SHORT-WAVE BEST BETS

RADIO NEWS

JUNE
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Radio Call Book Magazine
and
Technical Review

Build this 10,000 Mile Broadcast-band DX Receiver

A Publication Devoted to Progress and Development in Radio

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Short Waves
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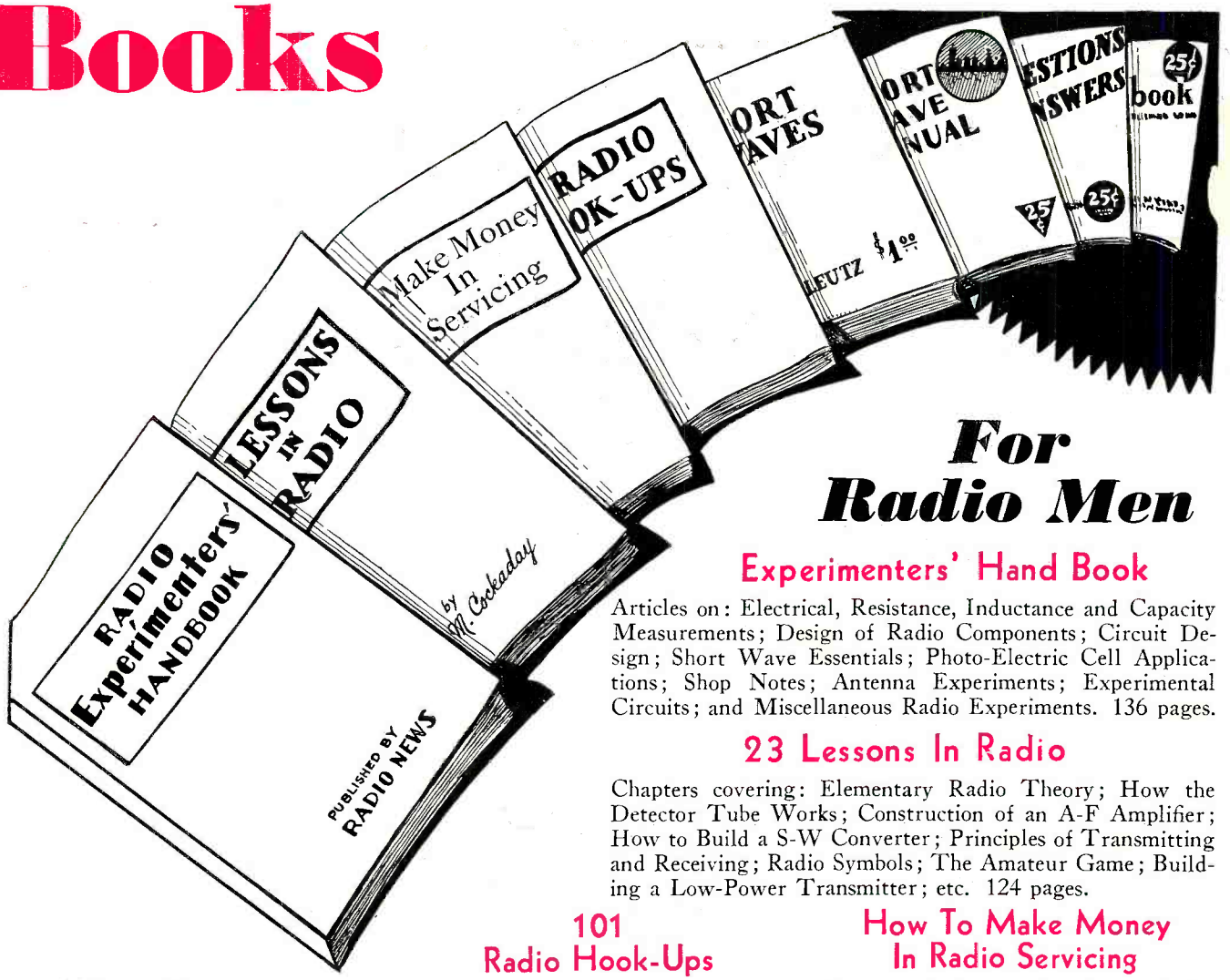
Books



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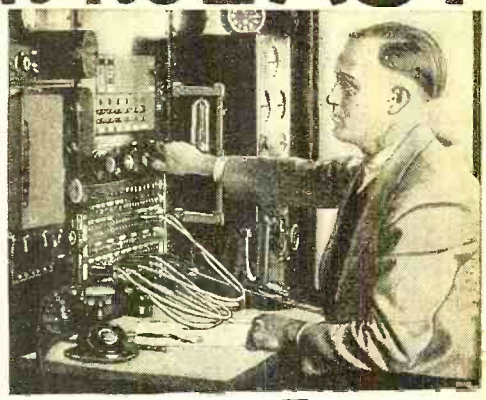

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Broadcasting stations use engineers, operators, station managers and pay up to $5,000 a year. Manufacturers continually employ testers, inspectors, foremen, engineers, service men, buyers, for jobs paying up to $6,000 a year. Radio operators on ships enjoy life, see the world, with board and lodging free, and get good pay besides. Dealers and jobbers employ service men, salesmen, buyers, managers, and pay up to $100 a week. My book tells you about these and many other kinds of interesting Radio jobs.

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Get your copy today. It's free to all residents of the United States and Canada over 15 years old. It tells you where Radio's good jobs are, what they pay, tells you about my course, what others who have taken it are doing and making. Find out what Radio offers you without the slightest obligation. Mail coupon in envelope or paste on post card. ACT NOW!

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VOLUME XIV | June, 1933 | NUMBER 12

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RADIO CALL BOOK SECTION

DEPARTMENTS

Published Monthly by **Teck Publications, Inc.,** *Washington and South Avenues, Dunellen, N. J.*

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Only THE SCOTT 15-550 METER ALL-WAVE *Deluxe* RADIO

delivers such Clear, Consistent Year 'Round

WORLD-WIDE RECEPTION

This receiver is the crowning achievement of my eight years experience building world's-record-breaking superheterodyne receivers. I have no hesitancy in backing it with the strongest guarantee ever placed on a radio.

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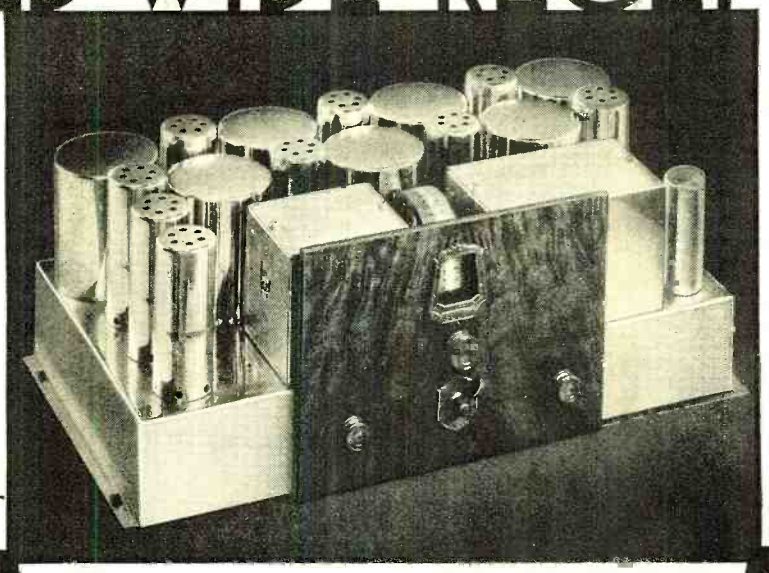

BEAUTIFUL in its chromium-plated finish, the SCOTT ALL-WAVE DELUXE is as capable as it looks. Embodying every worthy scientific improvement, such as automatic volume control, visual tuning, static suppressor, etc., it is a marvel of careful custom building to most exacting laboratory standards of perfection.

ITALY

Each day come new letters of enthusiastic praise from owners of SCOTT ALL-WAVE DELUXE RADIOS. Here are excerpts from a few late ones—on file at the Scott Laboratories for inspection by any one. "Rome, England, Germany and Spain come in very good — more than pleased with set — tone is superb," RPH, Conn. "Best radio I have ever owned—price very reasonable for what it is and will do—have logged Rome, England, France, Spain, Brazil, Germany, Australia," OSJ, Conn. "VK3ME, Australia, every time they are on the air—clarity of tone and volume like local," CGB, Conn. "European stations as much 'at my finger tips' as locals," TPB, D. C. "England so that it can be heard all over house — also Paris and Rome—on grounded 25-foot aerial," WCD, N. J. "Congratulations on a receiver of such extreme sensitivity. Marvelous tone quality." JES, Ill.,—commercial manager of a great broadcasting station—Reception and recording on phonograph records of *every* program from VK2ME and VK3ME for an entire year accomplished by Mr. Scott under home reception conditions in Chicago.

They Said It Couldn't Be Done ..but I GUARANTEE It!

FOREIGN STATIONS LIKE LOCALS

The thrill of tuning in foreign short wave stations, as far as 10,000 miles distant, clearly with full loudspeaker volume, consistently the year 'round . . . plus perfect reception of literally *everything* on the regular broadcast band on the North American continent! For years a dream . . . scoffed at as "impossible" by many so-called "experts" even today . . . yet the SCOTT ALL-WAVE DELUXE RADIO actually *does* it—not only in occasional test cases, but regularly—*for every* owner—under the broadest, soundest guarantee ever placed on a radio set. If you would like to know more about such a sensationally performing record-breaking radio . . . send for complete details, including PROOFS.

If you plan to visit Chicago's A CENTURY OF PROGRESS *be sure to come and inspect our Laboratories, to see and to hear these marvelous receivers.*

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SCOTT ALL-WAVE DELUXE owners are more enthusiastic over their receivers than most radio listeners—why not?—they have more to be pleased over! "Never owned or heard a better, clearer or purer-toned receiver, and this is my 13th all-electric set," RCS, Texas . . . "France, Italy, Russia and China with very powerful loudspeaker volume," EB, Indo-China . . . "Get as far afield as England," GAH, Australia . . . "Moscow, South America and Pittsburgh *fine*," EAC, Alaska . . . "U.S.A., Canada, Austalia, Japan, Indo-China, Siberia, Mexico, France whenever they are on the air," JTM, Hawaii. These and hundreds of other like letters may be seen in our files at any time upon request.

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Send me complete details regarding the SCOTT ALL-WAVE DE LUXE RADIO, including technical data, performance PROOFS, and price quotations.

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The Editor—to You

RADIO NEWS inaugurates, with this issue, a new feature that should broaden the scope of RADIO NEWS in the homes of American listeners. It is a new hour by hour and day by day schedule of the nation's best program features compiled from official data supplied by the broadcasting companies and arranged so that a moment's glance is all that is necessary to pick out any evening's radio entertainment in advance.

* * *

THE first edition of this program appears herewith on page 730. The programs listed are selected by a committee of art, music and drama critics as well as representative broadcast listeners and are believed to contain the most worthwhile and popular programs. This edition covers the period of May 10th to June 10th, or the period during which this issue is circulated on the newsstands. To use this list all that one has to do is to refer to the day of the week, and pick out the programs listed there and check their time. In this way the broadcast listener can be ready to tune in to each selected broadcast and thus be sure of not missing a single event. Every station broadcasting each program is shown in the schedule so that the list is national in scope and can be used by listeners anywhere in the United States or Canada.

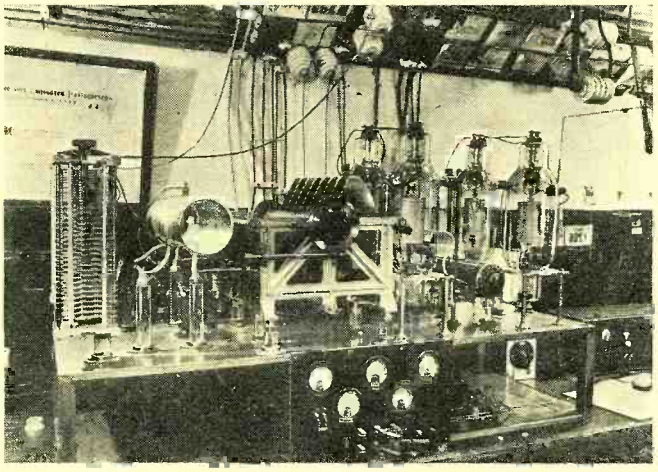
The programs are listed under their real names. Broadcast listeners who have seen the proofs of this new feature maintain that it will be almost a necessity for any listener who wants to get the most out of his radio receiver. The Editors recommend that our readers keep RADIO NEWS near the radio receiver, possibly on top of the cabinet, during the whole month, and that they show the members of their families how it is used. It is believed that it will be of much greater value than the ordinary newspaper lists, cluttered up as they are with hundreds of programs not worth listening to. Another point is that it always will be available, whereas newspapers are tossed about and discarded. Here you will have the information you need in a radio magazine; the natural place for such a magazine being right at the radio receiver. Try the list and see if it does not add materially to your radio enjoyment in the future.

* * *

PRINTED on this page is a reproduction of a photograph of the transmitter used in the Portuguese amateur radio station, CT1AA, at Lisbon. American listeners on the short waves report hearing this station exceptionally well as far west as California. Incidentally, it might be noted that practically all of the apparatus, instruments and tubes of which this transmitter is built is of American manufacture. CT1AA transmits on 31.25 meters on Tuesdays and Fridays during the hours of 4, 5 and 6 p.m., E.S.T. The quality of their transmission is excellent and their announcements are repeated in English. See if you cannot get them on your short-wave receiver, they are worth listening to.

* * *

THE new department, The DX Corner, is certainly bringing forth a large amount of comment on the part of RADIO NEWS reader listeners. Up to the present writing we have received over 70 applications for official RADIO NEWS listening posts. We hope these listeners, who are able to log foreign stations, will keep on sending in their logs and reports, for the appointments of these listening posts will be made on June 1st to the readers who send in the best and most reliable logs.



* * *

HUNDREDS of letters have come in from our readers regarding this department, and excerpts from a few of these are given below:

* * *

"YOUR new radio DX Corner prompts me to send a word of appreciation, especially of the 'Best Bets' on short waves. 'Best Bets' is the first compilation of schedules, wavelengths and call letters that I have found in convenient form." —H. G. Sweger, Peru, Illinois.

* * *

"I AM writing to compliment you on your new department, The DX Corner. It has the best information I have found yet on foreign stations."—Fred Tjerestat, Benson, Minn.

* * *

"I NOTICE with approval the beginning of The DX Corner in RADIO NEWS and believe it will be an exceptionally valuable addition to your magazine, from the short-wave listeners' viewpoint."—William Duff, Carbonear, Newfoundland.

* * *

"I HAVE been a reader of your excellent magazine for a number of years and have always found it most interesting and helpful. I particularly enjoy reading your new department, The DX Corner, and request that you continue the same. It gave me the first news that London was operating on 49.6 meters. I immediately tuned in this station and found it to have sufficient volume to fill an eight-room house. I listened to some speeches of the American financial crisis which were extremely interesting since they gave the British viewpoint of our conditions."—Vernon E. West, Office of the Corporation Counsel, Government of the District of Columbia, Washington, D. C.

* * *

"I HAVE been anxiously awaiting the time when short-wave listeners would be able to find such information as compiled in the splendid list of 'Best Bets' and the other short-wave information so valuable to the short-wave fan."—C. Rogers, Strathclair, Man.

* * *

"I FEEL sure that the new DX Corner will prove to be one of your most popular sections. Interest in short-wave broadcast reception is rapidly increasing in this section of the country and your service is undoubtedly accelerating this interest."—Jim Morris, Atlanta, Ga.

* * *

"SEVERAL months ago I wrote to you regarding the prospects of operating a DX section in RADIO NEWS, and note with much interest that such a section is now in operation by the technical staff. Your DX Corner is one of the best I have seen."—W. H. Reeks, Chicago, Ill.

* * *

"I BELIEVE the DX Corner will help the average short-wave listener immensely. A great many of the stations you list can be heard on any good short-wave receiver. For the man who is just beginning this list will be of great value because he can be certain if a station he is looking for is on the air. The fault of nearly all short-wave log books lies in this one thing—they are never up to date."—D. W. Parsons, Roanoke, Va.

Hugo Gernsback

An Indispensable Publication

RADIO NEWS *is an indispensable publication for the initially trained man. The technician trained in the fundamentals of radio finds in these pages practical, up-to-date information in every special phase of radio. Every technician should read it and keep his knowledge from going stale.* RADIO NEWS *should be congratulated for its years of untiring effort in serving the radio profession.*

J. E. Smith

President,
National Radio Institute
Washington, D. C.

The Demons of Noise and Reverberation

In this age of mechanization the fight against noise in city life is one that must be pushed to a solution if we are to retain sanity and an efficient nervous system. The acoustical engineer is the leader against these forces which tend to lower the efficiency of the office worker. The acoustical engineer, working closely with the architect, can now design into a building a sense of restfulness and quiet that will increase production and accuracy effecting an economy in sales, clerical and executive work

Radio News

VOLUME XIV June, 1933 NUMBER 12

RADIO and ACOUSTICS

The importance of radio principles in the reduction of noise and the architectural design of auditoriums, broadcast studios and even in office buildings and homes is now recognized. This article outlines some of the problems, as well as the solution worked out between the radio engineers and the architects

By Irving J. Saxl, Ph.D.

THE progress of the electro-acoustic industries has brought with it a number of problems which penetrate into fields previously never thought of as being in any way connected with the radio industry.

Radio, similar to all true sciences, has gone far above its original domain and has fertilized fields which heretofore seemed to deal with entirely different subjects. Like all living sciences, it is growing organically, it is developing and creating new approaches to the problems of civilization, stimulating progress in all directions.

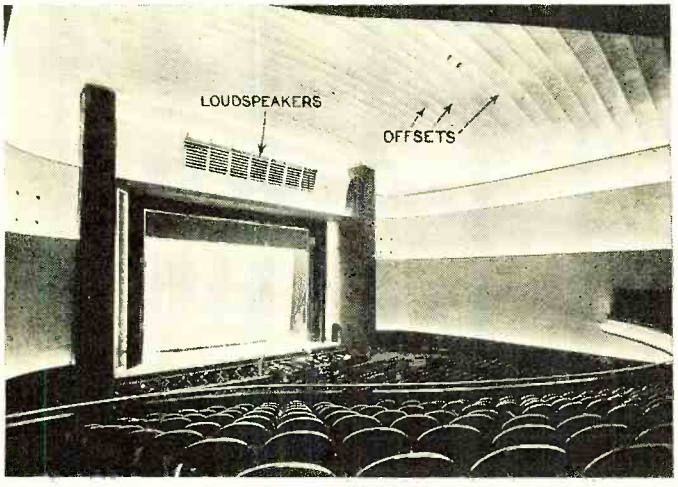
The discovery of the amplifier brought with it an interesting problem which was never encountered before: microphones near the speaker or the orchestra pick up the original sound. They impress feeble electric currents on the amplifiers of the public-address type. Thus the feeble voice currents can be amplified to any extent desired and feed loudspeakers which may easily reach several hundred electric watts in output.

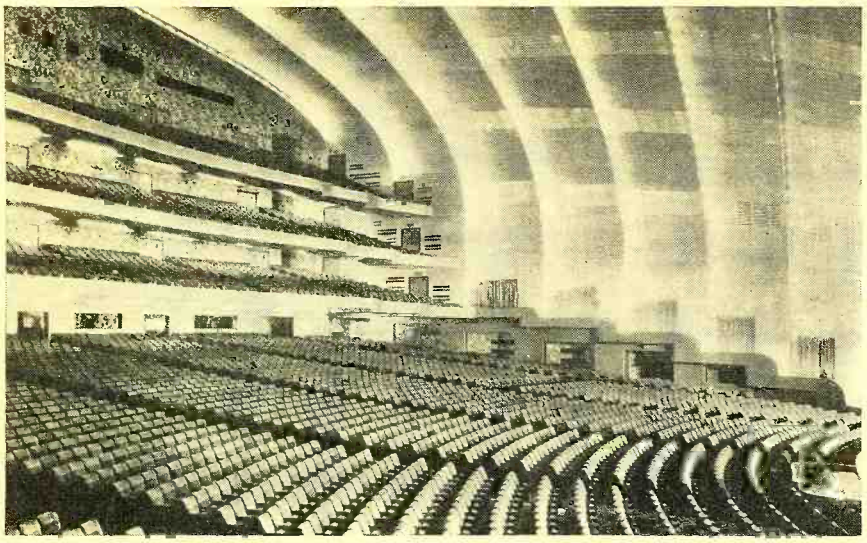
While it is possible to amplify the natural voice of the artist to such an extent that halls of any size can be filled with music, the problem arises: HOW TO BRING THIS SOUND CLEARLY TO THE INDIVIDUAL HEARER without reverberation? While the smaller intimate theatres usually have excellent acoustics, difficulties arose with the larger ones.

One might ask, "How can we arrange loudspeakers so that they do not influence the microphone and avoid acoustical backfeeding?" The solution of this problem is based on two principles. One is to distribute the loudspeakers over a considerable area and to arrange them in such a way that the sound waves traveling away from them do not reach the microphones directly. For this purpose the loudspeakers, as shown in Figure 1, are usually arranged above the stage, on the front wall or on the ceiling. Sound proceeding from them is radiated directly at the audience so that not too much is reflected back to the stage. The other improvement of this critical feedback situation has been made possible with the advent of directional microphones. These are placed in such a way that sound coming back from the hall falls upon the unsensitive parts of the microphone, while the most sensitive side is directed towards the actor or the speaker. In addition to giving the speaker's voice a decided preference in the amplification, and in cutting down acoustical feedback to a minimum, an extra advantage is gained in the fact that noises coming from the audience are *not* received and therefore are not

A MODERN SOUND AUDITORIUM

Figure 1. In such a design the large ceiling surface is broken up with offsets to prevent reverberation. Loudspeakers are installed in such a position that all parts of the auditorium are fed with sound





THE LARGEST AUDITORIUM IN THE WORLD

Figure 6. This is the new 6200-seat Radio City Music Hall, with an orchestra floor almost one-half block in length. In this the short balconies and the offsets in the ceiling are surfaced with acoustical plaster for preventing harmful sound reflection

amplified. Thus the directional mike makes possible the direct amplification of the speaker's voice over the background noise of the auditorium.

It is, however, insufficient to endeavor to reach perfect hearing in any point in the hall only by means of proper placing of microphones and loudspeakers. This may sometimes be sufficient in small auditoriums, but in the engineering of the bigger halls which have now, particularly since the advent of Radio City, come into importance, additional points have to be taken into consideration.

It is here that the average electrical engineer stops and where starts the domain of the acoustical engineer, the connecting link between the radio engineer and the architect. He must take care that the physiological conditions of good hearing are constructed into the building itself!

As is well known, sound waves need a certain time for travelling; in air this time is about 330 meters per second. We all know the effect of echos. If we make a sound, the echo is reflected from walls or mountains, sometimes as much as several seconds after the sound originated. We know the effect of thunder, which is a multiple reflection of the sounds of an electrical explosion; the sound waves being thrown back and forth between air layers of various densities and objects on the ground so that instead of a single sound impulse thunderous roar persists for quite some time. If a single sound impression is clearly separated from others we speak of an *echo*. If one sound impression runs directly into the others so that a time difference between both can not be detected by the human ear, we speak of *reverberation*.

Exactly as the human eye can not distinguish between two light impressions if they are quicker than one-sixteenth of a second, so the equivalent idea can be applied to the human ear, which can not distinguish sound impulses readily if they are approximately less than one-tenth of a second apart.

While a reinforcement of a sound will occur if a direct ray and a reflected ray are less than one-fifteenth of a second apart, a blurring of speech will take place if one wave has travelled only about seventy-five feet longer than the other. Then the speech will be disturbed, one syllable leading over into the next and the second syllable of the word being mixed with the first one spoken.

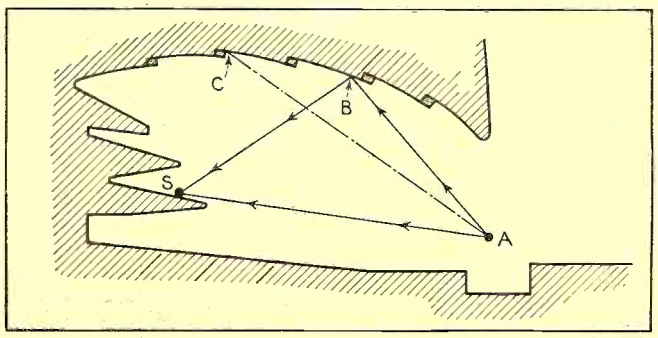
While this effect of reverberation was previously known where it occurred in rooms with bare walls, as for instance, churches, assembly halls, etc., its effect became most disturbing in the engineering of super-auditoriums just when the newly developed art of public-address had made it possible to actually fill such vast spaces with sufficient sound.

How does reverberation get into action? Let us consider Figure 2. This shows a cross-section of a theatre. If we consider A as the sound source and S as a place in the gallery, sound waves travelling will be heard from various points. One is a direct sound wave travelling from A to S; the other is a wave which is reflected by the ceiling at point B. We can readily see that the path ABS is considerably longer than the direct path AS.

