 14. These sets use a 6J5G for detector and amplified avc and a 6F5G audio amplifier.

ASSOCIATIONS

Rochester, RTG

The RTG of Rochester held its annual dinner meeting at Canandaigua, N. Y., May 27. Twenty-four members attended and, after a fine steak dinner, listened to a stirring talk on Salesmanship by Frank M. Houston of the Rochester Gas and Electric Corp.

On June 17 we were regaled with an instructive talk on radio gadgets for the service shop by John M. Thompson of Canandaigua.

A. T. MARSH, Sec.-Treasurer

NRPDA

The annual convention of the NRPDA took place at the Stevens Hotel, Chicago, during the week of June 10.

The annual meeting of the directors was called to order Monday, June 10. The first annual dinner meeting of the NRPDA membership was opened on Thursday, June 13, at the Stevens Hotel, Chicago.

The report of the nominating committee recommending the reelection of the seven directors whose terms expired was approved and those directors were reelected. The membership was advised that commencing with 1941 the Board recommended that seven new directors be elected who had not previously served.

The new board of directors retired to elect the officers for the coming year and the following were unanimously chosen: George Barbey, president; Elliott Wilkinson, Abe Davis, Alex Hirsch, Aaron Lippman, vice presidents; William Schoning, treasurer; John Stern, secretary. Arthur Moss had again been retained as the executive secretary.

Sectional group meetings have proven to be very effective and it is the immediate aim of NRPDA to establish sectional chapters in every important trading area in the United States.

The Representatives

The Representatives of Radio Parts Manufacturers held their fifth annual convention at the Stevens Hotel in Chicago on Thursday, June 13. Almost 100 members from all over the country attended the morning meeting, which was followed by a luncheon to which most of the members attended. The meeting was opened by our president, Sam MacDonald, who reviewed the progress of the organizations during his term of office and during the last five years. Starting with a group of 38 men in October, 1931, The Representatives have grown considerably year by year until today its roster numbers 150. Progress during the last year in membership has been excellent, taking into account a small number of members who were taken off, the increase in membership during the last year was almost 30 members.

Trade Show

The Radio Parts National Trade Show will be held, next year, in the Stevens Hotel, Chicago, June 10 to 13, inclusive.

This was the unanimous decision reached at the annual meeting of the exhibiting members of the Trade Show Corporation Friday (June 14.) At the same time the following four directors were elected: A. A. Berard, representing the Sales Managers Club, eastern division; H. W. Clough, representing the Sales Managers Club, western division; and H. E. Osmun and J. J. Kahn, representing the Radio Manufacturers Association.

BATTERIES FOR PORTABLES

(*Continued from page 9*)

Model		Acme	Advance	Bond	Bright Star	Burgess	Eveready	General	National Union	Philco	Rayovac	Usalite	Willard	Winchester
FADA (Fada Radio & Electric Co.)														
P22, PD22, PL22, P28, PD28	1A	118S6	747	...	868	2F4L	747	8CF4	...	...	P698L	646	...	...
	2B	830	284	...	30—33	M30	482	...	B861	...	P5S30	640	...	...
P24	1A	116	...	4824	660	6F	743	6F1	A831	P96	P96A	637	6F1	4814
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
PL24	1A	118	147	4829	860	8F	741	8F1	A833	...	P96A	635	8F1	4819
	2B	830	284	...	30—33	M30	482	...	B861	...	P5S30	640	...	...
P40, PD40, PL40, P47, PD47, PL58, PD49SW, P49SW	1A	118	147	4829	860	8F	741	8F1	A833	...	P96A	635	8F1	4819
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
P49, PD49, P58	1A	114	247	4826	462	4F	742	4F1	A830	P94	P94A	634	4F1	4816
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
FARNSWORTH (Farnsworth Television & Radio Corp.)														
AT30 (C6-1)	1A	114	247	4826	462	4F	745	4F1	A830	P94	P94A	634	4F1	4816
	2B	...	...	...	...	Z30	482	V30AA	...	...	P7R30	...	V30AA	...
AT31 (C7-1)	1A	118S	817	4827	866	2F4	718	8F4	A834	...	P698A	638	8F4	4817
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
BT58, BT68 (C67, C68)	1AB	...	...	...	...	6FA60	...	60A4L	...	P60A4L	AB84	AB667	...	...
FEARNOLA (See Wells Gardner)														
FIDELITONE (See Wells Gardner)														
FIRESTONE (Firestone Tire & Rubber Co.)														
S7426-6, S7426-7, S7426-9, S7427-5	1AB	460-15	411	...	...	5DA60	...	60A2L	...	...	...	AB665	...	...
S7402-6	1AB	...	...	...	...	G4B60	...	60B4H	...	...	...	...	...	...
GAMBLE (Gamble Stores, Inc.)														
4B5, 5B3	1A	118	147	4829	860	8F	741	8F1	A833	...	P96A	635	8F1	4819
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
1F465KC	1A	114	247	4826	462	4F	745	4F1	A830	P94	P94A	634	4F1	4816
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218
Coronado	1A	118S	817	4827	866	2F4	718	8F4	A834	...	P698A	638	8F4	4817
	2B	330	267	3017	30—03	B30	762	V30B	B860	P305	P5303	624	V30B	6218

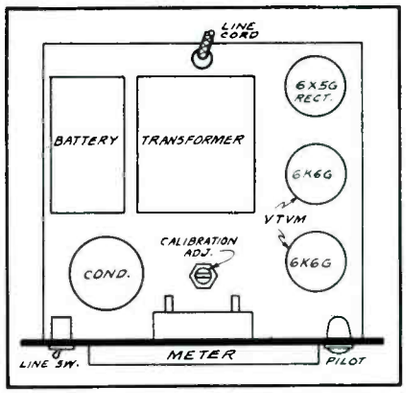
(*To be continued*)

RCA VOLTOHMYST

(*Continued from page* 19)

with the control grid of the rectified voltage. The high input resistance of the Volt-Ohmyst and the design of the voltmeter probe reduce the reaction on the circuit being measured to a negligible value.

The value of the rectified voltage across the oscillator grid leak is a direct measure



of the oscillator output. This voltage is negative and will, in general, vary as the oscillator is tuned. Dead spots at certain frequencies will be indicated by zero voltage or by a voltage dependent upon the grid return in the oscillator system.

The ohmmeter circuit utilizes the vacuum-tube voltmeter described above to measure the ratio between the voltage across the unknown resistance and one of seven standard resistors. The latter range in value from 10 ohms to 10 meg so that multiplying factors from R×1 to R×1,000,000 are provided. No readjustment of zero is required when changing ranges. The circuit is essentially independent of changes in the voltage and tube characteristics.

CONFIDENCE

J. A. BERRY, Berry Radio Service, Abilene, Texas, finds that confidence on the part of the public in his ability and equipment for rendering satisfactory service is most vital and helps him in obtaining a flat service charge for all service calls.

He makes his service car help to build that confidence. He not only keeps a comparatively new service car on the streets all the time but he periodically paints it, including the lettering, to keep it in such

an attractive condition that people not only see it but admire it.

"It creates an unconscious feeling of confidence that the man back of the truck knows his business," Mr. Berry declares.

He makes a minimum charge of one dollar for checking a radio set; and he believes the attractive appearance of his service car has a lot to do with selling people on the idea that the minimum check charge is just and fair. *Ruel McDaniel*

At a Triplett general sales meeting held June 7, 8 and 9, Triplett representatives from the United States and Canada posed for their picture. It was taken in front of the Triplett farm just outside of Bluffton, Ohio, where all sales meetings are conducted.

RCA BP10 BATTERY PORTABLE

THE RCA BP10 is a personal receiver housed in a small case with a hinged lid and may be carried about conveniently. The receiver is designed for operation on a single large flashlight cell and a special 67.5 volt B battery which fit into the back of the receiver as shown in Fig. 2.