If the difference of these two waves is more than seventy-five feet, excessive reverberation will take place at the point S and the visitor will no longer understand what has been said upon the podium or pulpit. In certain localities this reverberation can be so excessive that a hall may be filled with

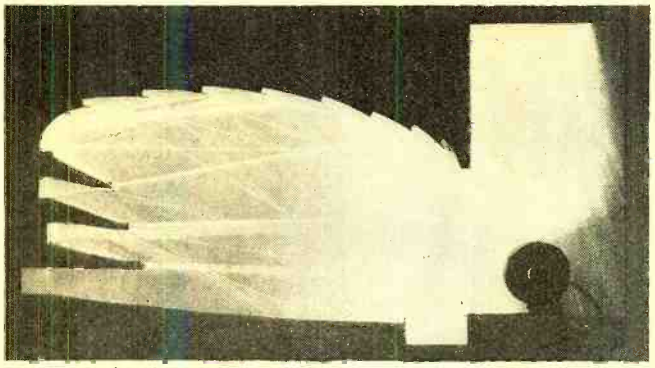
DIAGRAMMATIC AUDITORIUM CHART

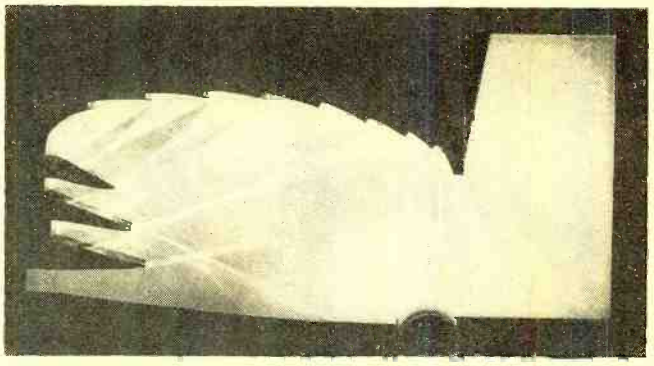
Figure 2. The point S receives sound directly from A and a moment later reflected sound from B. Point C shows how offsets absorb sound in the ceiling



SOUND ABSORPTION COEFFICIENTS OF VARIOUS MATERIALS
(REVERBERATION CHAMBER METHOD)

Material	Thickness, Inches	Absorption Coefficients for Frequency 128	256	512	1024	2048	4096	Authority
AUDIENCE, per sq meter, seated	-	0.72	0.89	0.96	0.99	1.0	1.0	W.C. Sabine
AUDIENCE, women with coats, seated		1.3	2.4	4.0	5.8	6.7	-	Bureau of Standards
MINERAL WOOL, acoustic plaster	1/2	0.15	-	0.38	-	0.35	-	V.O. Knudsen
NASHKOTE A	3/4	0.09	0.16	0.27	0.30	0.23	0.23	Bureau of Stds
PLASTER (gypsum) scratch and brown coats, on metal lath, on wood studs	-	0.020	0.026	0.040	0.062	0.058	0.028	Riverbank Lab
PLASTER (lime) scratch and brown coats, on wood lath, on wood studs	3/4	0.027	0.046	0.060	0.085	0.043	0.056	Riverbank Lab
PUMICE No. 2, 6" fill between 2X6s	-	0.42	0.48	0.53	0.54	0.53	0.55	V.O. Knudsen
ROCK WOOL, 14 lb. per cu. ft., between 2X4s, 16" on centers, covered with muslin and 068 perforated metal, on No. 14 J-M sound isolation wall treatment	4	0.40	0.66	0.76	0.70	0.64	0.65	Johns-Manville
ROCK WOOL, 14 lb. per cu. ft., between 2X4s, 16" on centers, covered with perforated TRANSITE	2	0.24	0.51	0.75	0.78	0.72	0.60	Johns-Manville
SOUNDEX, spray painted	1 1/16	0.21	0.26	0.48	0.68	0.75	-	Bureau of Stds
SPRAYO-FLAKE, between studding, covered with 1/2" wire mesh	4	0.38	0.43	0.57	0.58	0.55	0.54	V.O. Knudsen
STUCCOUSTIC PLASTER, Formula XB	3/4	0.29	0.53	0.59	0.73	0.72	-	Bureau of Stds
TRANSITE, acoustical tile	1 3/16	0.19	0.39	0.81	0.77	0.72	-	Bureau of Stds
WOOD, veneered flats, papered with crepe paper	-	0.116	0.109	0.062	0.081	0.091	0.021	V.O. Knudsen





sound for several seconds after the original sound has ceased.

Great sums are involved in building huge auditoriums and it is extremely important to know something about the sound distributions in such auditoriums before the hall is finished and the audience seated.

From the fact that sound waves—acoustical waves which propogate through the elastic medium, air—are reflected similar to light waves (although light waves—electro-magnetic waves—generally behave physically entirely different from sound waves) an optical method was developed for this purpose by the engineers of the C. F. Burgess Laboratories under the direction of Mr. R. F. Norris.

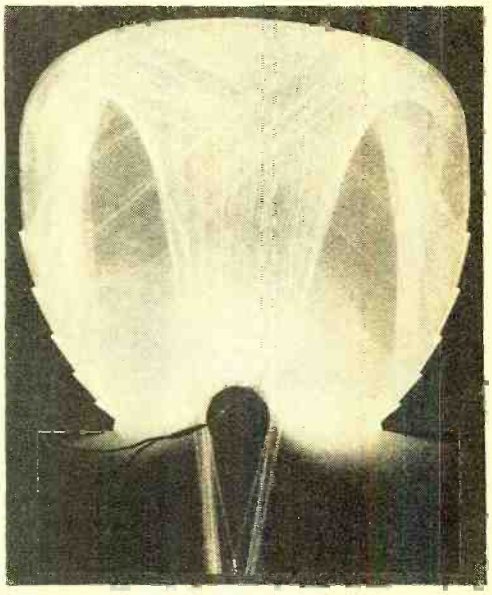
While several other methods have been known for some time, for instance, by Professor Exner of Vienna, by Professor F. R. Watson of the University of Illinois, and by Dr. Paul Sabine of the Riverbank Laboratories, the method first mentioned is appealing for its simplicity. Accompanying this article are a number of pictures of these test set-ups for which we acknowledge the courtesy of the Johns-Manville Corporation, which were done by the optical method. They consist primarily of a cross-section view of the auditorium to be investigated, laid out in reflecting sheet metal upon a white background. A small automobile lamp is placed on the stage where the actor would stand. The light coming from this source is reflected by the walls of the "halls", comparable to wall reflection in an actual auditorium. If there exists any focusing it will be readily seen by the photograph. Figure 3 shows such an affect of focusing which took place before acoustical correction was applied in a certain theatre. We see clearly that the rays are focused in the back of the balcony. The sound intensity at this point would be considerably greater than in any other part of the theatre. In addition, as this sound is received over several paths of different length, disturbing reverberations will occur. After acoustical correction, an improved distribution of the sound was accomplished, as shown in Figure 4. Figure 5 shows another interesting horizontal cross-section through the acoustical model of a theatre, made by the optical method. We see clearly that any sound coming from what is approximately the middle of the stage is reflected back into a focus point in the background of the stage. This is a defect which previously often occurred in auditorium design.

These disturbing factors, which are common to larger auditoriums that have a center point of curvature within a limited, finite distance, can now be corrected before the hall is actually built. If the back wall is flattened out, the center point of the curvature moves into the infinite and sound distribution becomes even throughout the hall.

There are several methods for improving the acoustics of halls. While changing the curvature of auditoriums after they are finished is expensive, and sometimes not feasible, as for instance in old churches with disagreeable reverberations, an acoustical treatment of the walls will in almost any case help to overcome these difficulties. In Figure 2, for instance, sound waves traveling toward point C can be absorbed in set-backs and thus will not reach the audience. But only a part of the total

MODELS

Figure 3, Left. Model design showing sounds concentrated on the third balcony. Figure 4, Above. Showing acoustical treatment results. Figure 5, Right. Horizontal cross-section showing fault of waves focusing behind the stage.



acoustical problem can be overcome that way. If we study Figure 6, which shows a clear picture of the world's largest theatre, the International Music Hall in Radio City, we find set-backs have been arranged regularly on the ceiling. In addition to giving a marvelous sun effect in the display of various colored lights behind these set-backs, they have the ability to break up an acoustically reflecting wall of huge dimensions.

But this is not always enough. Not only have the ceilings been broken up into these subdivisions, but the ceiling bands have been covered with *"acousticon" plaster.* Thus sound waves falling on the space between (*Continued on page* 758)

OFFICE TREATED WITH ACOUSTIC TILE

Figure 9. In this Addressograph Department of Montgomery, Ward building the ceiling is covered with Sanacoustic tile, which absorbs sounds of machines

A Condenser Microphone *for* HOME ASSEMBLY

Here is a kit which takes the headache out of condenser microphone construction and adjustment

By A. P. Holmes

ADDING A "PROFESSIONAL" TOUCH

Figure 7. This case, of cast aluminum with black crackle finish, contains the condenser head and 2-stage preamplifier. Its professional appearance will appeal to any "ham" or P. A. man

An answer to the prayer of "hams" and other experimenters for a high quality, yet inexpensive condenser microphone is found in this article. An approach to this achievement was made in the constructional article on the Argabrite condenser microphone described in the April 1932 issue of RADIO NEWS. While Mr. Argabrite's microphone was extremely popular many constructors ran into difficulty in their efforts to mount and dress down the back plate. Also the specified case was difficult to obtain.

The new Bruno condenser head described in the present article is available in the form of a complete kit with all parts precision made and ready for assembly. In fact the most critical part, the back plate, comes all mounted in the case and dressed down to provide the exact required spacing from the diaphragm. The builder has only to assemble the diaphgram and spacer rings and attach them to the case. Even the ordinarily critical adjustment of the diaphragm tension has been eliminated by the precision manufacture of the case and spacer rings.

Thus the construction has been made fool-proof insofar as it is physically possible to accomplish this. The result is that the veriest novice should have no difficulty in making a condenser head which will show an excellent frequency characteristic and as good sensitivity as many of the much higher priced units.

The complete Bruno microphone kit is shown in Figure 2 and the assembled unit in Figure 1. The finished job is 3⅛ inches in diameter by 1¼ inches thick, overall, and the assembly job requires only a pair of pliers, a center punch and a hammer. and can be easily accomplished in 20 minutes because it does not require any grinding, drilling, layout work, or sandpapering, or other dressing.

FIGURE 6. THE AMPLIFIER CIRCUIT

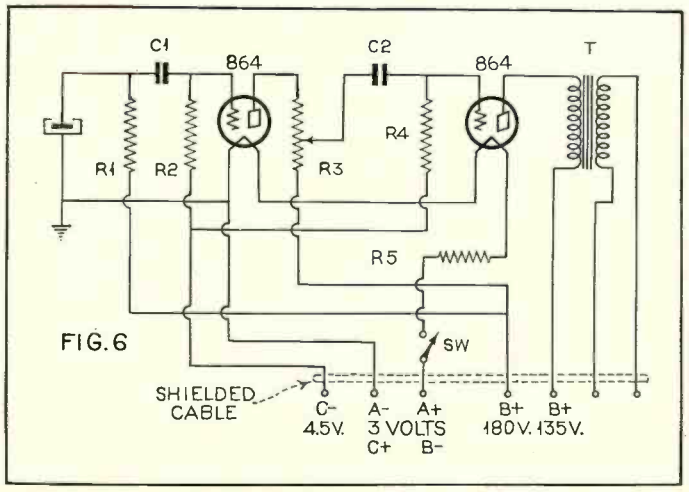
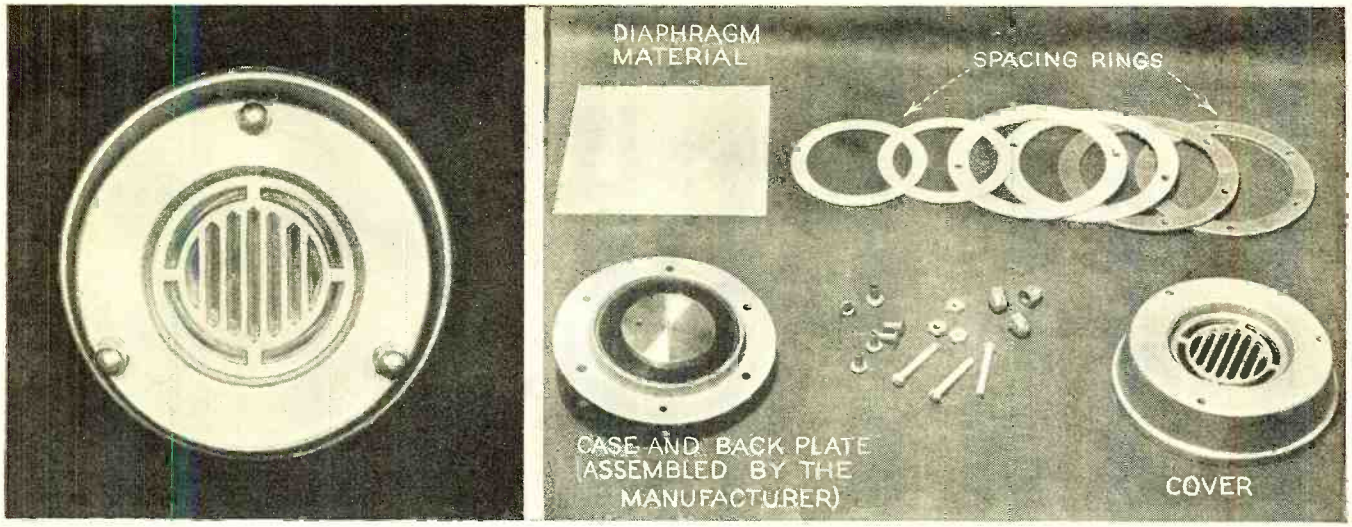


Figure 3 shows a cross-section drawing of the finished microphone head and a detail of the diaphragm assembly. In assembling the kit the case (with back plate), the cover, and the two small paper rings are set aside for the time being. Examination of the two large paper rings will disclose two holes punched in each. Lay these rings on top of the thin steel ring in such a position that these holes coincide with any two of the six holes in the steel ring. Then run an eyelet through the larger of these two holes in the steel ring and a rivet through the other, inserting both from the under side of the steel ring.

Now place the sheet of diaphragm material on an absolutely flat, hard surface such as glass or metal and lay the thick steel ring on top of it. With a scriber or other sharp pointed instrument scribe out two holes corresponding with those in the paper rings. When this has been done place the diaphragm on top of the paper rings, the holes slipping over the eyelet and rivet previously placed in this assembly. Then place the thick steel ring on top of the diaphragm. If these instructions have been followed the assembly will be as shown in the detail cross section of Figure 3. After checking this point the assembly is made secure by means of the rivet and eyelet. Placing the stack of plates on a hard surface (with the thin steel ring and the heads of the rivet and eyelet at the bottom) insert a center punch in the open end of the rivet and drive it down tight with a hammer. Repeat this with the eyelet. The assembly will thus be securely held together.

Next, with a scriber (or a nail will do in a pinch), punch the other four holes through the paper rings and diaphragm. Insert a rivet in each of the two smaller holes, an eyelet in each of the larger ones, all with their heads on the same side as before, and drive them home with a center punch. This completes the diaphragm assembly.

Before progressing further the back plate unit is thoroughly cleaned with a cloth or soft brush to remove all dust, particles of metal, etc., not only from the face of the back plate but also from the bakelite plate. *Do not try to clean by blowing on this assembly because the moisture from the breath is likely to condense on the back plate and may later cause trouble. Do not under any circumstances attempt to remove the back plate from the case or disturb the nut at the back of the case.* Such action might change the predetermined and correct adjustment. To satisfy the curiosity of the constructor it might be well to explain that there is nothing in the space under the bakelite plate except the mounting columns shown in Figure 3. The space provides a chamber where air can circulate



THE MICROPHONE HEAD

Figure 1 (left). Shows the completed head; Figure 2 (right) the complete kit as furnished by the manufacturer. Note that the back plate is mounted and dressed down by the manufacturer to insure correct position and spacing

to relieve pressure which would otherwise be exerted on the under side of the diaphragm and would prevent its free movement.

Having cleaned the back plate assembly thoroughly, the two small paper washers are dropped inside the thick metal ring of the diaphragm assembly and the latter is then slipped over the shoulder of the case, with the thick ring next to the case. This will bring the small paper rings between the top of the shoulder and the diaphragm, their purpose being to properly space the diaphragm and to prevent damage to the diaphragm when it is tightened down. The three machine screws are next inserted from the rear through three of the holes in the flange of the case and through the corresponding eyeletted holes of the diaphragm assembly. The nuts are screwed down on the three screws until they barely touch the top rings of the diaphragm assembly, then tighten them down a quarter turn at a time so as to keep the pressure equal all around. This tightening down process is continued until the bottom ring rests tight against the flange of the case. Due to the precision of the parts this will provide just the right tension on the diaphragm. All that is left now is to slip the front cover over the three projecting screws and fasten it in place by means of the acorn nuts provided.

Having completed the microphone head attention naturally turns to the question of a suitable amplifier. The condenser microphone is not comparable with the carbon microphone in output. For that reason it requires a pre-amplifier consisting of two or three resistance-coupled stages to bring the output level up to that of a carbon microphone. The best practice is to build this pre-amplifier in a metal case or box and mount the condenser head within the same case. This complete shielding reduces the possibility of undesirable coupling and the resulting short lead between the condenser head and the pre-amplifier input insures maximum transfer of energy from the condenser head.

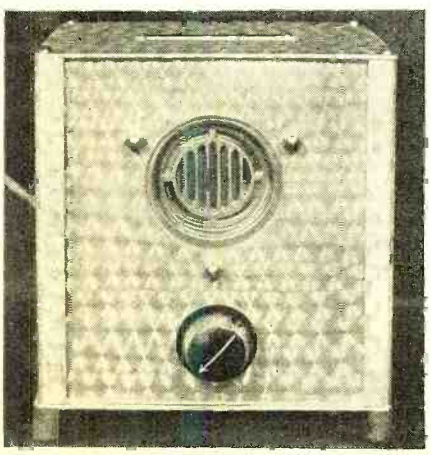
Figures 4 and 5 show one such unit, consisting of the head, a two-stage resistance-coupled amplifier and a suitable output transformer mounted in a standard aluminum box shield. The circuit is shown in Figure 6. Another unit is shown in Figure 7. This employs the same circuit as the other (except that R3 and SW are separate units) but this new Bruno case offers a more attractive appearance and better shielding, and is much more substantial inasmuch as it is of aluminum, cast in one piece, with a tight fitting base plate. Another important item —its cost is but little higher than that of the standard aluminum box shield.

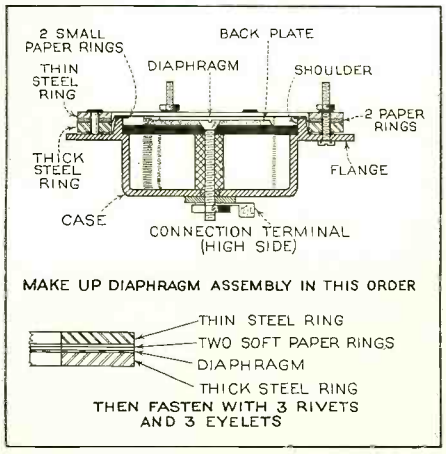
The circuit diagram of Figure 6 is for the most part self-explanatory, as the values of all parts are shown in the list at the end of this article. It is by all means advisable to use high grade parts in this circuit. Due to the high degree of amplification resulting from the combination of this amplifier feeding into a regular power amplifier, any noise caused by poor resistors or condensers is much more serious than it would be in any ordinary two or three stage amplifier. The tubes employed are of the standard 864 type. These are dry cell tubes intended for use where complete freedom from microphonic trouble is essential, as it is in the case of a pre-amplifier.

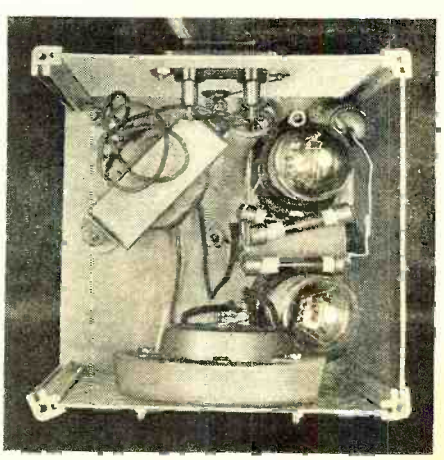
The output transformer (T) matches the output of the 864 tube to a 200 ohm line, or to the 200 ohm winding of a standard microphone transformer. This value is considered most practical because in most cases the output of the pre-amplifier will be fed into a main amplifier formerly used with a carbon microphone and which will therefore (*Continued on page 751*)

THE COMBINATION HEAD AND AMPLIFIER

Figure 5 (left) is the condenser head and pre-amplifier assembled in a standard 5-inch aluminum shield. Figure 4 (right) shows an inside view. Figure 3 (center) is a cross-section of the head assembly







Design Principles of

Long-Distance Receivers

for the Broadcast Band

This month Mr. Long presents some of the detailed constructional data on his pet receiver—a broadcast band receiver with which to date he has logged programs from 57 Trans-Pacific and South American stations

By C. H. Long

Part Four

GRID leak detectors are used. not for the better sensitivity afforded, as the amplifying stages are adequate for this task, but because of the smoother operating characteristics. Each is biased by its potentiometer to the point of best results. Due to the low value of grid leaks and small grid condensers employed, the handling capacity is really quite high; more than adequate where a two-stage amplifier is employed. The plate bend detector will carry a slightly heavier load, but it operates best only near its overload point. The author has experimented extensively with this type of detector and used it for a time, but finally discarded it in favor of the semi-power grid leak type. However, if the builder so prefers, he may use plate bend detection without change in the circuit constants.

Filament Supply

Figure 1 shows a six-volt storage battery filament supply. This is more economical than might appear at first glance, since all eight tubes draw only .48 of an ampere. and there is the advantage of having the biasing voltages furnished by the "A" battery. The series-parallel arrangement of filaments shown in Figure 2 (E) May issue may be employed, if desired, thus cutting operating costs somewhat. A two-volt supply may be used, if preferred, by making provisions for proper biasing.

Audio-Frequency Amplifier

Any standard, high-grade two-stage audio amplifier, a.c. or battery powered, may be used. A two-stage transformer-coupled amplifier is used by the writer. It goes without saying that the better the audio section and speaker, the better and more satisfying the overall results will be. It is best that the output stage have a large reserve of power to prevent overloading, and in order that weak signals may be made to sound as loud as those not burdened with a noise background.

Type –30 tubes are used throughout the signal-frequency section. A much better signal-to-noise ratio is obtained by using these tubes here, rather than screen-grid tubes. The full gain of these tubes is not used for best overall results, hence any further gain that might lure some is worse than useless. Contrary to expectations, regeneration does not upset the ganging appreciably, if the instructions given later are followed. Note the filter stage used between V1 and V2. This gives a better signal-to-noise ratio, aids selectivity and renders the two amplifying stages positively non-regenerative. The condensers employed have a maximum capacity of .0005 mfd., rather than the usual .00035 mfd., for the sake of the more accurate ganging and better selectivity. The sensitivity, which might be thought to suffer, is more than adequate; more, in fact, than can be fully used in practice.

Intermediate-Frequency Amplifier

Three stages of intermediate-frequency amplification employing type –32 tubes are used in a stable and efficient circuit that is selective without cutting sidebands appreciably. If smoother control of volume is desired than is afforded by the –32 tube (though the control of the –32 tube is satisfactory), type –34 tubes may be substituted. 90 volts on the plates has been found ample for all sensitivity requirements, at the same time giving quieter operation than is afforded when higher plate voltages are used. It will be noted by reference to the circuit diagram that both grid and plate circuits are tuned, and in addition, the coupling throughout between stages is by means of filter stages. These filter stages greatly improve the operation of the intermediate amplifier by aiding materially in reducing the receiver noise-to-signal ration, in attaining the necessary perfect stability in the amplifying stages, and in raising the selectivity to a high order. Regeneration is confined, as it should be for best results, to V3 and V8. The final amplifying stage is operated at full volume at all times in order to prevent the possibility of its overloading when the volume is reduced for strong signals. A type –30 tube is used for the second detector, in order that the tuner may couple into a standard audio amplifier and also because this tube gives slightly better overall results than the screen-grid tube as detector.

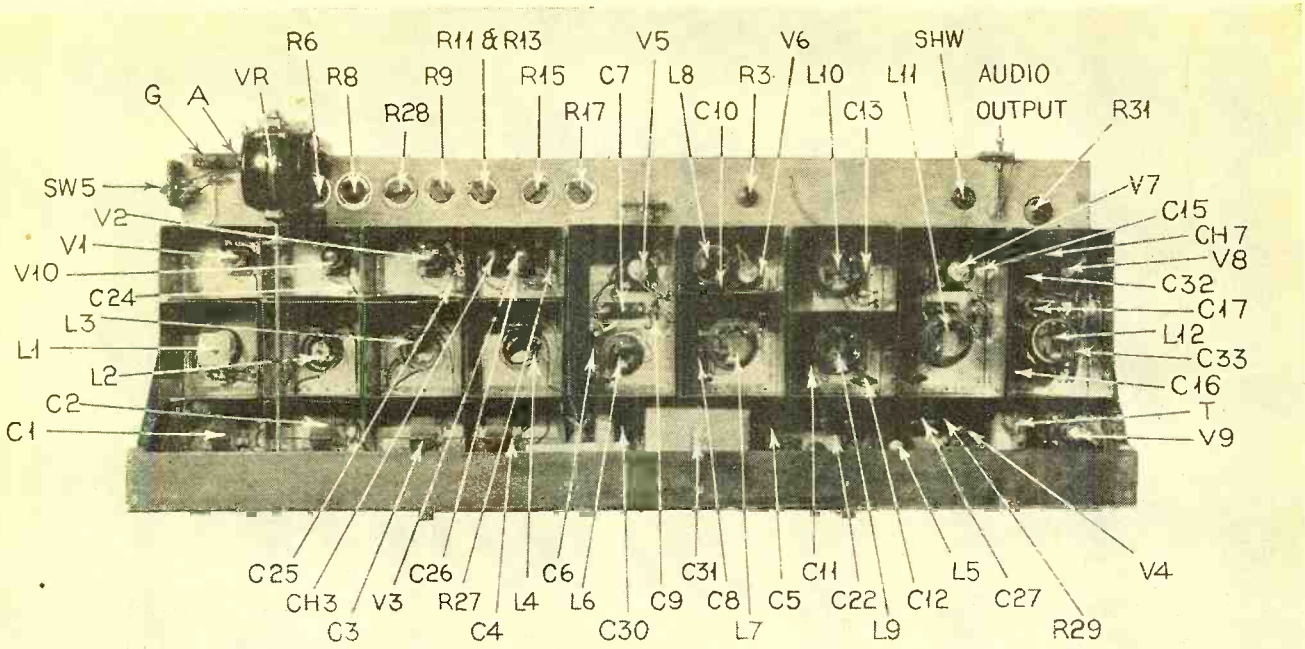
The method of regeneration employed in the second detector circuit deserves special comment. For fixed-frequency use it is much superior to the methods commonly employed. Reference to the circuit diagram will show that the variable condenser, C31, controlling regeneration, acts as a shunt to the regeneration condenser, C33, which is within the shield-can and is thrown in or out of the circuit by the three-position switch, SW2, on the right-hand side panel. Thus regeneration takes place when the variable condenser is at a minimum, and this condenser serves as a bypass condenser as its capacity is

What This Receiver Has Accomplished

The author's DX record (200-550 meter stations only) to date:

	Stations Logged		
Country	*Verified*	*Awaiting Verifications*	*Total*
Australia	26	5	31
New Zealand	4	—	4
Japan	9	5	14
China	1	—	1
Philippines	—	1	1
Hawaii	1	1	2
Peru	1	—	1
Venezuela	—	1	1
Argentina	—	1	1
Colombia	1	—	1
	—	—	—
	43	14	57

The 14 stations under the head "Awaiting Verifications" are stations so recently logged that sufficient time has not elapsed to allow for receipt of the letters of verification. All reception was recorded at Mr. Long's home in Winston, Missouri.