The loop antenna is housed in the plastic lid and is connected to the receiver circuits through two thin metal strips. The tuning and volume controls are two knurled finger wheels extending through slots at the end of the set just under the lid. A small rectangular opening in the panel under the lid shows the dial numbers. The off-on switch is arranged so that the set turns itself off when the lid is closed.

A superheterodyne circuit employing the miniature 7-prong tubes is utilized. Avc is also provided.

Specifications

Chassis No.: RC544.
Type: Camera portable.
Cabinet dimentions: 3 by 8⅞ by 3⅝ in.
Weight: 3¾ lbs net.
Tuning ratio: 1 to 1.
Range: 540 to 1600 kc.
I-f peak: 455 kc.
Power supply: A, 1.5 v.; B, 67.5 v.
Power consumption: A, 0.25 amp; B, 8.5 ma.
Power output: 0.05 watts, undistorted.
Speaker: 3-in, p-m; voice coil, 3 ohms at 400 c.

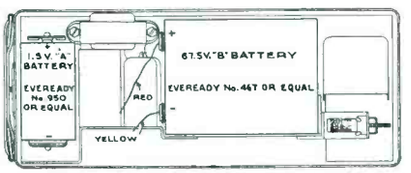
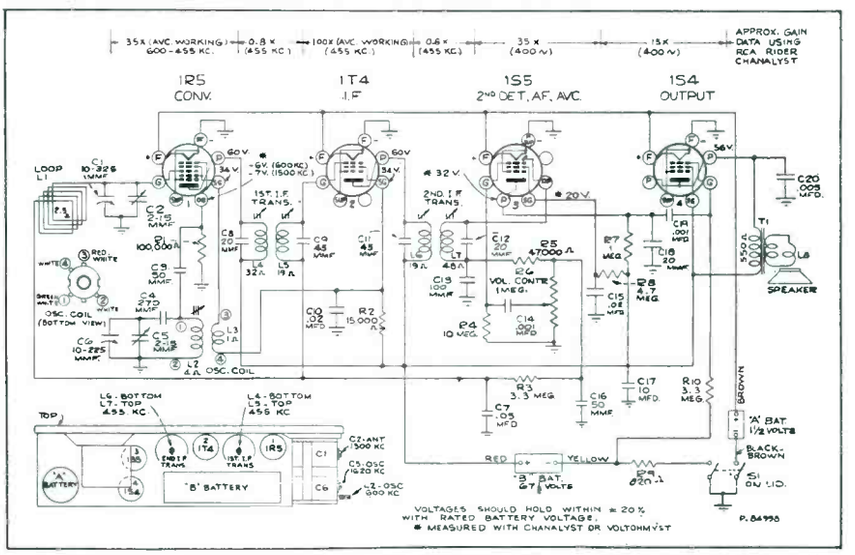


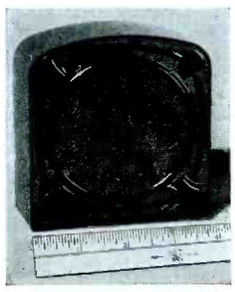
Fig. 2. (Above)

The RCA BP10 camera type battery portable employs a special 67½-volt B battery and a regular 1½-volt flashlight cell as A battery.
Fig. 1. (Below)



MIDGET SPEAKER

Oxford Tartak Radio Corp., 915 W. Van Buren St., Chicago, is now ready to market their small Permag cabinet speaker, Model 3ZM-CA. Measuring 4½"x4"x1⅞",



this little unit is expected to find innumerable applications. A second unit, Model 3ZM-CM, designed for use as a microphone, is equipped with a special shielded transformer. Descriptive literature will be sent upon request.

GENERAL INDUSTRIES BULLETIN

A new catalog illustrating and describing phonograph mechanisms has been made available by the General Industries Co., Elyria, Ohio. Electric and spring motors as well as record changers and recording assemblies are discussed.