TOP VIEW OF COMPLETED CHASSIS

The chassis is shown here with the shield covers removed to disclose the arrangement of parts. All parts are marked with identifying symbols corresponding to those used in the circuit diagram last month. It will be noted that a tube, V10, is shown in the second shield from the left at the rear, but this does not appear in the circuit diagram. This is an extra tube tried by the author, but found superfluous and was therefore not included in the circuit diagram. It was employed in an extra stage of r.f. amplification and should the builder desire to include this extra stage it will only be necessary to duplicate the circuit of tube V1

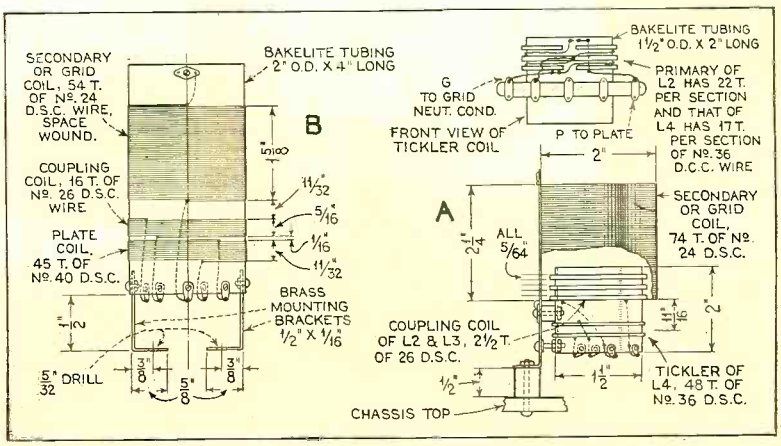
increased. The leads to the variable condenser are shielded and cabled and, due to the circuit arrangement, cause no difficulty, though quite long.

The R.F. Coils

The coils used for tuning to signal frequencies are Hammarlund space wound 2 inch shield-grid coils with their primaries removed by drilling out the supporting rivet, except that the antenna coil is the regulation Hammarlund coupler matching the shield-grid coils. The builder may, of course, make his own coils (see Figure 3A for data), although it will be somewhat difficult to equal the efficiency of those specified. A 1½ inch bakelite coil form is supported on the Hammarlund forms as shown. Two thicknesses of pasteboard strips 5/64 inch wide are glued on the forms fitted to L2 and L4 to serve as formers for the primaries. In addition, two pasteboard strips are glued, as shown, to the lower end of the form fitted to L4 to serve for the tickler. After the glue is thoroughly dry (and not until) thread is wound in the slots designed for primaries two or three layers deep. Starting with the "G" terminal, the primaries are then wound on scramble-wise in the same direction as the secondaries with No. 36 d.c.c. wire, taking a tap taken midway between the two equal sections. The primary of L2 has 22 turns per section and that of L4 has 17 turns per section. The coupling coils of L2 and L3 each consist of 2½ turns of No. 26 d.s.c. wire wound at a level with the lowest turn on the secondary. The tickler coil of L4 consists of 48 turns of No. 36 d.s.c. wire scramble-wound, starting with the "P" terminal, in the same direction as the secondary. The coils are mounted about ½ inch above the base shields, as indicated in the diagram, in order to allow the greatest practical space between coil and shield.

R.F. COIL DATA

Figure 3A. The details of coils L2, L3 and L4. L1 may be a regular antenna coupling coil as indicated in the list of parts, with a tapped primary. Figure 3B gives the details of the oscillator coupler



Oscillator Coupler

The oscillator coupler, Figure 3B, must be constructed throughout by the builder. It is wound on 2 inch bakelite tubing and must be constructed with care as to the number of turns and exact spacing in order to obtain satisfactory tracking and the highest efficiency. This coupler is the result of much careful experimentation *and should not be altered.* The small size wire used in the plate coil practically equalizes the oscillator energy at all frequencies. The coupling coil is so arranged that the transfer of oscillator energy increases somewhat as the frequency increases, a very desirable characteristic, tending to equalize the gain. The signal furnished by the oscillator is absolutely steady and free from noise modulation. The coil after being wound is treated sparingly at intervals of its circumference with thin celluloid cement in order to insure permanency. The grid or secondary coil consists of 54 spaced turns of No. 24 d.s.c. wire. The plate coil consists of 45 turns of No. 40 d.s.c. wire, and the coupling coil consists of 16 turns of No. 26 d.s.c. wire. The upper end of the secondary coil goes to the grid; the upper end of the coupling coil connects to the lower end of L4, and the lower end of the plate coil goes to the plate. Wind all coils in the same direction.

I.F. Coils

The coils used for the intermediate-frequency amplifying and filter stages are lateral wound on a Universal Coil Winder. The two coil winding forms shown in Figure 4A and 4B are required for the construction of the coils, which are wound in the ⅜ inch slot that the forms provide. Threads are inserted in the sawed slots above a strip of heavy paper (used in order that the coil may be slipped off the form without derangement) wound around the core, and are tied after the correct number of turns are wound on, in order to hold the coil together when taken from the form for cementing. Pure celluloid, such as is used in car curtains, dissolved in ethyl acetate makes an excellent cement for giving the coils the necessary rigidity and permanency. The cement should be of thin consistency. After being taken from the form the coil is immersed in the cement, and after plenty of time for thorough saturation has been allowed (say 10 or 15 minutes) is hung up to dry. When nearly dry the coil is again inserted in the form, and the sides of the form are screwed down for shaping of the coil. After a short time, the coil, in order to prevent its becoming cemented to the form, must be removed and allowed to dry further. It may be necessary to repeat this process.

The L6 and L8 coils are wound on the 1½ inch form. All others are wound on the 2 inch form. If space is an important consideration, all coils may be wound on the 1½ inch form with a slight sacrifice of efficiency. The principal loss in performance will occur in the filter stages. The primary of L6 consists of 220 turns of No. 36 d.c.c. wire; the filter coil following has 345 turns of the same size wire, and the grid coil of L6 has 395 turns of No. 32 d.s.c. wire. The grid coil of L8 is the same as that of L6, and the coupling coil consists of 35 turns of the same wire. With the exception of the plate coil of L12, the tuned transformer and filter coils of L7, L9, L10, L11, and L12 have 320 turns of No. 30 d.s.c. wire. The plate coil of L12 has 270 turns of the same size wire. The coupling coils of L10 and L11 consists of 30 turns of No. 32 d.s.c. wire. The tickler coil has 100 turns of No. 36 d.c.c. wire.

The coils are held in place on the tubing supports by a high degree of friction, but they may in addition be cemented to the tubing with celluloid cement after the correct positioning has been secured. The spacing employed by the writer between the various coils, and which has given best results, all things considered, is indicated in Figure 4. The coupling employed gives a practically uniform response over about 8 kilocycles, with a very sharp cut-off beyond. However, the degree of coupling may be varied to obtain the degree of band-pass desired. Care should be taken that the windings of all coils are in the same direction. The inside of all coils, excepting the tickler, should connect to the low potential or grounded side of the circuit. The inside of the tickler connects to the plate of V8.

The foregoing data will enable constructors to proceed to make the various coils and coupling transformers. Next month data will be given on the constructional layout of the chassis, shields and parts. Wiring suggestions will also be given at that time, as well as instructions on adjustment and operation of the finished receiver. The list of parts employed is given herewith in order that constructors who so desire may start to accumulate the necessary components.

—The Editors.

Parts Required

The complete list of parts as employed by the writer in the construction of the "A. F. A." tuner is given below. If substitutions are made, one should be careful to substitute only parts of equal quality. No circuit can perform better than its poorest parts, and poor parts can certainly not be tolerated in a circuit that is expected to deliver superior results.

C1, C2, C3, C4, C5—Hammerlund .0005 mfd. tuning condensers, Type ML-23

C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C17—Adjustable 30-165 mmfd. mica condensers

C18—Hammerlund 35 mmfd. midget condenser, Type MC-35S

C19, C20—Hammerlund 20 mmfd. midget condensers, Type MC-20S

C21, C23 C24, C25—Hammerlund 35 mmfd. equalizers, Type EC-35

C22, C33—Adjustable 100-360 mmfd. mica condensers (C22 consists of the variable and the two Sangamo .001 and .00025 mfd. mica condensers in parallel)

C26, C27—Sangamo .00015 mfd. mica condensers

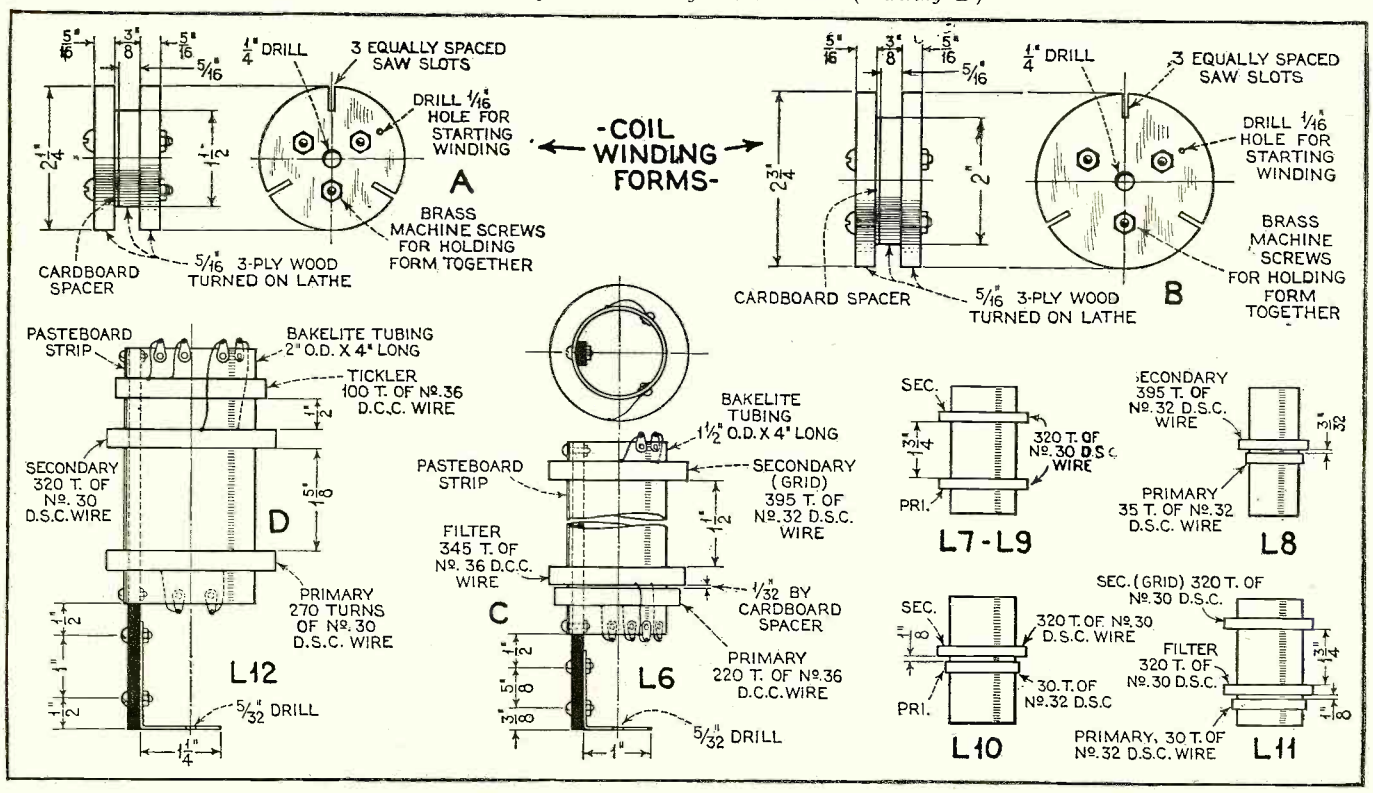
C28, C32 and one component of C22—Sangamo .001 mfd. mica condensers

C29, C60, C62 and one component of C22—Sangamo. .00025 mfd. mica condensers

(*Continued on page* 761)

I.F. COUPLING COIL DATA

Figure 4. (A) and (B) give specifications for forms used in winding i.f. coils. (C) and (D) show size of tubing and method of mounting i.f. coils; also the winding specifications and spacing for L6 and L12. The other drawings show number of turns and spacing for all other i.f. coils. Tubing and mounting for L8 are same as L6 (drawing C). For L7, L9, L10 and L11 tubing and mounting are like L12 (drawing D)



ONE OF THE C. S. C. G. CODE PRACTICE TRANSMITTERS

This "Ham" station, W8EVC, owned and operated by Charles Whitsel at Midland, Michigan, is one of the numerous amateur stations putting regularly scheduled code practice on the air. Mr. Whitsel, who is shown here, is well known among his brother "hams" for the perfection of his work at the key

An Opportunity for Code Practice at Home

The code practice transmissions of the amateur members of the C. S. C. G. provide an opportunity for anyone owning a short-wave receiver to learn to read code

[*By* Gordon Fraser]

ONE of the finest of short-wave activities, and one which will be of great interest and value to an enormous number of short-wave fans, "hams" and prospective "hams", is found in the series of code practice transmissions being put on the air regularly by members of the Candler System Code Guild for the benefit of all owners of short-wave receivers who desire to learn to read code, or to brush up in cases where former ability to read code has become rusty from lack of regular and steady practice.

With the constantly growing popularity of short-wave broadcast reception many former broadcast band fans have been brought down the wave bands into the realms of the amateur and the commercial stations. In tuning for short-wave broadcast stations, stations transmitting code are constantly being encountered and it is only human for the uninitiated listener to wonder what messages all the dots and dashes are conveying. Such curiosity is experienced by everyone who hears code transmissions and in a great many cases is sufficiently all-consuming to drive the listener to learn the code and practice until he can read some of the code transmissions. In many other cases, however, the will and the desire to learn is there but not the patience required to learn to read code by practicing on regular commercial or amateur transmissions. To add to the difficulties of beginners, the commercial transmissions are usually too fast to be of any material use for practice purposes. The average amateur transmission is slower but unfortunately the slowest transmission is more likely than not coming from the key of some amateur who is just breaking into the game and whose sending is so poor that even an expert might have great difficulty in understanding it. This sort of transmission is therefore not of any possible use to one who is endeavoring to learn to read and transcribe code messages.

The Code Guild overcomes these handicaps, and its regular scheduled transmissions should be particularly useful not only to beginners, but likewise to the "old timers" whose code reading ability has suffered from lack of practice, and to those who can read moderately fast transmission but who wish to improve their speed either for their own satisfaction or perhaps in order to qualify for operators' licenses of higher grades.

According to one of the latest Guild schedules these practice code transmissions are put on the air every day in the week. Monday, for instance, there are transmission periods starting at 3:30, 8:00 and 9:15 p. m., C. S. T., put on the air by amateur stations in the Middle West. At 7:30 p. m. M. S. T., an amateur station in the Rocky Mountain section goes on the air. At 10:00 p. m., Pacific Time, a West Coast "ham" station starts up. These stations transmit at speeds varying between 10 and 25 words per minute, each transmission including a variety of speeds within this or a somewhat narrower range.

Other days of the week the schedules include these as well as other hours, and also include other speeds, some as low as 5 and 8 words per minute and as high as 30 words per minute.

The operators of the amateur stations taking part in the transmission schedules are all highly qualified operators. All are men who have received their training in the Candler System, a scientific system of training which is widely known for the high degree of skill and precision among the operators it turns out. Walter H. Candler, the founder of the training course, was himself well known in the earlier days for his precise "fist" when working a transmitting key, and in his training system has demonstrated his ability to train others to duplicate his achievements.

No less an authority than T. R. McElroy, world's champion radio operator for three successive years, vouches for the perfection of the code transmission of (*Continued on page* 759)

TYPE –25Z5

TYPE –5Z3

TYPE –2A3

TYPE –2A5

FOUR NEW TUBES

This article gives the information of the four most recent tubes available. They include a novel rectifier which can be used in A.C.-D.C. receivers and also for a voltage doubler. Further, a heavy-duty full-wave rectifier, an output triode with a power output comparable to the –50, but with lower voltage and an improved cathode-type power pentode

By J. van Lienden

THE first four tubes to receive the new numberings are: a full-wave high-vacuum rectifier and voltage doubler, type 25Z5; a heavy-duty high-vacuum rectifier, type 5Z3; an output-power pentode, type 2A5 and a triode power-amplifier, type 2A3.

The new designations for tubes have been arranged so as to make it easy to tell, by the number, just what kind of tube it is. The first number—or group of numbers—indicates the filament voltage; the letter shows for what purpose the tube is intended, and the last number gives the number of elements within the tube.

Type –25Z5

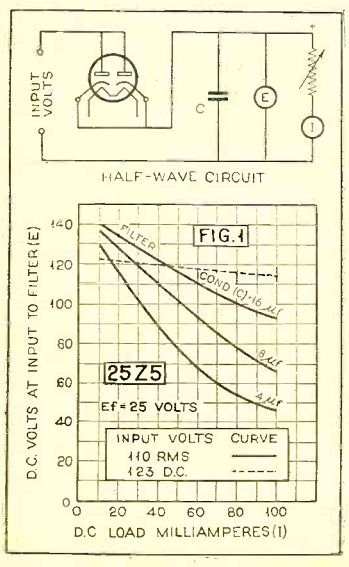
This is a tube of particular interest because of its possibilities as a voltage-doubler, which enables one to obtain 220 volts plate supply from 110 volts a.c. without a power transformer. At the same time, the tube is applicable to a.c.-d.c. receivers, supplying enough for both the speaker field and the set.

Inside the tube are two rectifier units of the cathode-heater type. The heater is designed for 25 volts and consumes .3 amperes. It can, therefore, be connected in series with the automobile tubes which draw the same current. This cuts down the size of the series resistor.

The two rectifier units can be connected in parallel, as in a.c.-d.c. receivers, or it can be used as a doubler. The circuits are shown in Figures 1 and 2. Perhaps the doubler circuit needs some explanation.

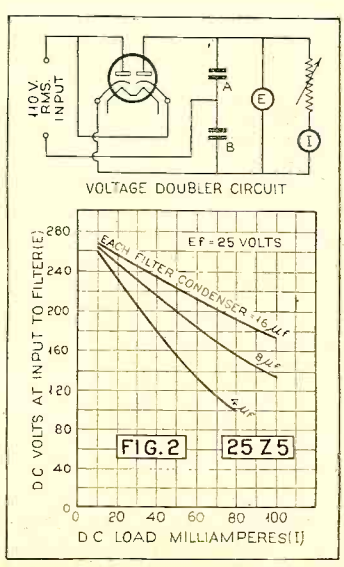
Referring to Figure 2, suppose that the upper terminal of the a.c. line becomes positive for half a cycle; then the left section of the rectifier becomes conducting and the condenser B is charged. When the upper terminal of the line becomes negative, the right section of the rectifier is conducting and the condenser A is charged. Both condensers are in series and discharge through the load. So double the line voltage is available for the load. Condensers A and B have to be large in order to obtain good regulation; the voltage rating, however, need not be larger than the line peak voltage.

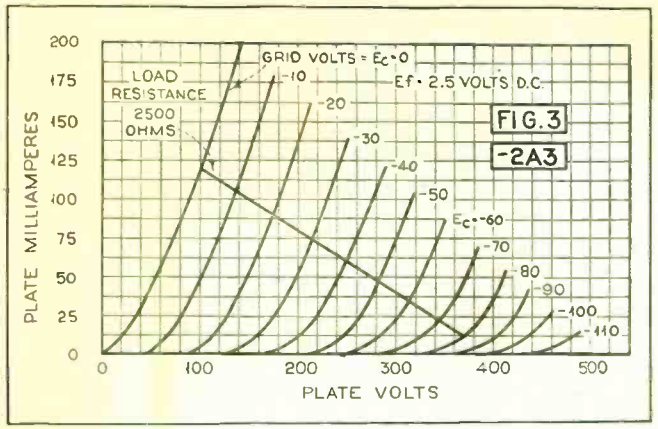
A filter of the condenser input type is recommended for use with this rectifier in order to

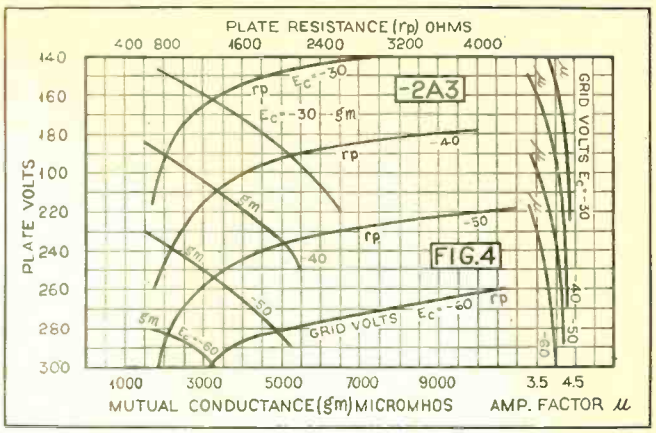


	25Z5	5Z3
FILAMENT VOLTAGE	25	5.0 A.C. VOLTS
" CURRENT	3	3.0 AMPS.
A.C. VOLTS PER PLATE(RMS)	125 MAX.	500 MAX. VOLTS
D.C. OUTPUT CURRENT	100 MAX.	250 MAX. MA.
MAX. OVERALL LENGTH	4¼"	5⅜"
MAX. DIAMETER	1 9/16"	2 1/16"
BULB	ST-12	ST-16
BASE	SMALL 6 PIN	MEDIUM 4 PIN

	2A3	2A5
FILAMENT VOLTS	2.5	2.5 VOLTS
" CURRENT	2.5	1.75 AMPS.
DIRECT INTERELECTRODE CAPACITY		
GRID TO PLATE	13	MMFD.
GRID TO FILAMENT	9	"
PLATE TO "	4	"
MAX. OVERALL LENGTH	5⅜"	4 1/16"
MAX. DIAMETER	2 1/16"	1 13/16"
BULB	ST-16	ST-14
BASE	MEDIUM 4 PIN	MEDIUM 6 PIN
	SINGLE STAGE CLASS A	PUSH-PULL CLASS A
PLATE VOLTS	250	300 (MAX.) 250 MAX. VOLTS
SCREEN VOLTS	—	250 " "
GRID VOLTS	-42	-62 -16.5 VOLTS
PLATE CURRENT	60	40 34 MA.
SCREEN CURRENT	—	6.5
PLATE RESISTANCE	765	100,000 OHMS
AMPLIFICATION FACTOR	4.2	220
MUTUAL CONDUCTANCE	5500	2200 MICROMHOS
		FIXED BIAS / SELF BIAS
LOAD RESISTANCE	2500	3000 / 5000 7000 OHMS
POWER OUTPUT	3.5	15 / 15 3.0 WATTS
TOTAL HARMONIC DIST.	5% (SEC. HAR)	2.5% / 5% 7 %
PLATE TO PLATE		







obtain a d.c. output as high as possible. A large condenser is desirable for half-wave rectifiers, 16 mfd, while a still higher value is advantageous for doubler circuits. For use in a half-wave rectifier circuit, the two cathodes and plates are connected together.

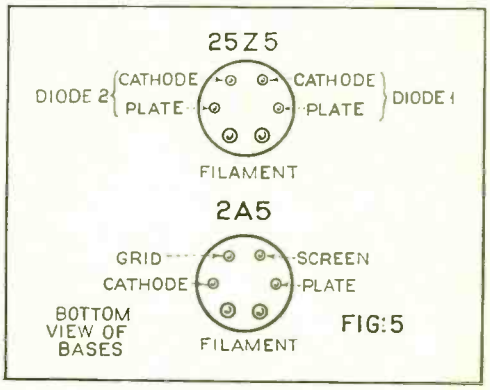
Type 5Z3

This is a high-vacuum rectifier of the full-wave type (similar to type –80) but with a higher current rating. A maximum continuous output of 250 ma. can be obtained. The base pins fit the standard 4-contact socket and the connections are the same as those of the type –80. However, one cannot replace the type –80 with the new 5Z3 without circuit changes. The filament of the type 5Z3 requires a current of 3 amperes, which makes it necessary to have a transformer designed for such a heavy drain. Connections have to be well soldered, wires heavy enough and the socket must make good contact.

The maximum a.c. input per plate should not exceed 500 volts, R.M.S. value. The positive terminal of the output filter should be connected to the centertap on the filament transformer. Filter circuits of the choke-input or condenser-input type can be employed, if the rating of the tube is not exceeded. When condenser input circuits are employed, the condenser should be able to withstand the a.c. peak voltage (700 volts) and the peak plate current in this circuit is often as much as four times the load current. Choke input filter circuits do away with these difficulties, but the output voltage is lower. Characteristics for this tube are shown in the table.

Type 2A3

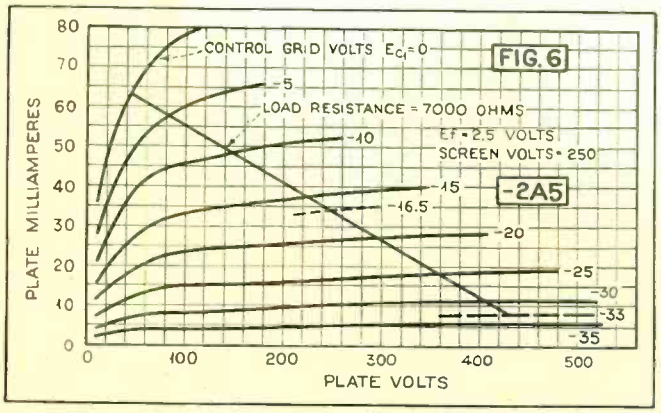
This is a 2.5-volt heater-type triode, power-amplifier tube, designed to give large output with a relatively low plate voltage. A pair of these tubes, operated Class A in a push-pull circuit, can deliver 15 watts with a plate potential of 300 volts. Such large outputs were hitherto impossible with class A amplifiers unless transmitter-type tubes and high voltages were used. The large electron emission for type 2A3 is obtained by an unusual filament design. Several filaments are connected in series-parallel, making a greater filament surface. The base fits the regular 4-prong socket; connections are similar to type –45. Characteristics are found in the table.

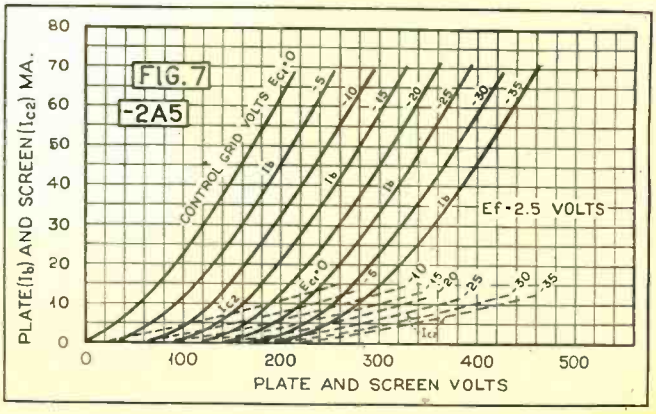


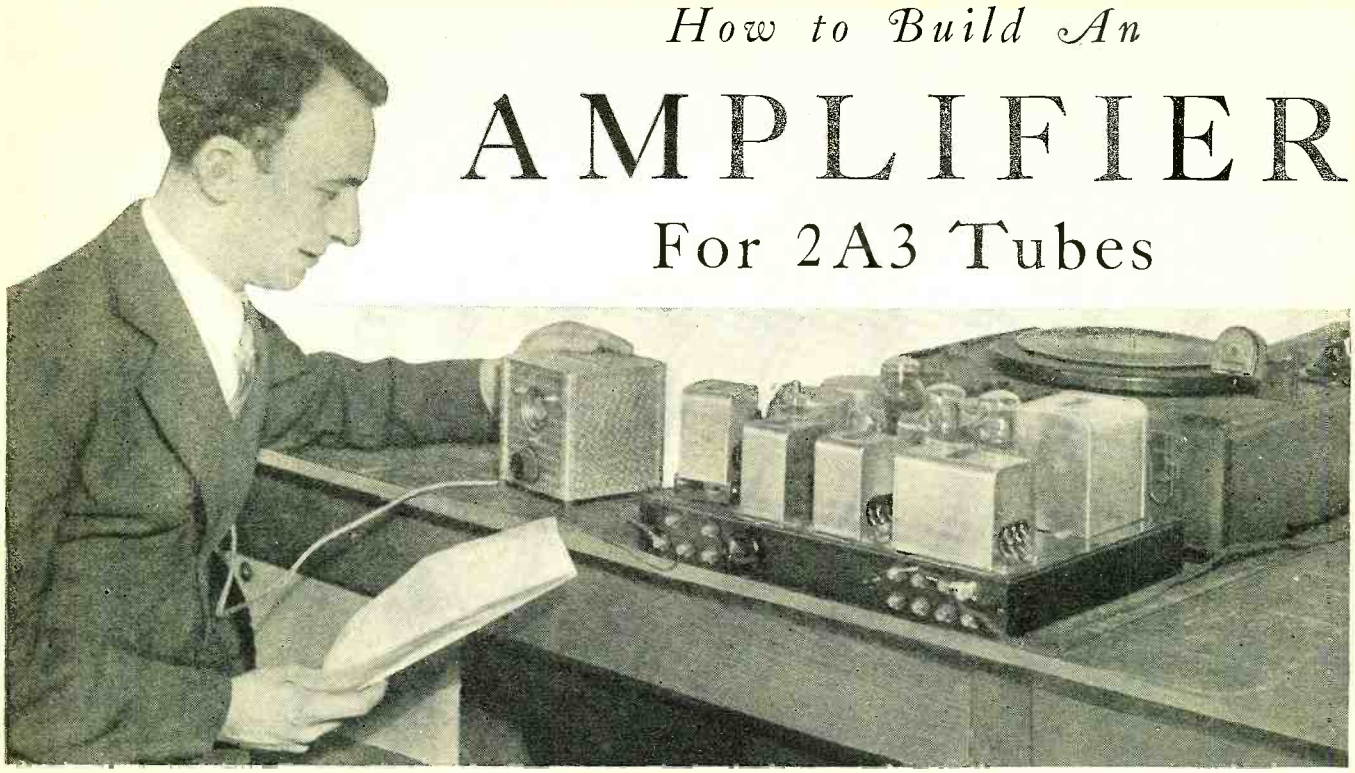
It will be seen that the power of the push-pull stage is much more than twice that of the single stage. This is because of a different adjustment of plate and grid voltages. Even harmonics are cancelled out in the push-pull circuit. The power output has been calculated for a signal which does not make the grids draw current. If grid-voltage is obtained by self-bias, the resistor should be approximately 700 ohms *both for the single and the push-pull stage*. As large a condenser as practical should be shunted across the bias resistor. The filament operates on 2.5 volts and 2.5 amperes. The high current requires a socket which makes good contact, heavy wires and a filament secondary with low resistance. If no centertap is present on the filament secondary a centertapped resistance of 20 ohms should be connected across the filament. When resistance coupling is employed, the grid leak should not be more than 500,000 ohms when self bias is employed. With fixed bias, this resistance should not be more than 10,000 ohms. Higher grid resistors may cause the grid to lose bias due to grid-current and the plate current will then rise so high as to damage the tube.

Type 2A5

Type 2A5 is a power-amplifier pentode of the heater-cathode type, for use in the audio-output stage of radio receivers. The indirect heating helps greatly in minimizing hum. The base pins of the 2A5 type fit the standard 6-prong socket; a diagram of connections is shown in Figure 5. The tube should be so installed that adequate ventilation is provided, because the bulb may become very hot. When a single tube is operated self-biased, the bias resistor (408 ohms) should be shunted with a large condenser in order to avoid degenerative effects at low frequencies. When operated in a push-pull stage, the bias resistor (204 ohms) theoretically does (*Continued on page* 760)







How to Build An AMPLIFIER For 2A3 Tubes

By I. A. Mitchell

CONSIDERING the many tube developments of the last six months, the series of the pentode tubes released by the manufacturers, for audio amplifiers in radio receiver design, has been an excellent one from the standpoint of economy and practical application. But these tubes have a relatively high harmonic content. The advent of class B amplification was therefore a forward step for use with these tubes, but here again unless components and voltages were very well matched, the harmonic content remained high. The next logical step in amplification was a cross between triode class A and class B. This was the so-called AAA or A′, and even with this, for a limited range, a carry-over from class A to class B is advantageous. But it must be remembered that in A′ amplification, considerable driving power is required, and that a fixed bias is not always economically obtainable in a.c. operated equipment.

The logical output tube so far released is the new 2A3. This tube is a highly efficient class A triode. The cathode consists of a large number of coated filaments connected in series parallel to provide a large radiation area. The resultant mutual conductance is extremely high, while the amplification factor is higher than with the 250 tube. A pair of these tubes connected in push-pull, with 300 volts on the plate and 62 volts bias, will deliver 15 watts output power. The plate efficiency is high for class A; the tubes draw only 40 ma. each.

Described in this article is a new power amplifier using these tubes as developed in the Kenyon Laboratories. The amplifier is universal in its application to the experimenter and serviceman. And inasmuch as most of the new microphones are relatively insensitive high gain was thought to be essential. Therefore, the overall gain of this new amplifier has been made 92 decibels. Considering the power output as 15 watts (or plus 34 db.), the input source can be 58 db. down.

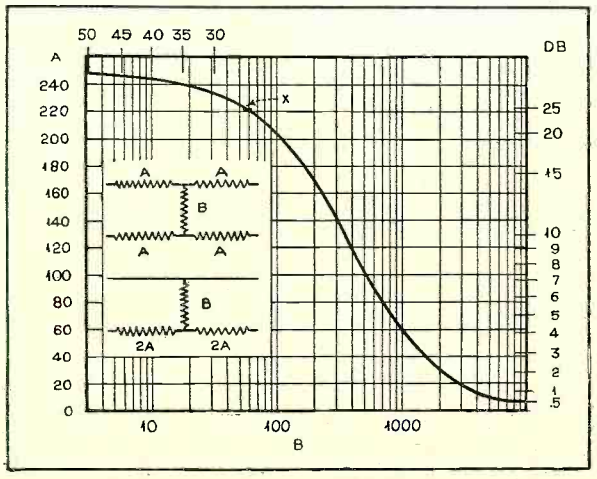
In this design, account was taken of the fact that high-gain a.c. operated amplifiers are, on the whole, tricky to build. One of the first points considered was the elimination of tube microphonic noises. It was therefore decided to use 6-volt (automobile type) tubes for the voltage amplification section as these tubes are inherently built more rugged. The next point considered was hum. A well-filtered B supply was designed to keep plate hum to a minimum, and heater tubes were used on the input to minimize filament hum. The possibility of electro-static and inductive pickup were next considered. The input tube was shielded to prevent the former and a simple bracket was designed to allow swinging the input transformer to a position where inductive pickup balanced out. This is shown in the photograph in Figure 1. The transformer can be rotated 360 degrees and tilted 45 degrees. Needless to say this adjustment makes a tremendous improvement in eliminating hum. The precautions mentioned were proved well-worth taking care of, as the amplifier, when completed, has an almost unbelievably low hum level and is entirey lacking in acoustic pickup.

The entire system is triode operated. Most of the gain is obtained from the type –75 input tube. This is one of the new duplex-diode-triode units. For audio-frequency work we have disregarded the diode plates and use only the triode section which has an unprecedented gain as a standard triode. The amplification factor is 100 and, by using a well-designed plate-coupling device, practically 90% of this is made effective. This feeds into a type –37 tube which in turn feeds the type 2A3 tubes in push-pull. The circuit diagram accompanies this article in Figure 2.

The input transformer used is the special type BPR Kenyon transformer. It contains two primary windings, one for triode plate or high-impedence pickup, the other for a double-button microphone, a low impedance pickup or a line. The output transformer employed is a Kenyon type B2A30 which also incorporates universal features providing output impedance of 500 ohms for a broadcast line,

ATTENUATOR DESIGN CURVE

Figure 4. This curve has been plotted for 500-ohm input and output termination. The method for using the graph is explained in the text



2000 or 4000 ohms to modulate an r.f. circuit and 4, 8 and 15 ohms to feed a number of voice coils. Therefore the completed amplifier can be used for modulation and monitoring in an amateur circuit at the same time, or it can be used for public-address work or for a general amplifier for a high-class receiver.

In looking over the circuit diagram it will be seen that a potentiometer volume control is connected in the first grid circuit. However, if the amplifier is to be used for operation from a high-level source, such as phonograph or radio reproduction, the overall gain may be unnecessarily high. The first stage can be omitted under these conditions or an attenuator with about 30 db. loss can be inserted in the output circuit. Attenuators for a 500 ohm line are shown in Figure 3, but for other circuit impedances all the values indicated should be multiplied proportionately.

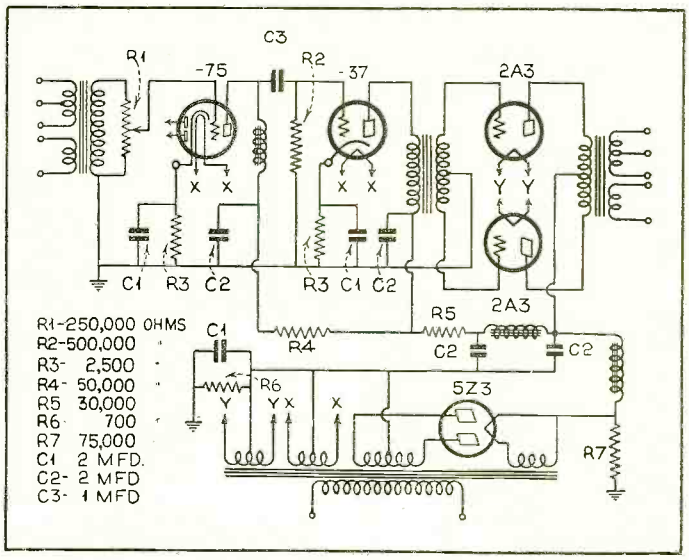


FIGURE 2. THE SCHEMATIC DIAGRAM

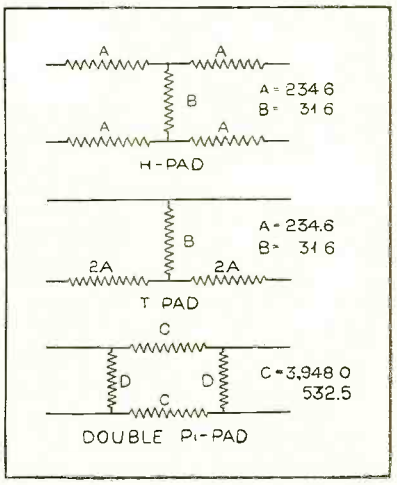


FIGURE 3. ATTENUATOR PADS

It has always been quite difficult to mix microphones, pickups and tuners of widely different output. In many of the less expensive sound systems a single gain control is used with a switching arrangement to throw in the microphone, phono or tuner. It is evident that if such a gain control is designed to properly operate with an average microphone, it will have to be turned to almost the "off" point to control a pickup or tuner input. Furthermore, most inexpensive gain controls show a marked frequency discrimination at the maximum attenuation point. To compensate for this effect, a fixed attenuator can be inserted between the pickup or tuner and the input to the variable gain control. This attenuator will bring the phono level down to the same output as a microphone, so that the original gain control will cover the entire volume range.

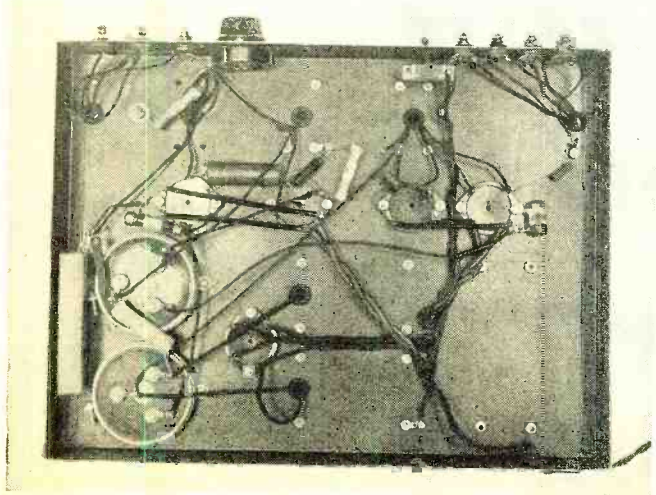
An ideal attenuator must maintain proper impedance on both input and output termination and must show no frequency discrimination throughout the audio range. It is customary to use either a "T" or "H" type pad to obtain the above results. With the curve shown on the opposite page, any person can make a pad of either of these types.

Inasmuch as the most common impedance for transmission lines is 500 ohms, this curve has been plotted for 500-ohm input and output termination. The method for using this graph is simple. The value of attenuation desired is read on the right or top scales. This value is then carried across or down, respectively, till the curve is intersected. The intersection point carried to the left and carried down will strike respectively the values of A and B to be inserted in the schematic pad circuits shown. These values are directly in ohms. If it is desired to attenuate a circuit of an impedance other than 500 ohms, both A and B values should be multiplied by the ratio of the desired impedance to 500 ohms.

For example, let us assume that we have an amplifier designed to operate from an input level of minus 50 DB with a gain control covering a range of 40 DB. It is desired to operate a 200-ohm pickup with an output level of minus 15 DB into this amplifier and it is evident that the original gain control would not be effective. It is decided to insert a fixed attenuator of 25 DB between the pickup and amplifier input to allow proper volume control. On the right-hand scale in Figure 4 we look up to the point 25 DB and carry this across to the point where it intersects the curve. Carrying this intersection point across to the left we obtain a value of 222 ohms for A, and carrying it down, we get a value of 56 ohms for B. Inasmuch as these values are based on 500 ohms, to reduce the impedance to 200 ohm values, both A and B are multiplied by 200/500. This gives us final values of 90 and 225 ohms for our pad. The "H" type attenuator is generally used where it is necessary to maintain perfectly balanced lines. Inasmuch as in this case balance is not of prime importance, a T pad will be suitable. It is consequently found that we need but three resistors; two of 180 ohms each and one of 22.5. The B value is the (*Continued on page 751*)

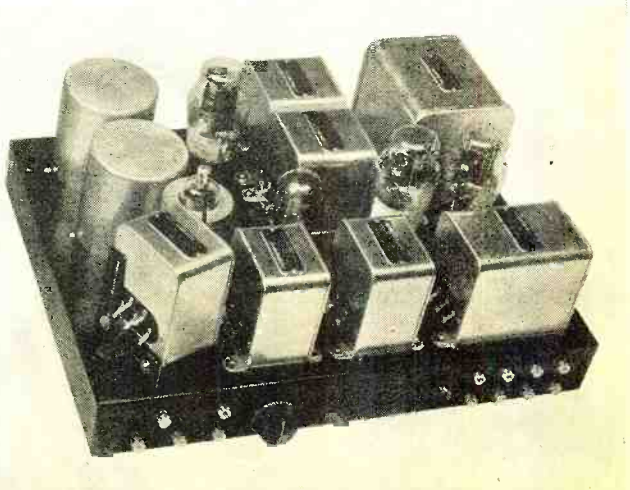
VIEW FROM BELOW

Figure 5. This shows the wiring and distribution of components underneath the chassis



VIEW FROM ABOVE

Figure 1. The completed amplifier showing the adjustable input transformer in the lower left corner

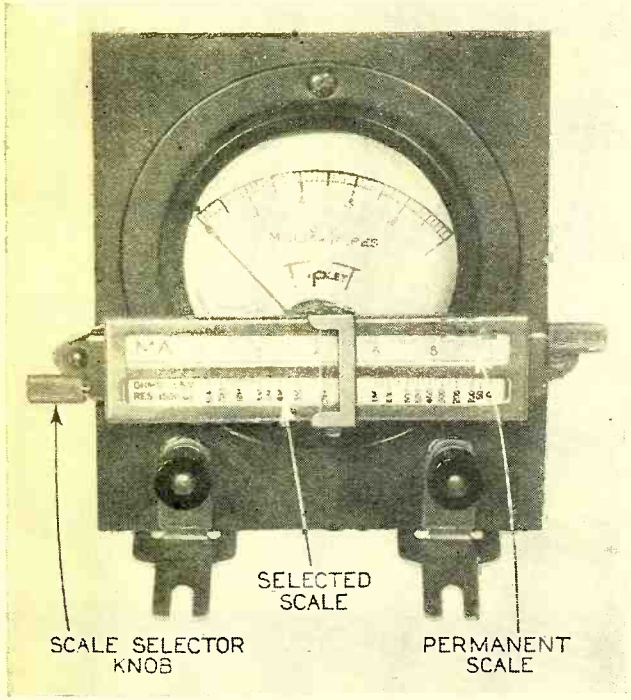


ELIMINATING CHARTS AND TABLES IN READING

MULTI-PURPOSE METERS

A new meter accessory provides direct reading scales for all ranges of universal meters, without recourse to calibration curves and without defacing the original meter dial

By H. G. Cisin



THE NEW UNIVERSAL METER SCALE

Figure 1. A unit is selected, having a permanent scale like that of the dial of the meter with which it is to be used. Calibrations for other ranges are marked on the rolled ribbon of the unit so that when using any range of the meter the roll can be turned to the proper scale to provide direct readings

EVERYONE who has ever had occasion to use an electrical meter knows how annoying it is to be compelled to stop and consult a calibration chart, curve or table, in order to convert the meter reading to useable form. To overcome this trouble, a number of calibrations and ranges may be placed on the meter dial, but this makes the meter difficult to read and often results in inaccuracies due to the confusion of one scale with another. Furthermore, the number of ranges which can be printed on a single dial, is extremely limited, through lack of space.

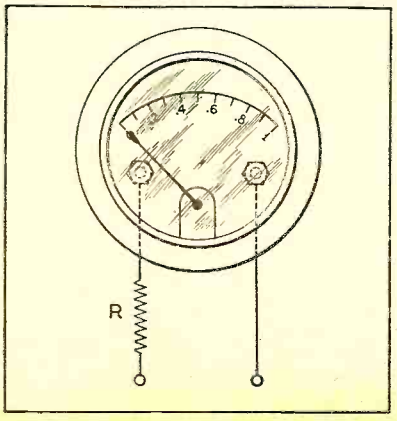
Now, in one of the most striking improvements ever devised for use with meters, all calibration troubles are eliminated. The new device, which is the invention of Leo Taussig of New York City, is called a Masterdial. It can be applied to any meter. Through its use, an ordinary single range milliammeter is immediately converted into an instrument having hundreds of different applications. Used as a d.c. voltmeter, the instrument is applied with as many ranges as desired. Or it can be used as a multi-range ohmmeter, a capacity meter, etc. Furthermore, every range is clearly readable in the same size numbers, with no chance of confusing one range with another. The Masterdial serves a useful function wherever meters are employed. It finds application not only in radio servicing, but in every other type of electrical testing, being especially adapted for use in radio and electrical laboratories in manufacturing concerns, schools and colleges.

How is it possible to change an ordinary instrument into such a "magic" meter? The new invention, shown in the accompanying illustration, is simplicity itself. After using it, the universal reaction is—why didn't I think of that?"

Essentially, the device consists of a calibrated roll of fine-woven linen, fastened above the meter in such a way that it does not interfere with the reading of the meter scale. A knurled metal knob at one end permits the roll to be wound up, while a similar knurled knob at the other end, permits it to be unwound.

A metal slider, with a mica window, may be moved laterally across the face of the roll. Above the roll, there is a scale printed on celluloid, which is identical with the scale on the meter face. Thus, suppose that the device is to be used on a voltmeter calibrated from 0 to 7. It would then be furnished with a similarly calibrated celluloid scale, reading from 0 to 7. Then, by changing the multipliers, the same meter may be used for any desired ranges, such as 0 to 25, 0 to 50, 0 to 100 or any other ranges, and a slight turn of the knurled knob on the Masterdial brings the corresponding calibrated scale on the roll into view.

FIGURE 2. FUNDAMENTAL MILLIAMMETER CONVERSION CIRCUIT



How It Is Used

For example, suppose that the 0 to 7 meter is connected to a multiplier which gives it a range of from 0 to 100. The circuit is closed and the meter needle swings over to a point marked 3.5 on its original scale. First of all, the knurled knob is turned until the 0 to 100 range calibrated scale appears on the case of the linen roll. The slider is then moved over the celluloid scale to the position where it will read the same as the meter needle—3.5. The correct reading "50" is apparent at once, in large clear numbers.

Figure 1, shows how quickly, simply and easily this entire operation is performed. There is nothing to learn or to remember. There are no curves to plot or to puzzle over, no charts to be consulted. The entire device can be calibrated in many different ways. It can be put on the meter with a screw driver. When removed, it can be slipped into the pocket or the tool kit, as it takes up very little room. Its actual dimensions are only 4½" long by 1" wide.

The purpose of this article is to give a general description of the new Masterdial and to show how it can be used to change a single range d.c. milliammeter into a multi-range d.c. voltmeter and also into a multi-range milliammeter. Other articles, which will follow, will show how to use the same device to convert the identical meter into an ohmmeter and a capacity meter. They will also show how to use a d.c. meter as a multi-range a.c. meter and as an output meter, merely by adding a simple rectifier.

The theory involved and the calculations necessary to determine the values of the resistors used as multipliers and shunts appeared in an excellent article on "Extending Meter Ranges" by George A. Eaton, in the April 1933 issue of RADIO NEWS. However, a few of the formulas used, will be repeated in this article, to permit the calculation of ranges other than those indicated below.

In order to convert a d.c. milliammeter into a d.c. voltmeter, the following formula is used:

$$R = \frac{1000xE}{I} \quad \text{(Formula 1)}$$

where R is the desired multiplier resistance in ohms, I is the original maximum reading of the meter in milliamperes and E is the desired maximum reading in volts. For example, let us consider the case of a 0 to 1 ma. instrument, which is to be converted into a 0 to 100 voltmeter. (See Fig. 2).

$$\text{Then } R\frac{1000x100}{1} = 100{,}000 \text{ ohms}$$

Hence, with 100,000 ohms connected in series as shown at R, Fig. 2, and with the Masterdial turned so that the 0 to 100 scale is visible, it is now possible to read any voltage from 0 to 100 directly at the meter, as easily as though the meter itself were calibrated for this particular voltage range.

The next step is to connect a number of these multiplier resistors in series between switch points, so that any desired voltage range may be obtained by moving the switch arm from one point to another. Each time this is done, the Masterdial is also turned to the corresponding range. It is apparent that this makes it possible to read all other desired voltage ranges as readily as in the case of the single 0 to 100 range. In fact, it is possible to place over 25 different calibrations on a single Masterdial roll, thus permitting the reading of 25 different ranges of various types. Figure 3 shows the connections for converting a d.c. voltmeter having a range of from 0 to 1 volt, into a multi-range voltmeter having ranges of 0 to 1, 0 to 10, 0 to 50, 0 to 100, 0 to 250 and 0 to 500 volts.

The value of R for meter sensitivity of 1000 ohms per volt is 1000 ohms. The values of R1, R2, R3, R4 and R5 may then be calculated by means of the formula:

$$Rx = \left(\left(\frac{V2}{V1}\right) - 1\right) \times Rv \quad \text{(Formula 2)}$$

where Rx is the unknown multiplier resistance for any desired voltage range; V2, the maximum value of the desired voltage range; Rv, the resistance of the voltmeter in ohms; and V1 is the original maximum reading in volts.

Let us apply Formula 2 to determine the value of R1. Then

$$R1 = \left(\left(\frac{10}{1}\right) - 1\right) \times (1000 \times 1) =$$

$9 \times 1000 = 9000$ ohms

In a similar manner the values of resistors R2, R3, R4 and R5 are determined. These are given in Table No. 1, Figure 3.

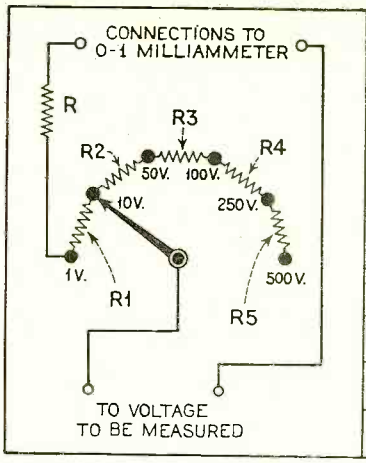


TABLE 1	
0-1 MILLIAMMETER	
	MULTIPLIER RES. VALUES IN OHMS
R	1000
R1	9000
R2	40,000
R3	50,000
R4	150,000
R5	250,000

FIGURE 3. MULTI-RANGE VOLTMETER CIRCUIT

The method of finding the shunt required for increasing the current range of a milliammeter was outlined comprehensively in Mr. Eaton's article, mentioned above. Before making the calculation, it is necessary to know the internal resistance of the meter. This may be ascertained from the manufacturer, or it may be calculated by any one of the three methods explained in Mr. Eaton's article.

The shunt resistance, R_s, is equal to the internal meter resistance, R_{meter}, divided by the ratio of the desired maximum reading in milliamperes, I_x to the original maximum reading in milliamperes, I_0 less 1.