PORTABLE RECORDER

A new development by Webster-Chicago is a portable recording system which will cut records up to 10" in size. The cutting head and pickup are of the crystal type. Both 78 and 33⅓ r-p-m models are available. An amplifier is included as a part of the system. Write to The Webster Co., 5622-5660 Bloomingdale Ave., Chicago, for catalogs.

POWER RESISTOR DECADE BOX

A power resistor decade box that can be inserted in actual circuits to simulate working condition, is announced by Clarostat Mfg. Co., Inc., 285-7 N. 6 St., Brooklyn, N. Y. It is intended primarily for laboratory use, for calibration of meters and

for development work generally. It covers a resistance range of from 1 ohm to 999,999 ohms at a maximum of 1,000 volts, by means of six decade switches on the sloping front panel. Each decade will dissipate up to 225 watts. The maximum current per decade is as follows: No. 1, 5 amp; No. 2, 1.5 amp; No. 3, .5 amp; No. 4, .15 amp; No. 5, .05 amp; No. 6, .005 amp.

SIMPSON TUBE TESTER

The front panel of the new Simpson tube tester is divided into three sections: the socket panel, the meter with its knobs and switches, and a handy speed roll chart which shows the proper settings for each

tube. The roll chart and the socket panel are designed as separate units and can be removed in just a few minutes without disturbing the meter. This unit design means that the Model 400 can be kept up-to-date at the price of a new unit rather than a complete new tester. In addition these replacement units can be secured without returning the tester to the factory. When the new units have been received and installed the old ones can be returned for credit.

Additional information may be obtained directly from Simpson Electric Co., 5216 Kinzie St., Chicago.

INTERMITTENT CONDENSERS

ONE of the most perplexing and difficult problems in radio servicing is that arising from intermittent bypass and coupling condensers. Usually this condition is indicated by complete interruption of the signal, a sudden drop in volume, or intermittent oscillation.

As a rule, cutting out or oscillation due to faulty condensers occurs at infrequent intervals. Normal operation may temporarily be restored in many cases by a burst of static, an unusually loud signal, the snapping on and off of a light switch, or any sudden surge of energy through the circuit. Normal reception may follow for a considerable period, and it is in this condition the Service Man frequently finds the receiver.

The erratic and hair trigger nature of this type of condenser failure makes it particularly difficult to trace. It may occur once or twice a day, once in two or three days, or once a week. In some cases it appears when the set is first turned on, while in others several hours of operation are necessary before failure takes place. Frequently the application of test prods at various parts of the circuit is sufficient to restore normal operation. Shunting a suspected condenser with one known to be perfect fails to give a definite indication because, in many cases, the slight r-f disturbance or charging surge is sufficient to reestablish continuity in the defective unit, even though the latter may be in an entirely different portion of the circuit. In fact, the shunting operation often may be performed on several condensers with identical results.

A great deal of time may be spent locating faulty condensers by ordinary methods with results that are far from certain. If more than one condenser is intermittent, as is often the case, the problem is correspondingly difficult. The fault will not be revealed unless the intermittent occurs while the test is in progress and continues long enough to be localized. Under normal test conditions intermittents occur no more frequently than under ordinary operating conditions.

The reason for the failure of such methods to locate the faulty unit is apparent when it is considered that little has been done to accelerate or amplify the fault.

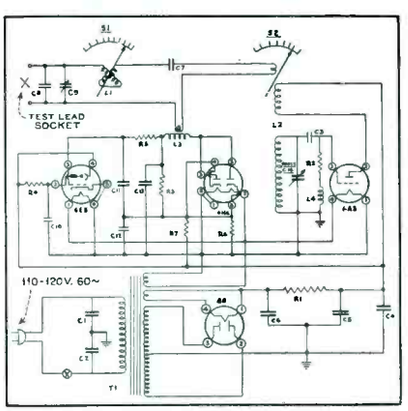
The test method to be described was designed to overcome this difficulty. By means of a low-impedance circuit, a r-f current up to 1½ amperes, at low voltage, is passed through the condenser under test, while a sensitive indicator detects variations in this current. Shunt resistance has little effect unless low enough to approach the reactance of the condenser, a condition not met in the ordinary radio circuit. Therefore, condensers may be tested by this method without removal from the circuit.