Expressed as a formula:

$$R_s = \frac{R_{meter}}{\left(\frac{I_x}{I_0}\right) - 1} \quad \text{(Formula 3)}$$

Calculating Meter Shunt Values

In order to illustrate the application of this formula, the value of the shunt necessary to convert a 0 to 1 ma. meter so that it can be used to measure 0 to 100 ma., will be calculated. Let us assume, that the resistance of the meter was found to be 50 ohms.

$$R_s = \frac{50}{\frac{100}{1} - 1} = \frac{50}{99} = .505 \text{ ohms}$$

Far greater accuracy in scale conversion may be obtained, especially if the internal meter resistance cannot be determined closely, by inserting a fixed resistor R, in series with the meter, as shown in Figure 4. R should have a resistance value of nine times the internal resistance of the meter.

The formula for determining the shunt resistor then becomes:

$$R_s = \frac{9\,R_{meter} + R_{meter}}{\left(\frac{I_x}{I_0}\right) - 1} = \frac{10\,R_{meter}}{\left(\frac{I_x}{I_0}\right) - 1} \quad \text{(Formula 4)}$$

Calculating the shunt resistor required in this case to change a 0 to 1 milliammeter of 50 ohms internal resistance to a 0 to 100 ma. range, we obtain:

$$R_s = \frac{10 \times 50}{\frac{100}{1} - 1} = \frac{500}{99} = 5.05 \text{ ohms}$$

Table No. 2, Figure 4, gives the values of R1, R2 and R3 determined in this manner. By means of the double contact switch arm, resistance R is kept in the circuit regardless of whether the meter is being operated on the 0 to 10, 0 to 25 or 0 to 100 range. If the Masterdial is turned each time the switch is shifted from one range to another, it gives direct reading.

TABLE 2	
0-1 MILLIAMMETER	
INT. RESISTANCE= 50 OHMS	
R = 9 X 50 = 450 OHMS	
R1	55.5
R2	20.83
R3	5.05

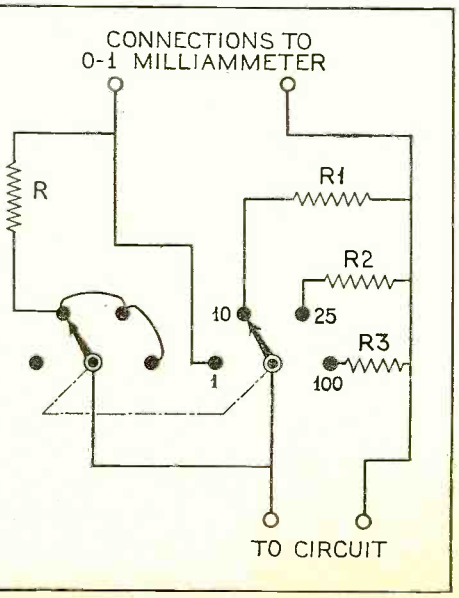
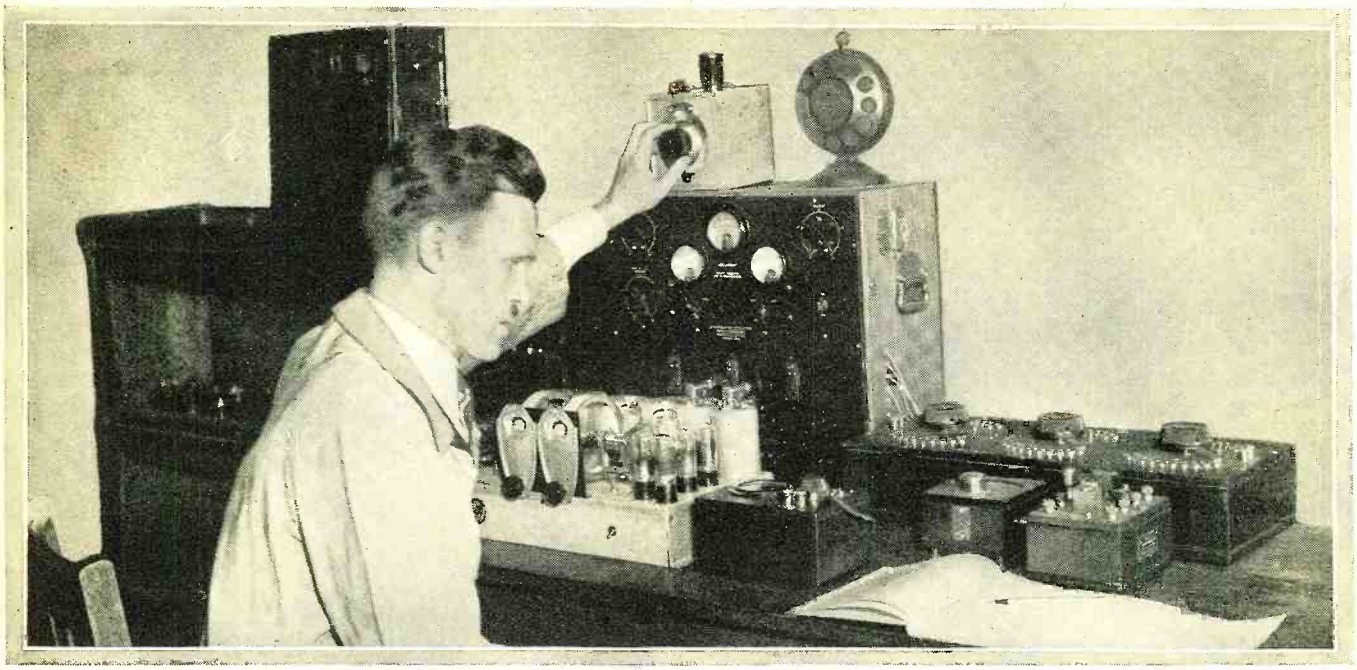


FIGURE 4. MULTI-RANGE MILLIAMMETER CIRCUIT



With the Experimenters

Voltage Measurement, A.C. Measurement Kink, Coil Terminals, Soldering Aluminum, Screen-Grid Detector, Band Spreading, Tone Control, Liquid Soldering Flux, Longer Dry-Cell Life, Air Cells, Transmitter Coils, Wavemeter Coils, Compact Antenna

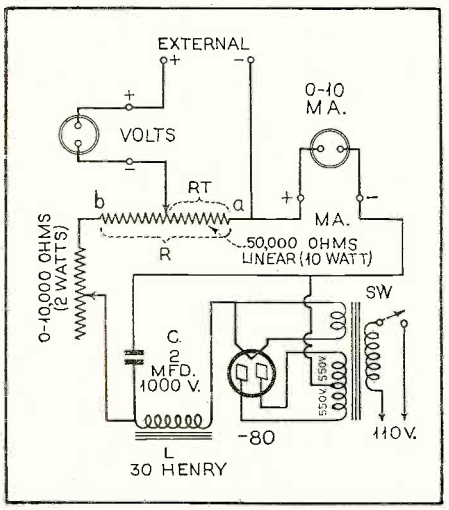
Conducted by

S. Gordon Taylor

Accurate Voltage Measurements in High Resistance Circuits

Only a few servicemen possess devices with which to measure voltages in high resistance radio circuits, such as are found in direct-coupled and resistance-coupled amplifiers. A device much used in laboratories, is the potentiometer method of measuring voltages without drawing any current from the circuit under test. By using accurate meters and resistors this method will give results as precise as one part in 10,000. For use in radio work, precision on the order of 95% or better is entirely satisfactory. With only this aim in mind the apparatus is simple to construct, simple to operate, and above all it is quite cheap, since the expensive constituents are always available from the serviceman's analyzer. The schematic circuit is shown herewith. The mechanical arrangement needs no care and is consequently left to the builder's ingenuity. The writer's outfit was constructed for measuring voltages up to 500 volts d.c. The power supply which should supply 500 volts to 550 volts is used to put a potential of 500 volts across the 50,000 ohm potentiometer at a current of 10 ma. This supply, incidentally, is used in service work when the power pack in a receiver is haywire, and, therefore, it does not constitute an investment solely for the potentiometer voltmeter. When the tap on the potentiometer is set at the same voltage as the voltage to be measured, the voltmeter will indicate zero voltage, since no current flows in that branch when the voltages are balanced.

To use this device, a milliameter of suitable range is connected at the ma binding posts, and R1 is adjusted until the current is 10 ma. A voltmeter of any range in excess of that to be measured is connected to the voltmeter posts. Before connecting the device to the circuit to be measured, turn the dial on the potentiometer to zero which turns the potentiometer tap to the end marked "a" on the diagram. The voltmeter will then give a reading when the external binding posts are connected to the points across which the voltage is to be measured. The



next step is to turn the potentiometer knob, so that the tap slides towards "b", until the voltmeter reading is zero. If the meter is of the multi-range type, the range can then be changed to 5 or 10 volts, and the potentiometer still further varied for greater accuracy. During this time the current through the potentiometer should remain at 10 milliamperes.

Since the potentiometer is linear in its characteristics, the voltage will be equal to the number of dial divisions from zero divided by the total number of dial divisions, times the voltage drop which is 500. If the potentiometer is turned ¼ of the way the voltage is ¼ of 500 volts or 125 volts, if ½, it is ½ of 500 or 250 volts. The dial used should preferably be one of about 4-inch diameter divided over its entire circumference. The average potentiometer will cover about 180 divisions on a 200 division dial. It is not necessary that the O-10 milliameter be other than the 1 ma. movement of the voltmeter with a shunt, for it is not necessary to have instantaneous readings of both meters at once. By the appropriate use of Ohms Law, other values than those given can be used. For instance a 250 volt supply with a 25,000 ohm potentiometer, etc. To make readings easier, the values of the dial may be plotted on a chart or graph.

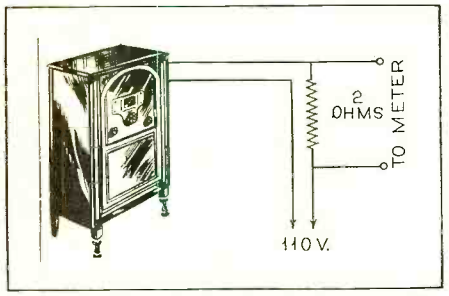
VINTON K. ULRICH,
Melrose, Mass.

Current Measurements with A.C. Voltmeter

I am the owner of a Weston Model 660 analyzer and have often found need to measure alternating current flow with it. This model does not however provide for the measurement of a.c. flow and so I have worked out this idea for the purpose. It may be adapted to any analyzer which provides for the measurement of an a.c. voltage of a low value.

I place a two ohm shunt in series with the load to be measured and the source of supply as in the diagram. The ends of the shunt are connected to the O-14 volt scale of the meter. With the a.c.-d.c. switch in the a.c. position the voltage drop across the shunt may be measured on the O-14 volt scale. As the resistance of the shunt is 2 ohms, the current flowing will be the volt-

age across the shunt divided by 2. On the Weston 660 this current may be read directly on the O-7 scale. This idea is, of

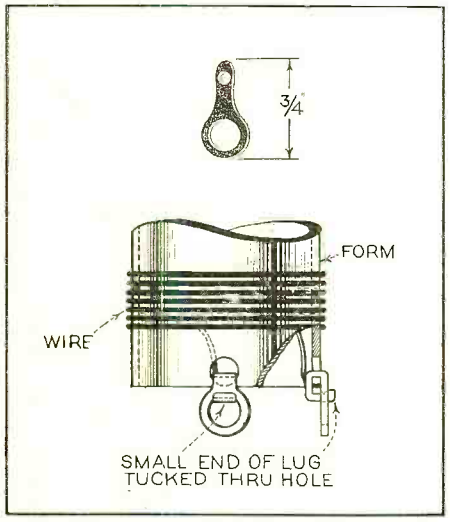


course, usable only in circuits having sufficient resistance to make the addition of 2 ohms insignificant.

JACK G. FOLLANSBEE,
Toronto, Ont., Canada.

Securing Coil Terminals

Since there are many experimenters who still "roll their own", the sketches of my method of making coil terminals will be of interest. Decide first the position of the coil terminals and mark the positions on the form. Then drill 1/16 inch diameter holes about 1/16 inch from end of form. This will be about right for forms 1/16 inch thick. (Thicker forms will require the hole closer to the edge.) Then ordinary soldering lugs of the type and size shown are used. After solder is applied the connection is as strong



as the form upon which the coil is wound. This is better than using a small bolt and bolting the lug to the form as I have seen most experimenters do.

FRANK J. FAULKNER,
Brigham, Utah.

Soldering Aluminum

Aluminum finds such extensive application for shielding purposes in radio set ups that the following suggestions on soldering this material should be of interest. It is quoted from a Bureau of Standards letter circular LC 343 "Solders and Soldering."

"An alloy containing 60 per cent tin and 40 per cent zinc is frequently used and will produce joints possessing satisfactory strength.

"The solder is best applied without the use of a flux. Rubbing the surfaces of the aluminum under the melted solder with a wire brush or a sharp object such as an old file will clean its surface so that the solder will "wet" the aluminum. The tin-zinc solders can be applied with a soldering iron.

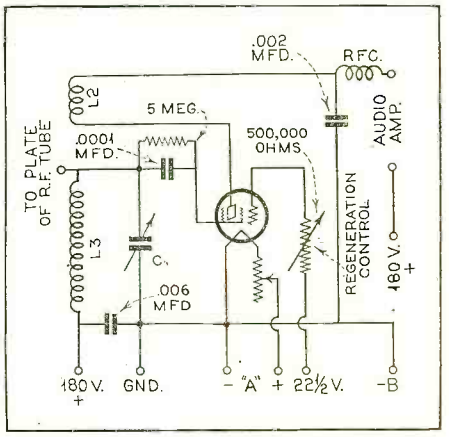
"The chief difficulty with soldered joints on aluminum is that the aluminum adjacent to the joint corrodes when exposed to a moist atmosphere as a result of galvanic action between the dissimilar metals. This can be avoided to a certain extent by covering the joint with a moisture-proof paint or varnish.

"Although it is generally considered best practice to join aluminum by welding rather than by soldering, aluminum solders serve a useful purpose in applications where the joints are normally well covered with oil or otherwise protected from the atmosphere."

Space-Charge Detector

Mr. Allen D. Rickert, Jr., Souderton, Pa., writing in the April 1932 issue of RADIO NEWS says, "By plugging a type 124 screen-grid tube into the detector socket (of a Pilot Super Wasp) and running a wire from the cap on the top of the tube to the cap of the radio-frequency tube, increased sensitivity and greater volume were obtained with fine regeneration".

What really happened was that the circuit was changed to a kind of space charge detector. The circuit shown herewith is a



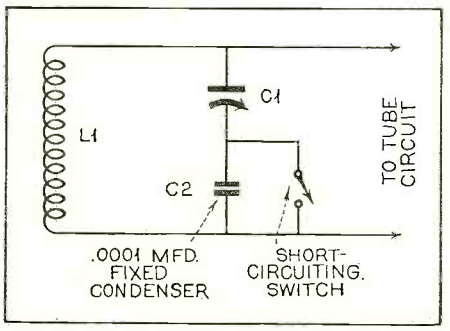
typical space-charge detector circuit which we have used many times in short-wave receivers. This circuit is noticeably more sensitive than a similar circuit using a three electrode tube. The circuit shown is for -32 type tubes although a.c. tubes may be used with the necessary changes in filament wiring.

This type detector operates best when fed into an amplifier tube which operate at a low temperature such as the -12a or -30.

HARRY D. HOOTON,
Beech Hill, W. Va.

Simple Band-Spread Circuit

The accompanying circuit shows a band-spread arrangement which I use in my short-wave receivers and converters. The .0001 mfd. fixed condenser (C2) is used to spread the amateur bands over a large portion of the dial. When the short-circuiting switch is closed the condenser (C1) tunes



the entire short-wave bands in the usual manner.

To use this system effectively it will be necessary to design the coils so that the band to be spread will fall within the tuning range of the two condensers in series. This system, of course, results in a decreased range for a given coil when the short-circuiting switch is open. The spreading effect is obtained over the higher frequency portion of the normal coil range, therefore the coil winding should be such that the band to be spread will occur at the low wave end of the normal tuning range for this coil.

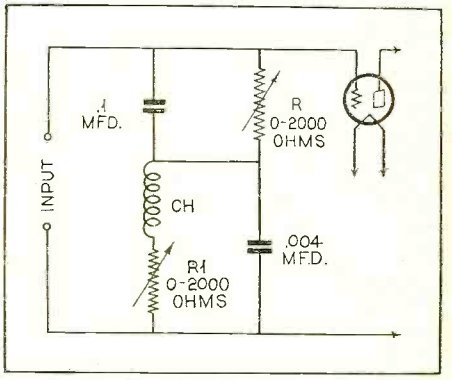
HARRY D. HOOTON,
Beech Hill, W. Va.

Tone Control Circuit

Experimentally inclined fans may be interested in a circuit utilized in telephone systems and which is readily applied to radio, giving results far superior to the conventional tone control systems as utilized in most commercial sets.

It is known as an equalizer circuit and is shown below. The equalizer circuit is connected across the secondary of the coupling unit which is across the grid-filament circuit of the a.f. input tube. This system affords a control of the low audio frequency band and can produce a rising characteristic of the high audio frequencies. In fact, the audio range can be peaked at almost any point along it's characteristic curve. The finest shadings of tone emphasis may be obtained by the proper manipulation of the variable resistors.

The constants are given in the diagram, except the choke CH which is of 250 millihenrys inductance, and may be obtained by



connecting in series a 1500 and 500 turn honeycomb coil.

By varying the values of the chokes and condensers somewhat, different ranges of control are obtained. However the values given embrace the normal audio range of present day sets.

MORRIS CHERNOW,
Brooklyn, N. Y.

A Liquid Rosin Soldering Flux

Ordinary liquid soldering flux is bad to use for fine soldering work, such as for the connections in a radio set or any other electrical work; as the flux has a tendency to set up a chemical action in the soldered joint that may, in the course of time, spoil the connection.

When rosin is used as a flux, this chemical deterioration of the connection does not take place. Hence, the almost universal use of rosin-core solder for all fine soldering work. But even with this type of wire solder there is a fault to be found. The rosin seems to melt quicker than the solder and runs over the surface to be soldered, resulting in the solder not always taking a good hold.

An excellent liquid soldering flux that has all of the advantages of these two fluxes, and none of their disadvantages can be made by dissolving rosin in denatured alcohol. A saturated solution can be obtained by adding powdered rosin to the alcohol until no more will dissolve. After the parts to be soldered have been thoroughly cleaned, they should be painted with this rosin-alcohol solution, using a small paint brush. The

(*Continued on page 763*)

The "Ounce of Prevention" Which Avoids

Burned-Out Meters

Fuses now available at a cost of a few cents each provide complete protection against burn-out for even the most delicate meters in common use by servicemen and experimenters

[*By* E. V. Sundt]

THE subject of fuse protection for radio equipment is becoming an increasingly important one. This is particularly true in the case of delicate meters. Every serviceman and experimenter is constantly using meters, practically all of which are of a low range type and therefore fragile. In view of the relatively high cost of good meters, it is only logical that they may be properly fused to prevent mishap from overloading. In a sense money expended for instrument fuses is a form of insurance—and a mighty inexpensive form.

There are probably few things more exasperating to the experimenter than burning out a meter after the set-up has been made. Usually he is in a hurry—he wants to know results and know them quickly—and it is this very characteristic which so often results in damage to sensitive instruments and provokes further delay and expense.

The value of instrument fuses (specially designed for meter protection) can hardly be overestimated in experimental work. The cost of these small fuses range from 10c to 20c while the cost of instrument repairs ranges from $3.00 to $20.00—and even more. But the repair cost is often the least source of annoyance. Instrument repairs must be made by skilled workmen which involves sending the meter to the factory and waiting a week or two for its return. Many an experimenter has had his heart rise into his throat on seeing his instrument wrecked due to one little false move. If he only has a fuse to change—oh, boy!—what a grand and glorious feeling!

Not so long ago it was practically impossible to obtain fuses sufficiently delicate for meter protection work. Many experimenters have attempted to make their own fuses by inserting narrow strips of metal foil in the meter circuit but these were found ineffective because their burn-out limits could not be accurately determined. Moreover, such makeshifts are slow in action even at their best.

Instrument fuses to be effective must have certain definite characteristics not necessary or even desirable in fuses used for less delicate equipment, the most essential characteristic being high speed action. The fuse must open the circuit before enough current has passed to heat up or burn out delicate wires or springs; or before the inertia of the needle is overcome and it is slammed across the scale.

Fuses meeting these requirements are now generally available for protecting such delicate meters as microammeters, galvanometers and small thermo-couples. "Littlefuses", for instance, are well known and have found extensive application in radio work not only for the unusually high degree of protection they provide but because of added advantages of small size and ease of mounting.

Of course meters are not the only equipment requiring protection. It has become common practice to fuse the a.c. input to radio receivers. In experimental circuits fuses are at least equally if not more important. In a temporary bread-board layout, for instance, where it is likely that the experimenter will be changing the connections and where the wiring is likely to be more or less "haywire", proper fusing of the plate supply at the rectifier may be the means of preventing damage to tubes, transformers and other parts. To assure this safety, the expenditure of a few cents for fuses is certainly more than justified. Meter protection, however, is probably the most important type of protection required because of the high original cost of meters and the high cost of repairs or replacements.

A favorite meter in general use is the 0-1 milliammeter, D'Arsonval type, and we will consider this instrument. Under a 110 volt d.c. direct short circuit, this meter burned out in .173 seconds. The peak current during this interval ran between 2 and 3 amperes, figured on the basis of total line resistance. (It may be news to some experimenters that this meter will stand 50 milliamperes indefinitely, and even 200 milliamperes for a few seconds, without injury.)

Under the above short circuit conditions, a 1/32 ampere (31.2 millamperes) "Littlefuse" (the size recommended to protect 0-1 ma. meters) burned out in .001 second. It sounds unreasonable that a 31 ma. fuse should protect a 1 ma. meter, but the protection is real because the fuse action is *so much faster than the meter burnout.*

The instrument fuse is under a disadvantage, however, in low voltage circuits; that is, less than about 20 volts, and when protecting thermo-couple instruments under gradual overloads. Under these conditions, no large surge is present to instantly blow the fuse. It is therefore imperative that the fuse manufacturer's suggested capacities for various instrument ranges be followed in order to secure the highest degree of satisfaction.

The accompanying illustrations show the results of a high speed camera study of a meter protected by these instrument fuses. The meter employed is a 0-5 voltmeter. For the purposes of this study the meter, adequately protected by instrument fuses, was connected directly across 135 volts d.c. Figure 1A shows the meter just (*Continued on page* 759)

ACTUAL PHOTOGRAPHS OF A FUSED METER UNDER HEAVY OVERLOAD

Figure 1. These photographs, (A) to (E) reading from left to right, show the progressive study of a fused meter under abnormal load. (A) was taken at the instant a 2700 percent overload was applied. (C) shows the needle just reaching full scale deflection when the instrument fuse blew, allowing the needle to return to normal as shown at (D) and (E). Thus another meter casualty was avoided. The fuse may be seen just below the meter

(A) (B) (C) (D) (E)

Broadcasting Stations in the U. S.

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560 KC., 535.4 Meters
KFDM, KLZ, KTAB, WFI, WIBO, WLIT, WNOX, WPCC, WQAM.

570 KC., 526.0 Meters
KGKO, KMTR, KVI, WEAO, WKBN, WMAC, WMCA, WNAX, WNYC, WSYR, WWNC.

580 KC., 516.9 Meters—*Canadian shared*
KSAC, WDBO, WIBW, WOBU, WSAZ, WTAG.

590 KC., 508.2 Meters
KHQ, WCAJ, WEEI, WKZO, WOW.

600 KC., 499.7 Meters—*Canadian shared*
KFSD, WCAC, WCAO, WICC, WMT, WOAN, WREC.

610 KC., 491.6 Meters
KFRC, WDAE, WFAN, WIP, WJAY.

620 KC., 483.6 Meters
KGW, KTAR, WFLA, WLBZ, WSUN, WTMJ.

630 KC., 475.9 Meters—*Canadian shared*
KFRU, KGFX, WGBF, WMAL, WOS.

640 KC., 468.5 Meters
KFI, WAIU, WOI.

650 KC., 461.3 Meters
KPCB, WSM.

660 KC., 454.3 Meters
WAAW, WEAF.

670 KC., 447.5 Meters
WMAQ.

690 KC., 434.5 Meters—*Canadian exclusive*

700 KC., 428.3 Meters
WLW.

710 KC., 422.3 Meters
KMPC, WOR.

720 KC., 416.4 Meters
WGN.

730 KC., 410.7 Meters—*Canadian exclusive*

740 KC., 405.2 Meters
KMMJ, WHEB, WSB.

750 KC., 399.8 Meters
KGU, WJR.

760 KC., 394.5 Meters
KNA, WEW, WJZ.

770 KC., 389.4 Meters
KFAB, WBBM, WJBT.

780 KC., 384.4 Meters—*Canadian shared*
KELW, KTM, WEAN, WMC, WPOR, WTAR.

790 KC., 379.5 Meters
KGO, WGY.

800 KC., 374.8 Meters
WBAP, WFAA.

810 KC., 370.2 Meters
WCCO, WPCH.

820 KC., 365.6 Meters
WHAS.

830 KC., 361.2 Meters
KOA, WEEU, WHDH, WRUF.

840 KC., 356.9 Meters—*Canadian exclusive*

850 KC., 352.7 Meters
KIEV, KWKH, WWL.

860 KC., 348.6 Meters
WABC, WBOQ, WHB.

870 KC., 344.6 Meters
WBCN, WENR, WLS.

880 KC., 340.7 Meters—*Canadian shared*
KFKA, KLXP, KPOF, WCOC, WGBI, WQAN, WSUI.

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KARK, KFNF, KSEI, KUSD, WGST, WILL, WJAR, WMMN.

900 KC., 331.1 Meters
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910 KC., 329.5 Meters—*Canadian exclusive*

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KFEL, KFXF, KOMO, KPRC, WAAF, WBSO, WWJ.

930 KC., 322.4 Meters—*Canadian shared*
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940 KC., 319 Meters
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960 KC., 312.3 Meters—*Canadian exclusive*

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KDKA.

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1010 KC., 296.9 Meters—*Canadian shared*
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1020 KC., 293.9 Meters
KFKX, KYW, WRAX.

1030 KC., 291.1 Meters—*Canadian exclusive*

1040 KC., 288.3 Meters
KRLD, KTHS, WESG, WKAR.

1050 KC., 285.5 Meters
KFBI, KNX.

1060 KC., 282.8 Meters
KWJJ, WBAL, WJAG, WTIC.

1070 KC., 280.2 Meters
KJBS, WCAZ, WDZ, WTAM

1080 KC., 277.6 Meters
WBT, WBCD, WMBI.

1090 KC., 275.1 Meters
KMOX.

1100 KC., 272.6 Meters
KGDM, WLWL, WPG.

1110 KC., 270.1 Meters
KSOO, WRVA.

1120 KC., 267.7 Meters—*Canadian shared*
KFIO, KFSG, KRKD, KRSC, KTRH, WDEL, WHAD, WISN, WTAW.

1130 KC., 265.3 Meters
KSL, WJJD, WOV.

1140 KC., 263.0 Meters
KVOO, WAPI.

1150 KC., 260.7 Meters
WHAM.

1160 KC., 258.5 Meters
WOWO, WWVA.

1170 KC., 256.3 Meters
WCAU.

1180 KC., 254.1 Meters
KEX, KOB, WDGY, WINS, WMAZ.

1190 KC., 252.0 Meters
WOAI.

1200 KC., 249.9 Meters
KBTM, KERN, KFJB, KFWF, KFXD, KFXJ, KGDE, KGDY, KGEK, KGEW, KGFJ, KGHI, KGVO, KMLB, KVOS, KWG, WABI, WABZ, WBBZ, WBHS, WCAT, WCAX, WCLO, WCOD, WEPS, WFAM, WFBC, WFBE, WHBC, WHBY, WIBX, WIL, WJBC, WJBL, WJBW, WKJC, WLAP, WNBO, WNBW, WORC, WPHR, WRBL, WWAE.

1210 KC., 249.9 Meters—*Canadian shared*
KASA, KDLR, KFJI, KFOR, KFPW, KFVS, KFXM, KGCR, KGNO, KGY, KIEM, KPPC, KWEA, WALR, WBAX, WBBL, WCBS, WCRW, WEBQ, WEDC, WFAS, WGBB, WGCM, WGNY, WHBF, WHBU, WHET, WIBU, WJBI, WJBU, WJBY, WJEJ, WJW, WKFI, WLCI, WMBG, WOCL, WOMT, WPAW, WPRO, WQDX, WSBC, WSEN, WSIX, WSOC, WTAR, WTAX.

1220 KC., 245.6 Meters
KFKU, KTW, KWSC, WCAD, WCAE, WDAE, WREN.

1230 KC., 243.8 Meters
KFQD, KGGM, KYA, WBIS, WFBM, WNAC, WSBT.

1240 KC., 241.8 Meters
KGCU, KLPM, KTAT, KTFI, WACO, WKAQ, WXYZ.

1250 KC., 239.9 Meters
KFMX, KFOX, WAAM, WCAL, WDSU, WGCP, WGMS, WLB, WODA, WRHM.

1260 KC., 238.0 Meters
KOIL, KRGV, KVOA, KWWG, WLBW, WNBX, WTOC.

1270 KC., 236.1 Meters
KGCA, KOL, KVOR, KWLC, WASH, WFBR, WJDX, WOOD.

1280 KC., 234.2 Meters
KFBB, WCAM, WCAP, WDOD, WIBA, WOAX, WRR.

1290 KC., 232.4 Meters
KDYL, KFUL, KLCN, KTSA, WEBC, WJAS, WNBZ.

1300 KC., 230.6 Meters
KALE, KFAC, KFH, KFJR, KGEF, WBBR, WHAZ, WEVD, WFAB, WIOD, WMBF, WOQ.

1310 KC., 228.9 Meters
KCRJ, KFBK, KFGO, KFPL, KFPM, KFXR, KFYO, KGBX, KGCX, KGEZ, KGFW, KIFH, KIT, KMED, KRMD, KTSM, KXRO, WBEO, WBOW, WBRE, WCLS, WDAH, WEBR, WEXL, WFBG, WFDF, WFDV, WGAL, WGH, WHAT, WIAS, WJAC, WKAV, WKBB, WKBC, WKBS, WLBC, WMBO, WNBH, WOL, WRAW, WROL, WSAJ, WSJS, WTEL, WTJS, WTRC, WTSL.

1320 KC., 227.1 Meters
KGHF, KGMB, KID, WADC, WSMB.

1330 KC., 225.4 Meters
KGB, KMO, KSCJ, WDRC, WSAI, WTAQ.

1340 KC., 223.7 Meters
KFPY, WCOA, WSPD.

1350 KC., 222.1 Meters
KIDO, KWK, WAWZ, WBNX, WCDA, WEHC, WMSG.

1360 KC., 220.4 Meters
KGER, KGIR, WCSC, WFBL, WGES, WJKS, WQBC.

1370 KC., 218.8 Meters
KCRC, KFBL, KFIM, KFIZ, KFLX, KGAR, KGDA, KGFG, KGFL, KGKL, KICA, KMAC, KONO, KOOS, KRE, KSO, KUJ, KVL, KWKC, WBTM, WCBM, WDAS, WGL, WGLC, WHBD, WHBQ, WHDE, WIBM, WJBK, WJEQ, WJTL, WLEY, WLVA, WMBR, WPFB, WQDM, WRAK, WRAM, WRDO, WRJN, WSVS.

1380 KC., 217.3 Meters
KOH, KQV, WKBH, WSMK.

1390 KC., 215.7 Meters
KLRA, KOY, KUOA, WHK.

1400 KC., 214.2 Meters
KLO, KOCW, WBAA, WBBC, WCGU, WFOX, WKBF, WLTH.

1410 KC., 212.6 Meters
KFLV, KGRS, WAAB, WBCM, WDAG, WHBL, WHIS, WODX, WRBX, WSFA.

1420 KC., 211.9 Meters
KABC, KBPS, KCMC, KFIZ, KGFF, KGGC, KGIW, KGIX, KGKX, KICK, KIDW, KORE, KUMA, KWCR, KXL, WAGM, WAMC, WAZL, WEHS, WELL, WENC, WERE, WHDL, WHFC, WILM, WJBO, WJMS, WKBI, WLBF, WMAS, WMBC, WMBH, WPAD, WSPA, WTBO.

1430 KC., 209.7 Meters
KECA, KGNF, WBAK, WCAH, WFEA, WGBC, WHP, WNBR.

1440 KC., 208.2 Meters
KDEN, KLS, KXYZ, WARO, WBIG, WCBA, WHEC, WMBD, WOKO, WSAN, WTAD.

1450 KC., 206.8 Meters
KTBS, WBMS, WGAR, WHOM, WNJ, WSAR, WTFI.

1460 KC., 205.4 Meters
KSTP, WJSV.

1470 KC., 204.0 Meters
KGA, WLAC.

1480 KC., 202.6 Meters
KOMA, WKBW.

1490 KC., 201.6 Meters
WCKY.

1500 KC., 199.9 Meters
KDB, KGFI, KGFK, KGIZ, KGKB, KGKY, KNOW, KPJM, KPQ, KREG, KXO, WFDV, WHEF, WKBV, WKBZ, WLOE, WMBQ, WMIL, WMPC, WNBE, WOPI, WPEN, WRDW, WSYB, WWRL, WWSW.

RADIO PROGRAM FEATURES

AN OFFICIAL PROGRAM SERVICE

THE radio receiver is worth only what it receives. One of the main difficulties in broadcast listening is to determine just when the more popular programs are on the air. Most listeners miss as much as 50 per cent of the worth-while programs for this reason. RADIO NEWS is therefore presenting this first instalment of a monthly broadcast schedule, listing day by day what is felt to be the most noteworthy programs on the air in the evenings, on Saturday afternoons and all day Sunday. The programs have been chosen by a committee of art, music and educational critics, as well as representative listeners. The programs listed are for the period of May 10th-June 10th inclusive. The listings include the name of the program, the time the program is on the air, the type of program, the name of the sponsor, the chain and the national stations through which it is transmitted. To use the lists one should refer to the day of the week and then run down the hours, marking off those programs you wish to listen to. If you want to find the time for a given program, the name of the program is shown bold face and is easily picked out. The list is correct up to the day of going to press. All time is Eastern Daylight Saving Time. Deduct one hour for Eastern Standard Time, two hours for Central Standard Time, three hours for Mountain Standard Time and four hours for Pacific Standard Time. All programs are sustaining, unless otherwise noted. All time is p. m. unless otherwise noted.

Compiled by

Samuel Kaufman

MONDAYS

5:45—**LITTLE ORPHAN ANNIE. Drama. Sponsor: Wander Co. NBC.** WJZ, WBAL, WBZ, WBZA, KDKA, WMAQ, KWK, WREN, KOIL, WGAR. **6:45**—WOAI, WKY, KSTP, KPRC, KOIL, WREN, WEBC, WDAY, KFYR, KWK, WBAP, WENR, KWCR, KTBS, KSO.

6:00—MAUD AND COUSIN BILL. Drama. Sponsor: Great Atlantic & Pacific Tea Co. NBC. WJZ, WBAL, WBZ, WBZA, KDKA, WHAM, WGAR, CKGW, WIS, WJR, WWNC, WRVA, WJAX, WLW, WCKY.

6:45—LOWELL THOMAS, News. Sponsor: Sun Oil Co. NBC. WJZ, WGAR, WLW, CKGW, WBAL, WBZ, KDKA, WHAM, WJR, WSYR, WBZA.

6:45—JUST PLAIN BILL. Sponsor: Kolynos Sales Co. CBS. WABC, WCAO, WAAB, WKBW, WHK, WCAU, WJSV, CKOK.

7:00—AMOS 'N' ANDY. Drama. Sponsor: Pepsodent Co. NBC. WJZ, WBAL, WBZ, WBZA, KDKA, WLW, WCKY, WRVA, WPTF, WJAX, WJR, WMAL, WHAM, WGAR, WWNC, WIOD, WFLA, CKGW. Also **11:00**—WMAQ, WENR, KWK, WREN, KOIL, WTMJ, WSM, KDYL, KSTP, WMC, WSB, WBAP, KPRC, KOA, WSMB, KTHS, WOAI, KHQ, WKY, KGO, KFI, KGW, KOMO, KFSD, WJDX, WDAF.

7:00—MYRT AND MARGE. Drama. Sponsor: Wm. Wrigley, Jr., Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WGR, WKRC, WHK, DRC, WCAU, WJAS, WEAN, WFBL, WSPD, WJSV, CKOK, WBT, KRLD, WWVA. Also **10:45**—WBBM, WFBM, KMBC, WHAS, KMOX, KERN, KMJ, KHJ, KOIN, KFBK, KGB, KFRC, KDB, KOL, KFPY, KWG, KVI, KLZ, WCCO, WLAC, WDSU, KSL.

7:15—WHEATENAVILLE. Drama. Sponsor: Wheatena Co. NBC. WEAF, WEEI, WJAR, WLIT, WRC, WGY, WTAM, WMAQ, WOW, WDAF, WOC, WHO, WWJ.

7:15—TASTYEAST JESTERS. Trio. Sponsor: Tastyeast, Inc. NBC. WJZ, WBAL, WBZ, WBZA, WHAM, KDKA, WCKY.

7:15—BUCK ROGERS IN THE YEAR 2433. Drama. Sponsor: Kellogg Co. CBS. WABC, WNAC, WGR, WFBM, WHK, WHAS, WCAU, KMOX, CKOK, WCCO.

7:30—FIVE STAR THEATRE—GROUCHO AND CHICO MARX. Drama. Sponsor: Standard Oil Co. of N. J., Pa., La., and Colonial Beacon Oil Co. NBC. WJZ, WBAL, WBZ, WBZA, WHAM, KDKA, WPTF, WWNC, WIS, WMC, WSMB, KTBS, WRVA, WMAL, WSAZ, WSM.

7:30—DOLPH MARTIN'S ORCHESTRA AND TRAVELERS QUARTET. Sponsor: Tide Water Oil Sales Co. CBS. WABC, WOKO, WCAO, WNAC, WGR, WDRC, WCAU, WJAS, WEAN, WFBL, WJSV, WLBZ, WHP, WFEA, WHEC, WORC.

7:45—THE GOLDBERGS. Drama. Sponsor: Pepsodent Co. NBC. WEAF, WEEI, KFYR, WFAA, KPRC, WTAG, WJAR, WCSH, WLIT, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WSAI, WENR, WOW, WDAF, WTMJ, WOAI, WKY. Also **12:00**—KOA, KPO, KDYL, KECA, KEX, KJR, KGA.

7:45—BOAKE CARTER. News. Sponsor: Philco Radio & Television. CBS. WABC, WCAO, WNAC, WGR, WBBM, WHK, KMBC, WHAS, WCAU, WJAS, KMOX, WJSV, CKOK, WBT, WCCO.

8:00—SOCONYLAND SKETCHES. Drama. Sponsor: Standard Oil Co. of N. Y. NBC. WEAF, WTIC, WTAG, WEEI, WJAR WCSH, WGY, WBEN.

8:00—CLIQUOT CLUB ESKIMOS. Harry Reser's Orchestra. Sponsor: Cliquot Club Co. NBC. WJZ, WBZ, WBZA, WBAL, WHAM, KDKA, WGAR, WLS, KWK, KWCR, KOIL, WREN, KSO, WCKY, WMAL.

8:15—SINGIN' SAM. Sponsor: The Barbasol Company. CBS. WADC, WOKO, WCAO WNAC, WGR, WGN, WKRC, WHK, WDRC, WFBM, KMBC, WCAU, WJAS, WEAN, KMOX, WFBL, WSPD, WJSV, CKOK, WCCO.

8:30—DON CARNEY DOG CHATS. Sponsors: Spratt's Patent, Ltd. NBC. WJZ, WBZ, WBZA, WBAL, KDKA, WLS, WREN, WJR, KWK, WGAR.

8:30—FU MANCHU MYSTERIES. Drama. Sponsor: Campana Corp. CBS. WABC, WADC, WOKO, WCAO, WNAC, WGR, WGN, WKRC, WHK, WOWO, WDRC, WFBM, KMBC, WHAS, WCAU, WJAS, WEAM, KMOX, WFBL, WSPD, WJSV, CKOK, WBT, KRLD, CFRB.

8:45—PHIL COOK AND INGRAM SHAVERS. Sponsor: Bristol-Myers Co., NBC. WJZ, WBZ, WBZA, WJR, WBAL, KDKA, WGAR, WCKY, WMAL, WLS, WSYR, KWK, KWCR, WREN, KSO, KOIL.

9:00—A. & P. GYPSIES. Sponsor: Great Atlantic & Pacific Tea Co. NBC. WEAF, WIIC, WTAG, WEEI, WJAR, WCSH, WLIT, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WSAI, WMAQ, KSD, WOC, WHO, WOW, WDAF.

9:00—SINCLAIR GREATER MINSTRELS. Sponsor: Sinclair Refining Co. NBC. WJZ, WBZ, WBZA, WHAM, KDKA, WGAR, WSB, WLS, KWK, WREN, WTMJ, WBAL, KSTP, WEBC, WDAY, KFYR, WRVA, WWNC, WIS, WJAX, WIOD, WMC, WJR, WFLA, WSM, WSMB, WJDX, KVOO, KPRC, WOAI, KTBS, WKY, KOIL, KWCR, WFAA, WLW, KSO, WIBA.

9:15—MILLS BROTHERS. Sponsor: Procter & Gamble Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WKBW, WGN, WKRC, WHK, WDRC, KMBC, WHAS, WCAU, WJAS, WEAN, KMOX, WFBL, WSPD, WJSV, CKOK.

9:30—MYSTERIES IN PARIS. Sponsor: Bourjois, Inc. CBS. WABC, WCAO, WNAC, WGN, WGST, KLZ, KSL, WCCO, WDSU, KOMA, WHK, KMBC, WCAU, WJAS, WEAN, KMOX, WJSV, CKOK.

9:30—JACK FROST MELODY MOMENTS, Sponsor: National Sugar Refining Co. NBC. WJZ, WBAL, WHAM, KDKA, WGAR, WLW, WJR, WENR.

10:00—CONTENTED PROGRAM. Sponsor: Carnation Milk Co. NBC. WEAF, WGY, WBEN, WCAE, WTAM, WWJ, KSD, WENR, CKGW, CFCF, WOAI, WOC, WHO, WDAF, KSTP, KPRC, WTMJ, WEBC, KFYR, WSM, WMC, WSB, WKY, WFAA, WLW.

10:00—RICHFIELD COUNTRY CLUB. Alex. Morrison. Golf Lessons. Sponsor: Richfield Oil Co. of N. Y. CBS. WABC, WOKO, WCAO, WAAB, WKBW, WDRC, WCAU, WJAS, WFBL, WJSV, WPI, WICC, WLBW, WHP, WHEC.

10:30—EDWIN C. HILL—"Human Side of the News." CBS. WABC, WADC, WOKO, WCAO, WAAB, WBBM, WHK, CKOK, WDRC, WFBM, KMBC, WHAS, WJAS, WEAN, KMOX, WFBL, WSPD, WJSV, WQAM, WDBO, WDAE, WGST, WPG, WLBZ, WBRC, WICC, WBT, WDOD, KVOR, WCAH, KLZ, WLBW, WBIG, WHP, KTRH, KLRA, WFEA, WREC, WISN, WCCO, WODX, WLAC, WDSU, WTAR, WMBD, WDBJ, WHEC, WTOC, KSCJ, WIBW, CFRB, WMT, WSJS, WORC, WNAX, WKBN.

11:00—HOWARD BARLOW'S SYMPHONY ORCHESTRA. CBS. WABC, WADC, WOKO, WCAO, WAAB, WHK, CKOK, WDRC, WFBM, KMBC, WHAS, WJAS, WEAN, WFBL, WSPD, WJSV, WQAM, WDBO, WDAE, WGST, WPG, WLBZ, WBRC, WICC, WBT, WDOD, KVOR, WCAH, KLZ, WLBW, WHP, KTRH, KLRA, WREC, WISN, WODX, WLAC, WDSU, WTAR, WMBD, WDBJ, WHEC, KSL, WTOC, KSCJ, WIBW, CFRB, WACO, WMT, KFH, WSJS, WORC, WNAX, WKBN, WIP.

TUESDAYS

5:45—**LITTLE ORPHAN ANNIE. Drama. Sponsor: Wander Co. NBC.** WJZ, WBAL, WBZ, WBZA, KDKA, WJR, WHAM, WGAR, WLW, WIS, WWNC, WRVA, WJAX, CKGW, Also, **6:45**—WENR, KSTP, KOIL, WREN, WEBC, WDAY, KFYR, WOAI, WKY, KTBS, WBAP, KWCR, KWK, KPRC, KSO.

6:00—MME. FRANCES ALDA. Songs. NBC. WEAF, WDAF, WSM, WCKY, WFBR, KSD. (WFI, WSB, WKY, CKGW, WDAY, WJAX, WSAI off 6:15) (WBEN, WJAR, WOC, WHO, WCSH, WFAA, WMC, WCAE on 6:15) WWNC, WIS, KGW, WIBA, KFYR, KOA, WSMB, KPRC, KGO, WOAI, KTBS, KFSD, WTAG, WAPI, KDYL, KOMO, KHQ, WWJ.

6:00—MAUD AND COUSIN BILL. Drama. Sponsor: Great Atlantic & Pacific Tea Co. NBC. WJZ, WBAL, WBZ, WBZA, WGAR. WMAQ, KDKA, KWK, WREN, KOIL.

6:30—MID-WEEK HYMN SING. NBC. WEAF, WTAG, WGY, KGO, WMAQ, WDAF, KSD, KFYR, KGW, KFSD, KTAR, WIS, KVOO, WSB, WOAI, WIBA, KTBS, WSAI, KHQ, WDAY, KTHS, KGIR, WWJ, WFBR, WJDX.

6:45—LOWELL THOMAS. News. Sponsor: Sun Oil Co. NBC. WJZ, WBZ, WBZA, CKGW, WJR, WBAL, KDKA, WGAR, WHAM, WLW, WSYR.

6:45—JUST PLAIN BILL. Sponsor: Kolynos Sales Co. CBS. WABC, WJSV, WCAU, WHK, WCAO, CKOK, WAAB, WKBW.

7:00—AMOS 'N' ANDY. Drama. Sponsor: Pepsodent Co., NBC. WJZ, WBAL, WBZ, WBZA, KDKA, WLW, WCKY, WMAL, CKGW, WIOD, WFLA, WRVA, WPTF, WJAX, WGAR, WJR, WHAM, WWNC. Also: **11:00**—WMAQ, KDYL, WDAF, KOIL, WTMJ, KSTP, WSM, WMC, WSB, WSMB, KTHS, WFAA, KPRC, WOAI, WKY, KOA, WJDX, KGO, KFI, KGW, KOMO, KHQ, WENR, KWK, KFSD, WREN.

7:00—MYRT AND MARGE. Drama. Sponsor: Wm. Wrigley Jr. Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WGR, WKRC, WHK, WDRC, WCAU, WJAS, WEAN, WFBL, WSPD, WJSV, CKOK, WBT, KRLD, WWVA, Also, **10:45**—

WBBM, WFBM, KMBC, WHAS, KMOX, KERN, KMJ, KHJ, KOIN, KFBK, KGB, KFRC, KDB, KOL, KFPY, KWG, KVI, KLZ, WCCO, WLAC, WDSU, KSL.

7:15—WHEATENAVILLE. Drama. Sponsor: Wheatena Corp. NBC. WEAF, WEEI, WJAR, WFI, WRC, WGY, WTAM, WMAQ, WOW, WDAF, WOC, WHO, WWJ.

7:15—BUCK ROGERS IN THE YEAR 2433. Drama. Sponsor: Kellogg Co. NBC. WABC, WNAC, WGR, WBBM, WHK, WHAS, WCAU, KMOX, CKOK, WCCO.

7:30—KELLER, SARGENT AND ROSS. Songs. Sponsor: George W. Luft Co. CBS. WABC, WCAO, WNAC, WGR, WGN, WKRC, WHK, WDRC, KMBC, WHAS, WCAU, WJAS, KMOX, WJSV, CKOK.

7:45—THE GOLDBERGS. Drama. Sponsor: Pepsodent Co. NBC. WEAF, WTAG, WFAA, KPRC, WKY, WEEI, WJAR, WCSH, WFBR, WFI, KFYR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WSAI, WENR, WOW, WDAF, WTMJ, WOAI. Also, 12:00—KOA, KPO, KECA, KEX, KJR, KGA, KDYL.

7:45—BOAKE CARTER. News. Sponsors: Philco Radio & Television. CBS. WABC, WBBM, WHAS, WJSV, WHK, WCAU, WCAO, CKOK, WNAC, WJAS, WBT, KMOX, WGR, WCCO, KMBC.

8:00—BLACKSTONE PLANTATION. JULIA SANDERSON AND FRANK CRUMMIT. Sponsor: Waitt & Bond Co., NBC. WEAF, WTAG, WEEI, WJAR, WCSH, WFI, WRC, WGY, WBEN, WCAE, WTAM, WWJ.

8:00—ENO CRIME CLUES. Drama. Sponsor: Harold F. Ritchie & Co. NBC. WJZ, WBZ, WBZA, KDKA, WHAM, WGAR, WBAL, KOIL, WMAQ, KWCR, KWK, KSO, WREN, WLW, WJR.

8:00—EASY ACES. Drama. Sponsor: Lavoris Chemical Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WGR, WGN, WKRC, WHK, WDRC, WFBM, KMBC, WHAS, WCAU, WJAS, WEAN, KMOX, WFBL, WSPD, WJSV, CKOK, WCCO.

8:30—WAYNE KING'S ORCHESTRA. Sponsor: Lady Esther. NBC. WEAF, WTAG, WCAE, WTMJ, WEEI, WBEN, WJAR, WFI, WRC, WGY, WTAM, WCSH, WWJ, WSAI, KSD, WOC, WHO, WOW, KSTP, WMAQ, WDAF.

8:30—KATE SMITH LA PALINA PROGRAM. Sponsor: Congress Cigar Co. CBS. WABC, WHAS, WJSV, WADC, WKRC, WCAU, WHEC, WMT, WOKO, WHK, WCAO, CKOK, WOWO, WJAS, WISN, KMOX, WGR, WFBM, WFBL, WCCO, WKBN, WGN, KMBC, WSPD.

8:45—ABE LYMAN'S ORCHESTRA AND HOLLYWOOD NEWSBOY. Sponsor: Sterling Products, Inc. CBS. WABC, WHAS, WJSV, WADC, WKRC, WCAU, WOKO, WHK, WCAO, CKOK, WJAS, WEAN, WDRC, KMOX, WGR, WFBM, WFBL, WCCO, WGN, KMBC, WSPD, WNAC.

9:00—BEN BERNIE'S BLUE RIBBON ORCHESTRA. Sponsor: Premier Malt Sales Co., NBC. WEAF, WTAG, WEEI, WJAR, WCSH, WRC, WFBR, WFI, WGY, WBEN, WTAM, WCAE, WLS, WSAI, WWJ, WOC, WHO, WOW, WDAF, KSTP, WDAY, KFYR, WSM, WMC, WSMB, WKY, WOAI, KPRC, WSB, WRVA, WBAP, WCKY, KOA.

9:00—HOUSEHOLD MUSICAL MEMORIES. Sponsor: Household Finance Corp. NBC. WJZ, WBAL, WBZ, WJR, WBZA, WHAM, KWK, KDKA, WREN, WMAQ, KSO, WSYR.

9:15—THREADS OF HAPPINESS ORCHESTRA. Sponsor: Spool Cotton Co. CBS. WABC, WHAS, WJSV, KGB, WADC, WKRC, WCAU, WQAM, KFRC, KLZ, WHEC, WOKO, WHK, WDBO, KDB, WBRC, KLRA, WIAC, KSL, WCAO, CKOK, WDAE, KOL, WDSU, KTSA, KFH, WNAC, WOWO, WJAS, KERN, KFPY, WBT, WREC, WTAR, WTOC, WEAN, KMJ, KWG, WDOD, KOMA, WKBW, WDRC, KMOX, KHJ, KVI, WFBM, WFBL, KOIN, WGST, KTRH, WCCO, WGN, KMBC, WSPD, KFBK, KRLD.

9:30—ED WYNN AND THE FIRE CHIEF BAND. Sponsor: Texas Co. NBC. WEAF, WCSH, WFI, KDYL, WSM, WFBR, WRC, WGY, WBEN, WEEI, WJAR, WCAE, WTAM, WWJ, WTAG, CFCF, WMAQ, KSD, WOW, WHO, WOC, WLW, WDAF, WIBA, KSTP, WEBC, WDAY, KFYR, WTMJ, WRVA, WWNC, KFSD, WIS, WJAX, WIOD, KVOO, WMC, WSB, WJDX, WSMB, WFLA, WBAP, KPRC, WKY, WOAI, KOA, KGIR, KGHL, KTAR, KTBS, KGO, KFI, KGW, KOMO, KHQ, KTHS.