Operating on this principle, the tester employs a r-f oscillator, operating at a fixed frequency, and variably coupled to a low-impedance condenser test circuit so designed that it may be tuned to resonance with the oscillator circuit. At this setting the tuning control indicates the capacity of the unit under test.

Included in the condenser test circuit is the indicating device, a 6E5 magic eye tube with its associated network, which is arranged to show resonance as well as to indicate variations of current.

For operation of the tester two controls are necessary; one of these regulates the amount of current passing through the condenser and the other tunes the condenser test circuit to resonance, indicating the capacity of the condenser under test.

This tester employs a low impedance resonant circuit which passes a r-f current up to 1½ amperes, at low voltage, through the suspected condenser while it is still connected in the circuit.



Circuit

The power supply and oscillator arrangement are conventional and require no explanation. The condenser test circuit, including C7, 8, 9, L1 and the primary of L3, is variably coupled to the oscillator by a rotating coil, the position of which is controlled by S2. C14 is set and locked during calibration of the capacity indicator, S1. The variable trimming condenser, C9, is also adjusted during this operation.

The low-inductance variometer, L1, controlled by S1, tunes the test circuit to resonance according to the capacity of the condenser under test. A portion of the total current in the test circuit is carried by C8 and C9; this portion is small when Cx is large, and increases as the latter decreases.

When the test circuit is tuned to resonance and the coupling set at the normal test position, the secondary output of the current transformer, L3, rectified by the 6H6 tube, produces a voltage at the load resistor, R3, approximately three times greater than necessary to actuate the shadow angle of the 6E5 tube from 90° to 0°. However, a positive voltage is applied to the 6E5 grid from the voltage divider R6-R7 to delay actuation of the magic eye until the test circuit current reaches a value of approximately one ampere. Between this value and 1½ amperes the full range of shadow deflection from 90° to 0° occurs.

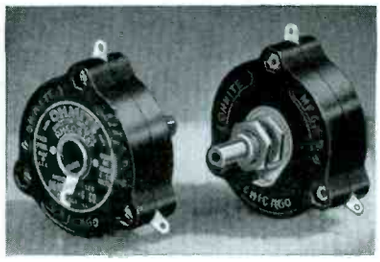
MICROPHONE TRANSFORMER

Three new microphone cable transformers, just released by United Transformer Corp., are designed to be inserted in the cable circuit. The units are constructed to withstand mechanical abuse, it is said. Cable connections are made through

the spring strain relief to terminal boards inside and end caps. Standard fidelity and high fidelity line to grid models are available, as well as a crystal to line matching unit. United Transformer Corp., 150 Varick St., New York City.

DIRECTION-INDICATOR RHEOSTAT

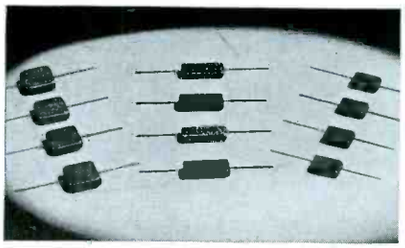
A new, Model DR-125 direction-indicator rheostat is now offered by Ohmite Manufacturing Co., 4835 Flournoy St., Chicago. This device is connected to the



moving part of radio rotary beam antennas, direction finding loop antennas, wind-vanes, etc. The Model DR-125 rheostat has a 360° continuous winding. It is designed for use on d-c up to 24 volts. It consists of a glazed ceramic housing which is 1⅞" diameter and 13/16" deep behind panel. Mounted by a ⅜"-32 bushing and nut on any panel up to ¼" maximum. Equipped with non-turn washer. Shaft ¼".

SILVER MICA CAPACITORS

Cornell-Dubilier announces an improved line of silvered mica capacitors. They find use in i-f tuned circuits, in fixed-capacitor tuned push-button circuits, in fixed-capaci-



tor tuned push-button selector, in high-frequency oscillator circuits, etc. These capacitors are available in values from .000001 to .0025 mfd with d-c voltage rating of 500; and in capacities from .003 to .005 mfd at 300-volt rating. Catalog No. 160T describing these capacitors free upon application. Cornell-Dubilier Electric Corp., South Plainfield, N. J.

TRIPLETT AUTOMATIC MULTIMETER

Triplett Model 1200F volt-ohm-milliammeter provides push-button switching for

25 ranges in a-c and d-c volts, d-c milliamperes and microamperes, ohms and output voltages. The d-c voltage ranges are at 25,000-ohms-per-volt, the a-c at 1000-ohms-per-volt.

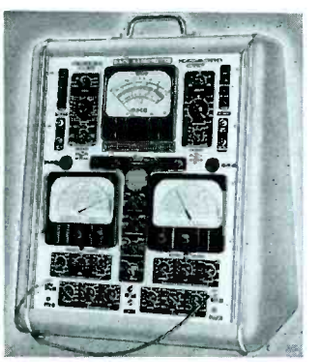
STANCOR SERVICE GUIDE

The 125B Service Guide is offered to readers of SERVICE, by the Standard Transformer Corp., 1500 N. Halsted St., Chicago, in addition to their other catalogs and bulletins. The Service Guide has 4300 listings of receivers manufactured by over 70 manufacturers and provides information on their transformer and filter choke requirements. Tube data are given in addition.

DACO RADIOMETER

The Daco Radiometer has been announced as "the master instrument" by the Dayton Acme Co., 2339 Gilbert Ave., Cincinnati, Ohio. It has been designed to provide a complete laboratory for the Service Man in one compact instrument.

The instrument includes a vacuum tube volt-ohm-milliammeter, an a-f and super-



sonic oscillator, an r-f, i-f oscillator, with frequency and video modulation, a 2-in oscilloscope and a p-m speaker.

Additional details and prices may be obtained directly from Dayton Acme.

JAMES VIBRAPOWR PATENT

The United States Patent Office has recently issued a patent, No. 2,200,064, on a vibrator and vibrator circuit, to Stephen F. James of the James Vibrapowr Co., 341 N. Crawford Ave., Chicago.

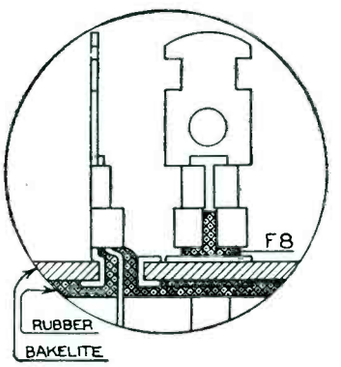
SUPREME ELECTRONIC VOLTMETER

The Supreme Model 549 electronic voltmeter has 28 ranges in five functions. Six d-c voltage ranges from 0.1 to 6,000 volts, with a minimum input impedance of 15 meg; 5 ohmmeter ranges to 1,000 meg; 5 a-c voltage ranges to 500 volts; 7 current ranges from 10 microamperes to 15 amperes d-c and 5 output ranges are provided in this single instrument.

A booklet, illustrating and describing this and other Supreme test instruments for the Service Man may be obtained directly from Supreme Instruments Corp., Greenwood, Miss.

PRONG-BASE ELECTROLYTICS

Several refinements have been announced by Aerovox Corp., New Bedford, Mass., in prong base electrolytics and are made



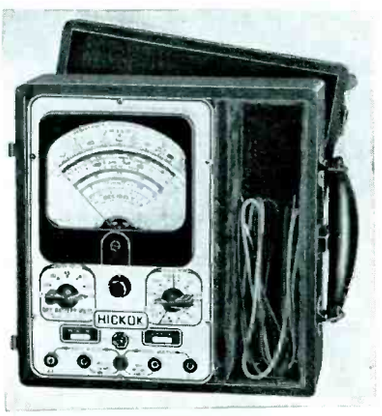
available in their series AF units. Gains are claimed in sealing of base and prongs, reduction of corrosion and mechanical construction.