10:00—NBC SYMPHONY ORCHESTRA—WALTER DAMROSCH. NBC. WEAF, KDYL, WAPI, WJAR, WCSH, WFI, WFBR, WRC, WGY, WIS, WJAX, WIOD, WFLA, WBAP, KSTP, WBEN, WCAE, WTAM, WWJ, WLW, WENR, KSD, WOC, WHO, WDAF, WTMJ, KFYR, WIBA, WRVA, KTHS, WWNC, KTAR, KFSD, WSM, WMC, WSB, WSMB, WJDX, WOAI, KTBS, WKY, KOA, KGO, KFI, KGW, KOMO, KHQ, KPRC, WEBC, WDAY, WTAG, WEEI, KGU.

10:00—SIGMUND SPAETH-TUNE DETECTIVE. NBC. WJZ, WBAL, WCKY, KWCR, CFCF, WREN, WJR, KDKA, KWK, KOIL, WMAQ, WSYR.

10:00—FIVE STAR THEATRE. Sponsored by Standard Oil Co., of N. J., Pa., La., and Colonial Beacon Oil Co. CBS. WABC, WJSV, WDBJ, WCAU, WOKO, KLRA, WLAC, WCAO, WICC, WFEA, WDSU, WNAC, WJAS, WBT, WREC, WTAR, WSJS, WEAN, WDOD, WBIG, WORC, WKBW, WDRC, WHP, WFBL, WNOX, WMBG, WOBU.

10:30—EDWIN C. HILL—"Human Side of the News." CBS. WABC, WADC, WOKO, WCAO, WAAB, WHK, CKOK, WDRC, KMBC, WHAS, WJAS, WEAN, WFBL, WSPD, WJSV, WQAM, WDBO, WDAE, WGST, WPG, WLBZ, WBRC, WICC, WBT, WDOD, KVOR, WCAH, KLZ, WLBW, WBIG, WHP, KTRH, KLRA, WFEA, WREC, WISN, WCCO, WODX, WLAC, WDSU, WTAR, WMBD, WDBJ, WHEC, WTOC, KSCJ, WIBW, CFRB, WACO, WMT, KFH, WSJS, WORC, WNAX, WKBN.

11:00—HOWARD BARLOW'S SYMPHONY ORCHESTRA. CBS. WABC, WADC, WOKO, WCAO, WAAB, WHK, CKOK, WDRC, WFBM, KMBC, WHAS, WJAS, WEAN, WFBL, WSPD, WJSV, WQAM, WDBO, WDAE, WGST, WPG, WLBZ, WBRC, WICC, WBT, WDOD, KVOR, WCAH, KLZ, WLBW, WHP, KFAB, KLRA, WREC, WISN, WODX, WLAC, WDSU, WTAR, WMBD, WDBJ, WHEC, WTOC, KSCJ, WIBW, CFRB, WACO, WMT, WWVA, KFH, KTRH, WSJS, WORC, WNAX, WKBN, WIP.

WEDNESDAYS

5:45—LITTLE ORPHAN ANNIE. Drama. Sponsor: Wander Co. NBC. WJZ, WBAL, WBZ, WBZA, WJR, KDKA, WHAM, WGAR, WIS, WWNC, WRVA, WJAX, CKGW, WLW. Also, 6:45—WENR, KWK, KWCR, WREN, KOIL, KSO, KSTP, WEBC, WDAY, KFYR, WKY, WBAP, KPRC, WOAI, KTBS.

6:00—MAUD AND COUSIN BILL. Drama. Sponsor: Great Atlantic & Pacific Tea Co. NBC. WJZ, WBAL, WBZ, WBZA, WGAR, WMAQ, KDKA, KWK, WREN, KOIL.

6:05—MEYER DAVIS ORCHESTRA. NBC. WEAF, WCKY, KSD, WWNC, WIBA, WIS, WSMB, WKY, KPRC, KPO, KVOO, WOAI, KTBS, KOA, KDYL, KEX, KGA, KFSD, (WFBR, WIOD, KFYR, WBEN, WCAE, WSM, WMC, WOC, WHO, KJR, WJAR on 6:15) (WFI, WSAI, WSB, WDAY, WDAF, CKGW off 6:15) WAPI, KECA, WWJ.

6:30—BACK OF THE NEWS IN WASHINGTON. William Hard. NBC. WEAF, WFBR, WBEN, WJDX, WCKY, WMAQ, KSD, WDAF, WWNC, KVOO, WIS, WIBA, KOA, KEX, KGA, KJR, KTHS, WOAI, KTBS, KPO, KECA, WJAR, KFYR, WEBC, WAPI.

6:45—LOWELL THOMAS. News. Sponsors: Sun Oil Co. NBC. WJZ, WBZ, WBZA, KDKA, WGAR, WHAM, WLW, CKGW, WBAL, WJR, WSYR.

6:45—JUST PLAIN BILL. Sponsor Kolynos Sales Co. CBS. WABC, WCAO, WAAB, WKBW, WHK, CKOK, WCAU, WJSV.

7:00—AMOS 'N' ANDY. Drama. Sponsor: Pepsodent Co. NBC. WJZ, WBAL, WBZ, WBZA, KDKA, WLW, CKGW, WMAL, WRVA, WPTF, WCKY, WJAX, WIOD, WGAR, WJR, WFLA, WHAM, WWNC. Also, 11:00—WMAQ, WENR, KWK, WREN, WDAF, KOIL, WTMJ, KSTP, WSM, WMC, WSB, WSMB, KTHS, WBAP, KPRC, WOAI, WKY, KOA, WJDX, KGO, KGW, KFI, KDYL, KOMO, KHQ, KFSD.

7:00—MYRT AND MARGE. Drama. Sponsor: William Wrigley Jr. Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WGR, WKRC, WHK, CKOK, WBRC, WCAU, WJAS, WEAN, WFBL, WSPD, WJSV, WBT, KRLD, WWVA. Also, 10:45—WBBM, WFBM, KMBC, WHAS, KMOX, KERN, KMJ, KHJ, KOIN, KFBK, KGB KFRC, KDB, KOL, KFPY, KWG, KVI, KLZ, WCCO, WLAC, WDSU, KSL.

7:15—WHEATENAVILLE. Drama. Sponsor: Wheatena Corp. NBC. WEAF, WEEI, WJAR, WLIT, WRC, WGY, WTAM, WMAQ, WDAF, WOC, WHO, WWJ, WOW.

7:15—BUCK ROGERS IN THE YEAR 2433. Drama. Sponsors: Kellogg Co. CBS. WABC, WNAC, WGR, WBBM, WHK, CKOK, WHAS, WCAU, KMOX, WCCO.

7:30—DOLPH MARTIN'S ORCHESTRA. Sponsor: Tide Water Oil Sales Corp. CBS. WABC, WOKO, WCAO, WNAC, WGR, WDRC, WCAU, WJAS, WEAN, WFBL, WJSV, WLBZ, WHP, WFEA, WHEC, WORC.

7:45—THE GOLDBERGS. Drama. Sponsor: Pepsodent Co. NBC. WEAF, WTAG, KFYR, WEEI, WJAR, WCSH, WFBR, WLIT, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WSAI, WENR, WOW, WDAF, WTMJ, WFAA, KPRC, WOAI, WKY. Also, 12:00—KOA, KDYL, KPO, KEX, KECA, KJR, KGA.

7:45—BOAKE CARTER. News. Sponsor: Philco Radio & Television. CBS. WABC, WCAO, WNAC, WGR, WBBM, WHK, CKOK, KMBC, WHAS, WCAU, WJAS, KMOX, WJSV, WBT, WCCO.

8:00—FANNY BRICE AND GEORGE OLSEN'S ORCHESTRA. Sponsor: Standard Brands. NBC. WEAF, WTIC, WTAG, WEEI, WJAR, WCSH, WLIT, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WSAI, WLS, KSD, WOW, (WDAF, WOC, WHO on 8:15) WCKY.

8:00—ENO CRIME CLUES. Drama. Sponsor: Harold F. Ritchie & Co. NBC. WJZ, WBAL, WBZ, WBZA, KDKA, WHAM, WGAR, KOIL, WLW, KWCR, KWK, KSO, WREN, WMAQ, WJR.

8:30—THE SHADOW. Drama. Sponsor: Delaware, Lackawanna & Western Coal CO. NBC. WEAF, WEEI, WJAR, WCSH, WTAG, WTIC, WFBR, WLIT, WRC, WGY, WBEN.

8:30—KATE SMITH LA PALINA PROGRAM. Sponsor: Congress Cigar Co. CBS. WABC, WADC, WOKO, WCAO, WGR, WGN, WKRC, WHK, CKOK, WOWO, WFBM, KMBC, WHAS, WCAU, WJAS, KMOX, WFBL, WSPD, WJSV, WISN, WCCO, WHEC, WMT.

8:45—PHIL COOK AND HIS INGRAM SHAVERS. Sponsor: Bristol-Myers Co. NBC. WJZ, WBZ, WBZA, WJR, WBAL, WHAM, WMAL, WLS, WSYR, KWK, KWCR, KOIL, WREN, KSO, KDKA, WGAR, WCKY.

8:45—ABE LYMAN'S ORCHESTRA AND HOLLYWOOD NEWSBOY. Sponsor: Sterling Products Co., Inc. WABC, WADC, WOKO, WCAO, WNAC, WGR, WGN, WKRC, WHK, CKOK, WDRC, WFBM, KMBC, WHAS, WCAU, WJAS, WEAN, KMOX, WFBL, WSPD, WJSV, WCCO.

9:00—ADVENTURES OF SHERLOCK HOLMES. Drama. Sponsor: G. Washington Coffee Refining Co. NBC. WJZ, WBAL, WBZ, WBZA, WHAM, KDKA, WGAR, WJR, WLW, KWK, WREN, KWCR, CKGW, CFCF, KOIL, WLS, WMAL, WSYR. Also, 12:15 A. M. Thursday—KOA, KDYL, KGO, KFI, KGW, KOMO, KHQ, KTAR, KFSD, KGIR, KGHL.

9:15—THE ROMANTIC BACHELOR. Sponsor: Vick Chemical Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WKBW, WGN, WKRC, WHK, CKOK, WOWO, WDRC, WFBM, KMBC, WHAS, WCAU, WJAS, WEAN, KMOX, WFBL, WSPD, WJSV, KERN, KMJ, KHJ, KOIN, KFBK, KGB, KFRC, KDB, KOL, KFPY, KWG, KVI, WGST, WLBZ, WBRC, WBT, WDOD, KRLD, KLZ, WBIG, KTRH, WKBH, KLRA, WREC, WISN, WCCO, WODX, WLAC, WDSU, WTAR, KOMA, WMBG, WDBJ, KSL, KTSA, WTOC, KSCJ, WIBW, WMT, KFH, WNAX.

9:30—DONALD NOVIS AND BELASCO ORCHESTRA. Sponsor: John H. Woodbury Co. NBC. WJZ, WBAL, WBZ, WBZA, KDKA, WHAM, WGAR, KSO, WLW, WENR, KWCR, KWK, WREN, KOIL, WSM, WMC, WSB, WJDX, WSMB, KTBS, KVOO, WFAA, KPRC, WOAI, WKY, KTHS, KSTP, WJR.

9:30—ROBERT BURNS PANATELA PROGRAM. Burns and Allen; Guy Lombardo's Orchestra. Sponsor: General Cigar Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WKBW, WGN, WKRC, WHK, CKOK, WOWO, WDRC, WFBM, KMBC, WCAU, WJAS, WEAN, KMOX, WFBL, WSPD, WJSV, WRR, KLZ, KTAT, KTRH, WCCO, KOMA, KSL, KTSA, WORC.

10:00—CORN COB PIPE CLUB. Sponsor: Larus & Bro. Co. NBC. WEAF, WTIC, WTAG, WCSH, WRC, WFBR, WLIT, WGY, WBEN, WTAM, WCAE, WENR, WWJ, WLW, KSD, WOC, WHO, WOW, WDAF, KOA, KGIR, KGHL, KGO, KFI, KGW, KOMO, WEEI, WJAR, KHQ, KDYL, WTMJ, WIBA, WEBC, WDAY, KFYR, KSTP, WRVA.

10:00—OLD GOLD PROGRAM. Sponsor: P. Lorillard Co. CBS. WABC, WADC, WOKO, WCAO, WAAB, WKBW, WGN, WKRC, WHK, CKOK, WOWO, WDRC, WFBM, KMBC, WHAS, WCAU, WJAS, WEAN, KMOX, WFBL, WSPD, WJSV, WQAM, WDBO, WDAE, KERN, KMJ, KHJ, KOIN, KFBK, KGB, KFRC, KDB, KOL, KFPY, KWG, KVI, WGST, WBRC, WBT, WDOD, WCAH, WRR, KLZ, KTAT, KTRH, KLRA, WREC, WCCO, WODX, WDSU, KOMA, WHEC, KSL, KTSA, WIBW.

10:30—EDWIN C. HILL—"Human Side of the News." CBS. WABC, WADC, WOKO, WCAO, WAAB, WKBW, WBBM, WHK, CKOK, WDRC, WFBM, KMBC, WHAS, WJAS, WEAN, WFBL, WSPD, WJSV, WQAM, WDBO, WDAE, WGST, WLBZ, WBRC, WBT, WDOD, KVOR,

WCAH, KLZ, WLBW, WBIG, WHP, KTRH, KLRA, WFEA, WREC, WISN, WCCO, WODX, WLAC, WDSU, WTAR, WMBD, WDBJ, WHEC, KTSA, WTOC, KSCJ, WIBW, CFRB, WMT, WSJS, WORC, WNAX.

11:00—HOWARD BARLOW'S SYMPHONY ORCHESTRA. CBS. WABC, WADC, WOKO, WCAO, WAAB, WGR, WHK, CKOK, WDRC, WFBM, KMBC, WHAS, WJAS, WEAN, WFBL, WSPD, WJSV, WQAM, WDBO, WDAE, WGST, WPG, WLBZ, WBRC, WICC, WBT, WDOD, KVOR, WCAH, KLZ, WLBW, WHP, KTRH, KFAB, KLRA, WREC, WISN, WODX, WLAC, WDSU, WTAR, WMBD, WDBJ, WHEC, KSL, WTOC, KSCJ, WSBT, WIBW, CFRB, WACO, WMT, KFH, WSJS, WORC, WNAX, WIP.

THURSDAYS

5:45—LITTLE ORPHAN ANNIE. Drama. Sponsor: Wander Co. NBC. WJZ, WBAL, WBZ, WBZA, WJR, KDKA, WGAR, WHAM, WIS, WWNC, WRVA, WJAX, CKGW, WLW. **Also, 6:45—** WENR, KSTP, KOIL, WREN, WEBC, WDAY, KFYR, WOAI, WKY, KPRC, KWK, KTBS, WBAP, KWCR, KSO.

6:45—LOWELL THOMAS. News. Sponsor: Sun Oil Co. NBC. WJZ, WBAL, WBZ, WBZA, WJR, KDKA, WGAR, WLW, CKGW, WSYR.

6:45—JUST PLAIN BILL. Sponsor: Kolynos Sales Co. CBS. WABC, WCAO, WAAB, WKBW, WHK, WCAU, WJSV, CKOK.

7:00—AMOS 'N' ANDY. Drama. Sponsor: Pepsodent Co. NBC. WJZ, WBAL, WBZ, WBZA, KDKA, WLW, WCKY, WMAL, CKGW, WRVA, WPTF, WJAX, WIOD, WFLA, WGAR, WJR, WHAM, WWNC. **Also, 11.00—**WMAQ, WENR, KWK, WREN, WDAF, KOIL, WTMJ, WSMB, KSTP, WSM, WMC, WSB, KFSD, KTHS, WFAA, KPRC, WOAI, WKY, KOA, KDYL, KGO, KFI, KGW, KOMO, KHQ, WJDX.

7:00—MYRT AND MARGE. Drama. Sponsor: William Wrigley Jr. Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WGR, WKRC, WHK, WDRC, WCAU, WJAS, WEAN, WFBL, WSPD, WJSV, CKOK, WBT, KRLD, WWVA. **Also, 10:45—**WBBM, WFBM, KMBC, WHAS, KMOX, KERN, KMJ, KHJ, KOIN, KFBK, KGB, KFRC, KDB, KOL, KFPY, KWG, KVI, KLZ, WCCO, WLAC, WDSU, KSL.

7:15—WHEATENAVILLE. Drama. Sponsor: Wheatena Corp. NBC. WEAF, WEEI, WJAR, WFI, WRC, WGY, WTAM, WMAQ, WOW, WDAF, WOC, WHO, WWJ.

7:15—BUCK ROGERS IN THE YEAR 2433. Drama. Sponsor: Kellogg Co. CBS. WABC, WNAC, WGR, WBBM, WHK, WHAS, KMOX, CKOK, WCCO, WCAU,

7:30—KELLER, SARGENT AND ROSS. Songs. Sponsor: George W. Luft Co. CBS. WABC, WCAO, WAAB, WGR, WGN, WKRC, WHK, WDRC, KMBC, WHAS, WCAU, WJAS, KMOX, WJSV, CKOK.

7:45—THE GOLDBERGS. Drama, Sponsor: Pepsodent Co. NBC. WEAF, WTAG, WEEI, WJAR, WCSH, WFI, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WSAI, WENR, WOW, WDAF, WTMJ, KFYR, WFAA, KPRC, WOAI, WKY. **Also, 12:00—**KOA, KDYL, KPO, KECA, KEX, KJR, KGA.

7:45—BOAKE CARTER. News. Sponsor: Philco Radio & Television. CBS. WABC, WCAO, WGR, WBBM, WHK, KMBC, WHAS, WCAU, WJAS, KMOX, WJSV, CKOK, WBT, WCCO, WNAC.

8:00—EASY ACES. Drama. Sponsor: Lavoris Chemical Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WGR, WGN, WKRC, WHK, WDRC, WFBM, KMBC, WHAS, WCAU, WJAS, WEAN, KMOX, WFBL, WSPD, WJSV, CKOK, WCCO.

8:00—FLEISCHMANN HOUR—RUDY VALLEE AND GUEST STARS. Sponsor: Standard Brands, Inc. NBC. WEAF, WTAG, WEEI, WCSH, WFI, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WMAQ, KDYL, KSD, WOC, WHO, WOW, CKGW, WSB, CFCF, KSTP, WEBC, WTMJ, WDAF, WIOD, WJAX, WFLA, WMC, WAPI, WJDX, WJAR, WRVA, WSMB, WOAI, WKY, KOA, KFI, KGO, KGW, KOMO, KTAR, KFYR, WDAY, KHQ, KPRC, (WSM, WBAP, WSAI, WCKY on 8:30) (WLW off 8:30) WPTF.

8:30—KATE SMITH LA PALINA PROGRAM. Sponsor: Congress Cigar Co. CBS. WABC, WADC, WOKO, WCAO, WGR, WGN, WKRC, WHK, WOWO, WFBM, KMBC, WHAS, WCAU, WJAS, KMOX, WFBL, WSPD, WJSV, CKOK WISN, WCCO, WHEC, WMT, WKBN.

8:45—HOWARD THURSTON, MAGICIAN. Sponsor: Swift & Co. NBC. WJZ, WREN, KOIL, WBZ, WBZA, WHAM, KDKA, WGAR, KWK, WJR, WLS, WLW.

8:45—ABE LYMAN'S ORCHESTRA AND HOLLYWOOD NEWSBOY. Sponsor: Sterling Products, Inc. CBS. WABC, WADC, WOKO, WCAO, WNAC, WGR, WGN, WKRC, WHK, WDRC, WFBM, KMBC, WHAS, WCAU, WJAS, WEAN, KMOX, WFBL, WSPD, WJSV, CKOK, WCCO.

9:00—CAPTAIN HENRY'S MAXWELL HOUSE SHOW BOAT. Charles Winniger, Lanny Ross, Annette Hanshaw, others. Sponsor: General Foods Corp. NBC. WEAF, WTAG, WEEI, WJAR, WCSH, WFI, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WSAI, WMAQ, KSD, WOC, WHO, WOW, WDAF, WTMJ, WRVA, WWNC, WIS, WJAX, WIOD, WFLA, WJDX, WMC, WSB, WAPI, WSMB, KTBS, WKY, KPRC, WOAI, KOA, KDYL, KGO, KFI, KGW, KOMO, KHQ, KFSD, KTAR, WCKY, WSM, KSTP.

9:15—MILLS BROTHERS. Songs. Sponsor: Procter & Gamble Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WKBW WGN, WKRC, WHK, WDRC, KMBC, WHAS, WCAU, WJAS, WEAN, KMOX, WFBL, WSPD, WJSV, CKOK.

9:30—WAYNE KING'S ORCHESTRA. Sponsor: Lady Esther. NBC. WJZ, WBAL, WBZ, WBZA, WENR, KDKA, KWK, KWCR, WGAR, KSO, KOIL, WREN.

9:30—COLONEL STOOPNAGLE AND BUDD. Sponsor: General Motors Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WKBW, WGN, WKRC, WHK, WOWO, WDRC, WFBM, KMBC, WHAS, WCAU, WJAS, WEAN, KMOX, WFBL, WSPD, WJSV, CKOK, WQAM, WDBO, WTOC, WDAE, KERN, KMJ, KHJ, KOIN, KFBK, KGB, KFRC, KDB, KOL, KFPY, KWG, KVI, WGST, WPG, WBRC, WICC, WBT, WCAH, WRR, KLZ, KTRH, KLRA, WREC, WHAD, WCCO, WLAC, WDSU, WTAR, KOMA, WMBD, KOH, WMBG, WHEC, KSL, KTSA, KSCJ, WIBW, WMT, KFH, WORC, KTAT, WTOC.

10:00—LUCKY STRIKE HOUR — JACK PEARL. Sponsor: American Tobacco Company. NBC. WEAF, WTAG, WEEI, WJAR, WCSH, WFI, WFBR, WRC, WGY, WENR, KSD, WOC, WHO, WOW, WDAF, WBEN, WCAE, WTAM, WWJ, WLW, WTMJ, KSTP, WEBC, WDAY, KFYR, WIBA, WRVA, WIS, WWNC, KVOO, WJAX, WIOD, WFLA, WSM, WMC, WSB, WSMB, WJDX, KTHS, KTAR, KFSD, WKY, WBAP, KPRC, WOAI, KTBS, KOA, KDYL, KGO, KFI, KGW, KOMO, KHQ

11:00—HOWARD BARLOW'S SYMPHONY ORCHESTRA. CBS. WABC, WADC, WOKO, WCAO, WAAB, WGR, WHK, CKOK, WDRC, WFBM, KMBC, WHAS, WJAS, WEAN, WFBL, WSPD, WJSV, WQAM, WDBO, WGST, WPG, WLBZ, WBRC, WICC, WBT, WDOD, KVOR, WCAH, KLZ, WLBW, WHP, KTRH, KFAB, KLRA, WREC, WISN, WODX, WLAC, WDSU, WTAR, WMBD, WDBJ, WHEC, KSL, WTOC, KSCJ, WSBT, WIBW, CFRB, WACO, WMT, WWVA, KFH, WSJS, WORC, WNAX, WKBN, WIP.

FRIDAYS

5:45—LITTLE ORPHAN ANNIE. Drama. Sponsor: Wander Co. NBC. WJZ, WBAL, WBZ, WBZA, KDKA, WJR, WGAR, WIS, WLW, WWNC, WRVA, WJAX, WHAM, CKGW. **Also, 6:45—** WENR, KSTP, KOIL, WREN, WEBC, WDAY, KFYR, WOAI, WKY, KPRC, KTBS, WBAP, KWCR, KWK, KSO.

6:45—LOWELL THOMAS. News. Sponsor: Sun Oil Co. NBC. WJZ, WLW, WHAM, CKGW, WGAR, WBZ, KDKA, WBAL, WBZA, WJR, WSYR.

6:45—JUST PLAIN BILL. Sponsor: Kolynos Sales Co. CBS. WABC, WCAO, WAAB, WKWB, WHK, CKOK, WCAU, WJSV.

7:00—AMOS 'N' ANDY. Drama. Sponsor: Pepsodent Co. NBC. WJZ, WBZ, WBZA, WBAL, KDKA, WLW, WCKY, WMAL, CKGW, WRVA, WPTF, WJAX, WFLA, WIOD, WJR, WGAR, WHAM, WWNC. **Also, 11:00—**WMAQ, WENR, KWK, WREN, WDAF, KOIL, WTMJ, KSTP, WSM, WMC, WSB, WSMB, KFSD, KTHS, WBAP, KPRC, WOAI, KHQ, WKY, KOA, KGO, KFI, KGW, KOMO, WJDX, KDYL.

7:00—MYRT AND MARGE. Drama. Sponsor: William Wrigley Jr. Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WGR, WKRC, WHK, CKOK, WDRC, WCAU, WJAS, WEAN, WFBL, WSPD, WJSV, WBT, KRLD, WWVA. **Also, 10:45—**WBBM, WFBM, KMBC, WHAS, KMOX, KERN, KMJ, KHJ, KOIN, KFBK, KGB, KFRC, KDB, KOL, KFPY, KWG, KVI, KLZ, WCCO, WLAC, WDSU, KSL.

7:15—BUCK ROGERS IN THE YEAR 2433. Drama. Sponsor: Kellogg Co. CBS. WABC, WNAC, WGR, WBBM, WHK, CKOK, WHAS, WCAU, KMOX, WCCO.

7:30—FIVE STAR THEATRE. Drama. Sponsor: Standard Oil Companies of N. J., Pa., La., and Colonial Beacon Oil Co. NBC. WJZ, WBAL, WBZ, WBZA, WHAM, KDKA, WPTF, WWNC, WIS, WMC, WSMB, KTBS, WRVA, WSM, WSAZ, WMAL.

7:30—DOLPH MARTIN'S ORCHESTRA AND THE TRAVELERS QUARTET. Sponsor: Tide Water Oil Co. CBS. WABC, WOKO, WCAO, WNAC, WGR, WDRC, WCAU, WJAS, WEAN, WFBL, WJSV, WLBZ, WHP, WFEA, WHEC, WORC.

7:45—THE GOLDBERGS. Drama. Sponsor: Pepsodent Co. NBC. WEAF, WTAG, WKY, WFAA, WOAI, WEEI, WJAR, WCSH, WLIT, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WSAI, WENR, WOW, WDAF, WDMJ, KFYR, KPRC. **Also, 12:00—**KOA, KEX, KDYL, KPO, KECA, KJR, KGA.

7:45—BOAKE CARTER. News. Sponsor: Philco Radio & Television. CBS. WABC, WCAO, WNAC, WGR, WBBM, WHK, CKOK, KMBC, WHAS, WCAU, WJAS, KMOX, WJSV, WBT, WCCO.

8:00—JESSICA DRAGONETTE AND THE CAVALIERS. Sponsor: Cities Service Co. NBC. WEAF, WTIC, WCSH, WCAE, WLIT, WFBR, WRC, (WGY off 8:30) (WDAF off 8:45) WBEN, WOAI, WTAM, WWJ, WSAI, KYW, KSD, WOC, WHO, WOW, CKGW, KSTP, KOA, KPRC, KTBS, WTMJ, WEBC, WKY, WTAG, WFAA, WEEI, KDYL, WJAR.