MECK BULLETIN

John Meck Industries, 1313 Randolph St., Chicago, have issued a bulletin dealing with speaker matching problems in designing public address systems. The material offered is said to present much practical data that should be in the hands of every sound technician. Copies of the bulletin may be obtained directly from Meck.

HICKOK MULTIMETER

Hickok Electrical Instrument Co., 10514 DuPont Ave., Cleveland, Ohio, have introduced their Model 133 radio set tester. The instrument features a 5-in square

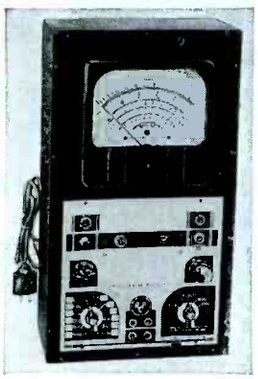


meter and has a four-color scale. Some twenty odd ranges are provided for 6 functions. The d-c voltage ranges are at 25,000-ohms-per-volt. Additional data may be obtained directly from Hickok.

RADIO CITY MULTITESTER

The RCP Model 414 (universal deluxe multitester) is now available in four additional series: V7, V9, RP7 and RP9, each with its own characteristics in addition to the multipurpose features of Model 414, it has been announced by Radio City Products Co., 88 Park Pl., New York City.

Model 414 Series V7 has a large 7¼"



bakelite square meter with jewel indicating light. In black crackle finish steel case. RCP Model V9 is the same, except that meter is the 9-inch jumbo round type.

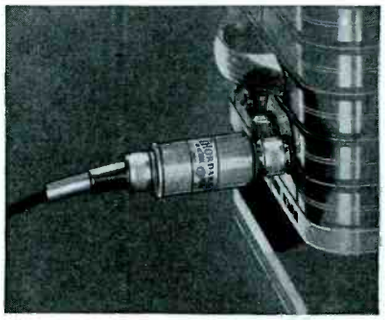
Similar to V7 is Model RP7, except that here the panel is arranged horizontally for rack mounting and there is no overall case. The 414 unit (less meter) is housed in an open-faced case and may be removed from the panel for convenience while working some distance away. Model RP9 is identical to RP7 with the exception of the meter which is a 9-inch round type. Send for new catalog No. 122.

SIGNAL CATALOG

The Signal Indicator Corp., 16 Hudson St., New York, has released a new illustrated catalog, covering their complete line of signal lights, indicator units, pilot assemblies, dial lights and bull's eyes. Copies are available to the trade. Write directly to the manufacturer.

MICROPHONE CABLE TRANSFORMER

The Thordarson Electric Mfg. Co., Chicago, announces a new microphone cable transformer which adds to the serviceability of amplifiers—having only high impe-



dance microphone circuits. Low impedance microphones are an advantage when the microphone is to be used long distances away from the amplifier.

The cable transformer is available in two types which are designed for voice coil connection of dynamic or velocity microphones which have self-contained line transformers.

Fully described in catalog No. 600E, available from Thordarson Electric Mfg. Co., 500 W. Huron St., Chicago.

PERMO BOOKLET

Permo Products Corp., 6415 Ravenswood Ave., Chicago, have prepared a comprehensive booklet for the layman on home recording which gives information on cutting needles, records and how to improve all kinds of recordings. This booklet also gives information on how to record different musical instruments, where to place microphones for better pick-up, pertinent information or details on how to make better recordings and general useful information for anyone using the new home recording instruments as manufactured by the various companies who have placed equipment of this type on the market recently.

PHILCO BUYS INTEREST IN NATIONAL UNION

A substantial interest in National Union Radio Corp., manufacturers of radio tubes for equipment of new sets and replacements, has been purchased by Philco Corp. as the first step in a program to expand the scope and activities of National Union Radio Corp., it was announced by S. W. Muldowny, president.

"National Union will continue as a separate company to manufacture its products and distribute them nationally under its own trade-mark, as in the past," Mr. Muldowny said in discussing the transaction.

RECORDISC CATALOG

The RecorDisc Corp., 395 Broadway, New York City, has released a catalog and price list on their new line of recording blanks. The booklet gives many hints on satisfactory home recording methods and is available to distributors, dealers and service shops upon application to the manufacturer.

Index to Advertisers

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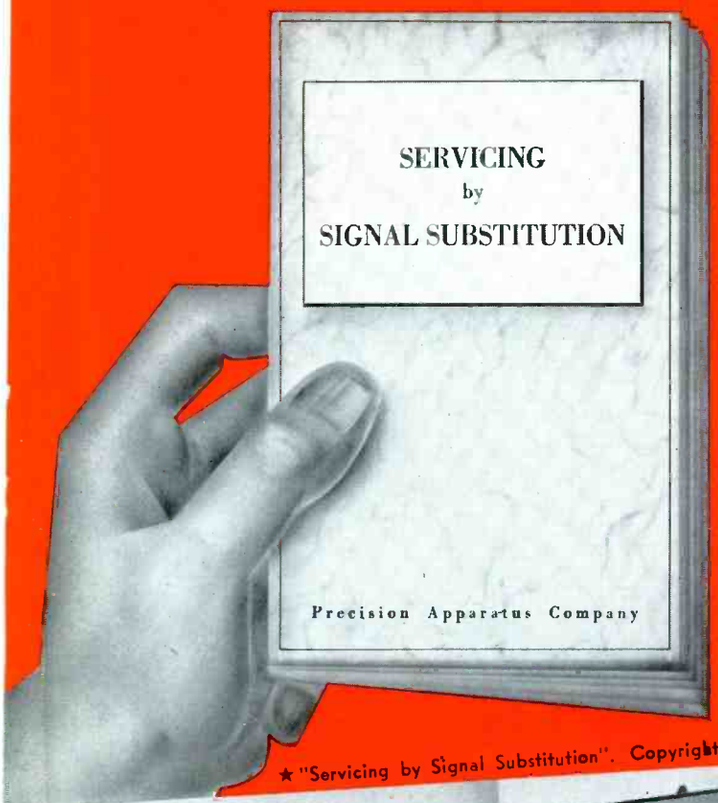
SERVICING by SIGNAL SUBSTITUTION



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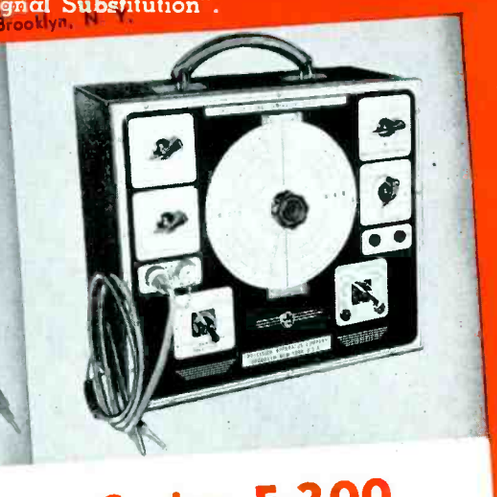

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DYNAMIC MUTUAL CONDUCTANCE TUBE TESTER

The first step in "S-S-S" is the rapid, unfailing selection and elimination of defective tubes. The PRECISION series of Dynamic Mutual Conductance Type Tube Testers. (Series 910, 912, 915, 920 or 922) permanently and efficiently removes the "Question Mark" from your tube test problems.

PRECISION Series 910P, (illustrated), in attractive, hardwood, walnut finished carrying case, also available in counter or standard panel mount. Dealer net price....$33.95

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37 Range A.C.-D.C. volt-ohm-decibel-milliammeter-ammeter . . . Including ranges to 6000 volts A.C.-D.C. 60 microamperes, 12 AMPERES AND 60 MEGOHMS.

A single Master Rotary Range Selector and the high sensitivity of 20,000 ohms per volt D.C., permits rapid check of voltage, current, resistance, etc., in troublesome stages, quickly localized through "Servicing by Signal Substitution."

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• • •

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