9:00—BEST FOODS MUSICAL GROCERY STORE. Tom Howard, Jeannie Lang, others. Sponsor: Best Foods, Inc. NBC. WEAF, WTIC, WTAG, WEEI, WJAR, WCSH, WMAQ, WFBR, WRC, WGY, WBEN, WTAM, KSD, WDAF, WWJ. **Also, 12:30 A. M., Saturday—**KOA, KGO, KGW, KHQ, KOMO, KDYL, KFI, KFSD, KTAR.

9:00—FIRST NIGHTER. Drama. Sponsor: Campana Corp. NBC. WJZ, WBZA, WBAL, WBZ, WHAM, KDKA, WGAR, WCKY, KWK, WREN, KTAR, KOIL, KSTP, WEBC, KOA, KDYL, WSB, KGO, KFI, KGW, KOMO, KHQ, KFSD, WOAI, KPRC, WKY, KTBS, WLS, WAPI, WTMJ, WSMB, WJR.

9:30—POND'S PROGRAM. Leo Reisman's Orchestra. Sponsor: Lamont, Corliss & Co. NBC. WEAF, WDAF, WWJ, WTAG, WJAR, WCSH, WLIT, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WSAI, WENR, KSD, WOC, WHO, WOW.

9:30—PHIL BAKER. Variety. Sponsor: Armour & Co. NBC. WJZ, WBAL, WBZ, WBZA, KGW, KOMO, KHQ, WHAM, KDKA, WGAR, WJR, WMAQ, KWK, WREN, KOIL, WTMJ, KSTP, WEBC, WRVA, WWNC, WJAX, WIOD, WSM, WMC, WSB, WAPI, WSMB, WFAA, KPRC, WOAI, WKY, KOA, KGO, KFI, KDYL, KSO.

9:30—THE INSIDE STORY. Interviews by Edwin C. Hill. Sponsor: Socony-Vacuum Corp. CBS. WABC, WADC, WOKO, WCAO, WNAC, WKBW, WGN, WKRC, WHK, CKOK, WOWO, WDRC, WFBM, KMBC, WHAS, WCAU, WJAS, WEAN, KMOX, WFBL, WSPD, WJSV, KERN, KMJ, KHJ, KOIN, KFBK, KGB, KFRC, KDB, KOL, KFPY, KWG, KVI, WLBZ, WCAH, KRLD, KLZ, WLBW, WHP, KTRH, WKBH, KLRA, WHAD, WCCO, KOMA, WMBD, WHEC, KSL, KTSA, WIBW, WACO, KFH, WORC.

10:00—JACK BENNY AND FRANK BLACK'S ORCHESTRA. Sponsor: Chevrolet Motor Car Co. NBC. WEAF, WTIC, WTAG, WLIT, WFBR, WRC, WGY, WBEN, WWJ, WCAE, WTAM, WENR, KSD, WOC, WHO, WOW, WDAF, WTMJ, WIS, WIBA, KSTP, WRVA, WWNC, WIOD, WFLA, WSM, WMC, WSB, WJDX, WSMB, KTBS, KVOO, WKY, KTHS, WFAA, KPRC, WOAI, KOA, KDYL, KGIR, KGHL, KGO, KFI, KGW, KOMO, KHQ, KFSD, KTAR, WCSH, WEEI, WJAR, WEBC, WDAY, KFYR, WJAX, WLW.

10:30—RICHFIELD COUNTRY CLUB. Golf lessons by Alex Morrison; Music. Sponsor: Richfield Oil Corp. of N. Y. NBC. WEAF, WEEI, WTIC, WJAR, WLIT, WFBR, WRC, WGY, WBEN, WCAE.

11:00—HOWARD BARLOW'S SYMPHONY ORCHESTRA. CBS. WABC, WADC, WOKO, WCAO, WAAB, WGR, WHK, CKOK, WDRC, WFBM, KMBC, WHAS, WJAS, WEAN, WFBL, WSPD, WJSV, WQAM, WDBO, WDAE, WGST, WPG, WLBZ, WBRC, WICC, WBT, WDOD, KVOR, WCAH, KLZ, WLBW, WHP, KTRH, KFAB, KLRA, WREC, WISN, WODX, WLAC, WDSU, WTAR, WMBD, WDBJ, WHEC, WTOC, KSCJ, WSBT, WIBW, CFRB, WACO, WMT, KFH, WSJS, WORC, WNAX, WIP.

SATURDAYS

5:45—LITTLE ORPHAN ANNIE. Drama. Sponsor: Wander Co. NBC. WJZ, WBAL, WBZ, WBZA, KDKA, WJR, WHAM, WGAR, WLW, WIS, WWNC,

WRVA, WJAX, CKGW. **Also, 6:45**—WENR, KSTP, KOIL, WREN, KPRC, WEBC, WDAY, KFYR, WOAI, WKY, KWK, KTBS, WBAP, KWCR, KSO.

8:00—EASY ACES. Drama. Sponsor: Lavoris Chemical Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WGR, WGN, WKRC, WHK, CKOK, WDRC, WFBM, KMBC, WHAS, WCAU, WJAS, WEAN, KMOX, WFBL, WSPD, WJSV, WCCO.

8:15—THE MAGIC VOICE. Drama. Sponsor: Ex-Lax Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WGR, WGN, WKRC, WHK, CKOK, WDRC, WFBM, KMBC, WHAS, WCAU, WJAS, WEAN, KMOX, WFBL, WSPD, WJSV, WBT, KRLD.

10:00—SATURDAY NIGHT DANCING PARTY. B. A. Rolfe's Orchestra. Sponsor: Hudson Motor Car Co. NBC. WEAF, WTAG, WEEI, WJAR, WCSH, WRC, WFBR, WFI, WGY, WBEN, WTAM, WCAE, WLW, WMAQ, WWJ, KSD, WOC, WHO, WOW, WDAF, CKGW, KSTP, WSB, WSMB, WBAP, KOA, KDYL, KGO, KFI, CFCF.

10:30—CUCKOO PROGRAM. Comedy and Music. NBC. WJZ, WBAL, WHAM, KOIL, KDKA, WGAR, KWK, KSO, KWCR, WREN, WCKY, KYW, WIS, WJAX, WIOD, WWNC, WRVA, WFLA, WMAL, WSYR.

SUNDAYS

11:15 A. M.—MAJOR BOWES' CAPITOL FAMILY. Variety. NBC. WEAF, WJAR, WFBR, WRC, WTAM, WDAF, WFLA, KFYR, WAPI, WSMB, KPRC, KOA, KDYL, KECA, KEX, KGA, WEBC, KFSD (WTAG, WFI, WGY on 12:00) WSAI, (WIS off 11:30), WHO, (WIBA, KSTP off 11:45), (WDAY, WSB, KPO on 11:30), (WMC, WIOD, WKY, WBAP, KTBS, WOAI, KJR off 12:00), WOC, WJAX.

12:00 Noon—SALT LAKE TABERNACLE CHOIR AND ORGAN. CBS. WABC, WADC, WOKO, WCAO, WNAC, CKOK, WDRC, WHAS, WCAU, WJAS, WFBL, WSPD, WJSV, WQAM, WDBO, WDAE, WGST, WPG, WLBZ, WBT, WDOD, KVOR, KLZ, WTAQ, WLBW, WBIG, WHP, WKBH, KFAB, WFEA, WREC, WCCO, WDSU, WTAR, KOMA, WMBD, WDBJ, KSL, KSCJ, WSBT, WIBW, CFRB, WMT, WWVA, WORC, WKBN.

12:15—RADIO CITY CONCERT. Variety. NBC. WJZ, WBAL, WRC, WHAM, WGAR, WLW, KDKA, KWK, WREN, KOIL, CKGW, WWNC, WINS, WJAX, WIOD, WFLA, WDAY, KFYR, WSMB, KVOO, KPRC, KOA, KDYL, KPO, KEX, KGA, KFSD, WBZ, WBZA, CFCF (WRVA, WSM, WIBA, KSTP, WEBC, WSB, WFAA, WKY, WOAI on 1:00) WJR, WMAQ, WAPI, KJR, WSYR, KECA, KTAR.

1:15—COOK TRAVELOGUES. NBC. WJZ, WBZ, WGAR, WJR, WBZA, WBAL, WMAL, WSYR, WHAM, KDKA, WCKY, WMAQ.

3:30—HOUR OF WORSHIP. Dr. S. Parkes Cadman. NBC. WEAF, WEEI, KTHS, WTAG, WCSH, WFBR, WRC, WBEN, WJAR, WCAE, WTAM, WSAI, WOW, WDAF, WLIT, WEBC, KFYR, KSD, KOA, KVOO, KPRC, WOAI, WKY, KGHL, KGO, KGW, KHQ, WGY, KDYL, WOC, WHO, WIBA, KFSD, WMC, WRVA, WJDX, WIS, WWJ, WSMB, WWNC, WJAX, KOMO, WIOD, WFLA, WSM, WSB, KGIR, WPTF, KFI.

4:30—NATIONAL YOUTH CONFERENCE. Dr. Daniel A. Poling. NBC. WJZ, WBZ, WBZA, WIS, WBAL, KWK, WPTF, WWNC, WREN, WEBC, WDAY, KFYR, WRVA, WENR, WSM, WAPI, KGHL, WIOD, KGW, WMC, KGO, WSB, KOA, KSO, WJDX, KVOO, KPRC, WOAI, KHQ, KOIL, KFSD, KWCR, WHAM, WJAX, WFLA, WCKY, WKY, WSYR, KGIR, KTBS, WSMB, WAPI, KOA.

5:00—NATIONAL VESPERS. NBC. WJZ, WBAL, WBZ, WREN, WEBC, KFYR, WBZA, WGAR, KWK, WSM, WPTF, WIS, WWNC, KWCR, WIOD, WFLA, WSB, KOA, KGHL, KGW, WJDX, KPRC, WOAI, KTBS, KGO, KHQ, KFSD, KTAR, KOIL, WJAX, WSMB, WBAP, KOMO, WMC, WRVA, KGIR, KVOO, WHAM, WCKY, WCFL, WTMJ, KSTP, WKY.

5:00—LOWELL THOMAS. News. Sponsor: Sun Oil Co. NBC. WEAF, WTAG, WEEI, WJAR, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WSAI, WFI, CFCF.

5:30—BLUE COAL MUSICAL REVUE. Sponsor: Delaware, Lackawanna & Western Coal Co. CBS. WABC, WOKO, WCAO, WAAB,, WGR, WDRC, WCAU, WEAN, WFBL, WHP, WHEC.

6:00—CATHOLIC HOUR. NBC. WEAF, WTAG, WEEI, WJAR, WCSH, WLIT, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WIOD, WEBC, KFYR, WRVA, WOAI, WSAI, WOC, WHO, WOW, WDAF, WIBA, WFLA, WSM, WMC, KEX, KJR, KGA, WSMB, WDJX, KVOO, WBAP, KPRC, WWNC, WCKY, WKY, KOA, KGHL, KGIR, KTAR, KSD, WIS, WDAY, WSB, KTBS, KDYL, KECA, KPO, WMAQ, WAPI, WJAX.

6:30—CATHEDRAL HOUR. CBS. WBBM, WJSV, WLBZ, WSFA, WDBJ, WACO, WQAM, KLZ, WHEC, WMT, WOKO, WHK, WDBO, WLAC, KSL, WWVA, WCAO, CKOK, WIP, WDAE, WICC, WLBW, WFEA, WDSU, KFH, WJAS, WBT, WREC, WSJS, WEAN, WDOD, WBIG, WISN, KOMA, KSCJ, WORC, WKBW, WDRC, KVOR, WHP, WSBT, WNAX, WFBM, WFBL, WGST, WCAH, WCCO, KMBC, WSPD, KRLD, WNOX, WODX, CFRB. **Also, 6:35**—WABC, WADC, WOKO, WCAO, WAAB, WBBM, WHK, CKOK, WDRC, WFBM, KMBC, WHAS, WJAS, WEAN, WFBL, WSPD, WJSV, WQAM, WDBO, WDAE, WGST, WLBZ, WBRC, WICC, WBT, WDOD, KVOR, WCAH, KRLD, KLZ, WLBW, WBIG, WHP, WKBH, WFEA, WREC, WCCO, WSFA, WDSU, WTAR, KOMA, WDBJ, KSL, WTOC, KSCJ, WSBT, WIBW, CFRB, WACO, WWVA, KFH, WORC, WKBN, WIP.

7:15—WHEATENAVILLE. Drama. Sponsor: Wheatena Corp. NBC. WEAF, WEEI, WJAR, WLIT, WRC, WGY, WTAM, WWJ, WMAQ, WDAF, WOC, WHO.

7:30—JOE MOSS' SOCIETY ORCHESTRA. Sponsor: J. B. Williams Co. NBC. WEAF, WTIC, WTAG, WJAR, WCSH.

8:00—CHASE & SANBORN HOUR. Eddie Cantor and Rubinoff's Orchestra. Sponsor: Standard Brands, Inc. NBC. WEAF, WTIC, WTAG, WBEN, WCAE, WTAM, WWJ, WLW, KSD, WOC, WHO, WDAF, CFCF, WSB, KFYR, WWNC, WIS, KDYL, KPRC, WKY, CKGW, WTMJ, KSTP, WEBC, WDAY, WIOD, WFLA, WMC, WJDX, WSMB, KVOO, WFAA, WOAI, KOA, KGO, KFI, WFBR, WRC, WGY, KGW, KOMO, KHQ, KTAR, WPTF, (WSM off 8:30), WOW, WJAR, WCSH, KFSD, WLIT, WMAQ.

9:00—GENERAL ELECTRIC SUNDAY CONCERTS. Concert stars. Sponsor: General Electric Co. NBC. WEAF, WTIC, WTAG, WCSH, WFI, WFBR, WRC, WGY, WTAM, WWJ, WENR, WSAI, KSD, WOW, WDAF, WRVA, WWNC, WIS, WJAX, WIOD, WSB, WFLA, WJDX, WKY, WFAA, KPRC, WJAR, WOAI, KTBS, KTHS. (WBEN, WCAE, WSM, WAPI, WSMB on 9:15), WOC, WHO, WTMJ, WIBA, KSTP, WEBC, WDAY, KFYR, KOA, KDYL, KGO, KFI, KGW, KOMO, KHQ, KFSD, KTAR.

9:00—WARDEN LAWES IN "20,000 YEARS IN SING SING." Drama. Sponsor: W. C. Warner Co. NBC. WJZ, WBZ, WBZA, KSO, WBAL, WHAM, KDKA, WGAR, WJR, WLW, KYW, KWK, KWCR, KOIL, WREN.

9:30—AMERICAN ALBUM OF FAMILIAR MUSIC. Orchestra and vocalists. Sponsor: Bayer Co. NBC. WEAF, WTAG, WCKY, WJAR, WCSH, WFI, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, KSD, WSAI, WENR, WOC, WHO, WOW, WIOD, WFLA, WSM, WMC, WSB, WOAI, WJDX, KTHS, WFAA, WKY, KOA, KPRC, KGO, KFI, KGW, KOMO, KHQ, WSMB, KDYL, WAPI, WRVA, WJAX, WTMJ, KSTP, WEEI, WDAF.

9:30—WALTER WINCHELL. Gossip. Sponsor: Andrew Jergens Co. NBC. WJZ, WBAL, WGZ, WBZA, WHAM, KDKA, WGAR, WLW, KYW, KWCR, KWK, WREN, KOIL, KSO, WJR.

9:30—PENNZOIL PARADE OF MELODIES. Sponsor: Pennzoil Co. CBS. WABC, WHAS, WJSV, WLBZ, WRR, WADC, WKRC, WCAU, WHEC, WOKO, WBRC, KLRA, WLAC, WCAO, CKOK, WDSU, KTSA, WNAC, WBT, KTAT, WEAN, KOMA, WDRC, KMOX, WGR, WFBM, WFBL, WGST, WCCO, WGN, KMBC, WSPD.

10:15—VINCENT LOPEZ AND THE TWO DOCTORS. Music and Comedy. Sponsor: Real Silk Hosiery Mills. NBC. WJZ, WBAL, WBZ, WBZA, KDKA, WGAR, WLW, WMAQ, KWK, WREN, WTMJ, WIBA, KSTP, WSM, WSB, WJDX, WSMB, WKY, WBAP, KPRC, WOAI, KOA, KDYL, KGO, KFI, KGW, KOMO, KHQ, WHAM, WMC, KSO, KTHS, KSD, WJR.

Our "Uncle Sam" Says

WHY does Jack Benny insist on wearing his hat in the studio? . . . The Governor of Maine made Rudy Vallee a Colonel on his military staff but quickly changed the appointment to a Lieutenant-Commandership on his naval staff when he discovered that the crooner once served in the Navy. . . . Peter Dixon and his wife, Aline Berry, have revived their "Raising Junior" skits over WOR; the series was formerly a daily NBC feature. . . . Some network artists have their own stooges around the studios to step up at the completion of broadcasts and ask for autographs. . . . Both nation-wide networks did splendid jobs in broadcasting the Presidential inauguration. . . . Many parents have complained that children's features on the air should be "edited" to eliminate scaring aspects which they claim cause bad dreams. . . . Amos 'n' Andy have been gaining back a lot of their former prestige; listeners are heard again and again discussing the daily exploits of the blackface pair. . . . Jack Pearl's Broadway show "Pardon My English" went floppo in a few weeks. . . . Ed Wynn seemed greatly pleased when the sirens and bells of real fire engines passing by were heard in the studio just prior to his Fire Chief broadcast one recent night. . . . The Rollickers Quartet, co-featured with the Pickens Sisters on the Paul Whiteman Buick programs, should be given more time on each period. . . . Radio stations, especially the chains, are making careful checks on the lyrics of popular songs in an effort to keep the airwaves clean. . . . Sponsors of commercial programs in France have copied the American contest idea in an effort to draw large mail from listeners. . . . William A. Schudt, Jr., former television director of the CBS, has been appointed manager of the chain's Dixie Network. . . . The CBS has suspended operation of its New York television station until better equipment is available.

CLIFF ARQUETTE KEN BROWNE RED CORCORAN

JOHN P. MEDBURY

Personal interviews with broadcast artists and executives

Backstage in

By Samuel

A PACIFIC Coast trio, the Three California Nuts, has been brought East to star on an NBC Sunday feature sponsored by the J. B. Williams Company. The three comedians — Cliff Arquette, Ken Browne and Red Corcoran once were well-known individual performers. They were winning a large following in the West when their new contract brought them to New York. Arquette, the piano-player of the act, made his radio debut in California seven years ago. Browne, the straight man of the trio, was a vaudeville performer before he came to radio as a dramatic actor in 1929. Corcoran, the "dumbbell" of the group, began broadcasting with his own orchestra from Pacific Coast roadhouses. The trio appears on the air with Joe Moss and his orchestra

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A NEW radio program that won wide favor in recent weeks is the Old Gold period on CBS Wednesday nights starring Fred Waring's Pennsylvanians and John P. Medbury, the humorist. Waring's orchestra, a well-known stage unit, has kept away from radio contracts for a longer period than other musical organizations of its prominent type. Waring's Pennsylvanians consist of twenty-one musicians and singers. Waring started the orchestra while he was still a student at Penn State College. For many years, the unit has been seen and heard in vaudeville, talking pictures and musical comedy. Medbury has earned a large following through his syndicated humorous writings and talkie dialogues.

OCTAVUS ROY COHEN, well-known magazine writer, is the author of "The Townsend Murder Mystery," the radio serial heard three days a week on NBC stations under the sponsorship of the Westinghouse Electric & Manufacturing Company. The large, carefully chosen cast is headed by Thurston Hall who fills the part of Jim Hanvey, the detective. Although filled with action, thrills and suspense, the series is hampered by the fact that each broadcast is not complete within itself. The entire series cannot be of any entertainment value to a listener unless he can hear every episode. It is inconceivable that a large number of listeners can conveniently tune in every episode at the rate of three each week for a four-month period. This is particularly true in a mystery series, where the listener must be assured of hearing everything leading up to the solution. Bolstered by a prize-contest with large awards, the series undoubtedly has a large number of listeners. Sponsors, however, should show more consideration for the entertainment value of their programs than they do for mail-baiting ideas.

TOM HOWARD, the comedian, and Jeannie Lang, the blues singer, were both drafted from the CBS ranks to star in the new Best Foods Musical Grocery Store program heard Fridays over the NBC. The third star on the new series is Herbert Polesie, well-known writer, producer and director of radio programs. Polesie serves as straight man for Tom Howard. Miss Lang's musical efforts are supplemented by Harry Salter's Orchestra and a vocal group billed as the Singing Clerks, headed by Scrappy Lambert. The series also utilizes the services of a large dramatic cast.

FANNIE BRICE, noted star of musical comedy, has joined the ranks of radio comics. Together with George Olsen and his orchestra, Miss Brice is featured on the new Royal Vagabonds period over the NBC Wednesday nights. On her radio series, Miss Brice presents the sentimental songs, monologues and comedy sketches for which she became widely known during her long stage career. Olsen, who has been grabbing one juicy radio contract after another in recent months, furnishes dance tunes and novelty instrumental numbers on the Brice programs. Fran Frey, Richard Gardner and Ray Bolger, popular vocalists of the Olsen group, assist Miss Brice in occasional songs and sketches.

RIGHT:
HERBERT POLESIE,
JEANNIE LANG
AND TOM HOWARD

FANNIE BRICE

OCTAVUS ROY COHEN

THE THREE X SISTERS

Broadcasting

Chatty bits of news on what is happening before the microphone

Kaufman

B. A. ROLFE and his orchestra are again back on the Saturday night program spot which they occupied for a long period under the sponsorship of Lucky Strike. This time, the Rolfe NBC offering is sponsored by the Hudson Motor Car Company. The program billed as the Saturday Night Dancing Party is presented by Rolfe's aggregation of forty musicians in addition to the Men About Town, well-known harmony trio. Most of the men in Rolfe's present orchestra were with him during the long Lucky Strike series.

AL JOLSON'S sudden departure from the Chevrolet program on NBC resulted in the starring of Jack Benny, the stage humorist who earned quite a radio reputation on the Canada Dry broadcasts. Benny is assisted by his wife, Mary Livingstone, Frank Black's Orchestra and a weekly selection of guest artists. His announcer, Howard Claney, serves as Benny's straight man. Not content with but one comedy assistant, however, Benny insists on using many persons in the cast in his spright dialogue creations. The Benny programs are particularly outstanding for the unusual manner in which the commercial announcements are put over. The comedian pokes fun at the commercial plugs in a manner that is inoffensive and highly entertaining.

THURSTON HALL

JANE FROMAN, radio contralto of wide reputation, has been signed as the Tuesday and Friday star of the daily Chesterfield series on CBS. The vocalist came to New York to make her debut on the CBS series. Previously, her network broadcasts were picked up from Chicago studios. Miss Froman, a very attractive, blue-eyed brunette, started out to be a newspaper reporter but soon after college yielded to a musical career. She made her radio debut over WLW, Cincinnati. Two years ago, Paul Whiteman introduced her to network audiences and she has enjoyed increasing popularity ever since. She is accompanied on the Chesterfield program by Leonard Hayton's Orchestra. Ruth Etting continues as the Monday and Thursday star of the Chesterfield programs while Bing Crosby remains the Wednesday and Saturday featured vocalist.

JANE FROMAN

THE Three X Sisters, a former British Broadcasting Corporation vocal trio, recently switched from CBS to NBC to be given a thrice-weekly radio billing. They are heard Mondays, Wednesdays and Fridays and are accompanied by the Blue Devils, a string ensemble. The girls are Americans. Four years ago they journeyed to London and were booked at the Palladium. Later, they were featured in a Cochrane revue. Two years ago they made their microphone debut over the B. B. C. and gained prominence on the British Isles. The lure of American radio caused them to leave London and return to their homeland. In addition to their harmonizing, the trio also presents original dramatic interludes on the air.

SPURRED on by the sensational success of the Mills Brothers on the CBS, stations in various parts of the country are experimenting with Negro trios and quartets. The NBC's Three Keys made an auspicious début several months ago but never reached the popularity of the Mills Brothers. Now, Station WLW, of Cincinnati, calls our attention to their Riff Brothers, namely Mifflin, Ivory, Orville and Slim, who sing and play a variety of instruments in Harlem tempo. These lads hail from Indianapolis. At WLW, they are facing the same microphones which first introduced the Mills Brothers to the radio audience.

TED LEWIS, the famous "high-hatted tragedian of song," is again being presented to radio listeners. His familiar greeting, "Is everybody happy?" is heard over CBS each Tuesday, Thursday and Sunday night from the Hollywood Restaurant in New York. This is the identical Broadway location, then occupied by another night club, where Lewis and his orchestra scored their initial success several years ago.

The DX Corner

THE response from RADIO NEWS readers to the DX Corner has been marvelous and if following issues bring an adequate return this department will be established on a firm footing. It has already warranted increasing the department from a page to three pages in the present issue. Listed below is a time schedule of Short-Wave Best Bets of stations logged during the past month at the RADIO NEWS Short-Wave Listening Post in Westchester County, New York. The schedule includes only the best-received stations, hourly, from 5 o'clock in the morning to 12 midnight, E. S. T. A space has been left for filling in local time. Space has also been left opposite the call letters for your own dial settings for each station you pick up. Unless otherwise noted, stations are heard daily.

Short-Wave "Best Bets"

Wavelengths in Meters	*Call Letters*	*Dial Settings*
5 A.M. Eastern Standard Time....Local Time		
30.4	J1AA	
31.2+Sun.	VK2ME	
31.3	GSC	
31.5 Wed., Sat.	VK3ME	
6 A.M. Eastern Standard Time....Local Time		
25.5	GSD	
31.2+ Sun.	VK2ME	
31.3	GSC	
31.3+	W1XAZ	
31.5 Wed., Sat.	VK3ME	
7 A.M. Eastern Standard Time....Local Time		
19.6	FYA	
30.4	J1AA	
31.2+ Sun.	VK2ME	
31.3+	W1XAZ	
8 A.M. Eastern Standard Time....Local Time		
16.8	W3XAL	
19.6	FYA	
19.7	DJB	
23.3	RABAT	
25.4	I2RO	
31.2+ Sun.	VK2ME	
31.3+	W1XAZ	
31.5	GSB	
49.9+	VE9DR	
9 A.M. Eastern Standard Time....Local Time		
16.8	W3XAL	
19.6	FYA	
19.7	DJB	
25.3	GSE	
25.4	I2RO	
31.3+	W1XAZ	
31.5	GSB	
49.9+	VE9DR	
10 A.M. Eastern Standard Time....Local Time		
16.8+	W3XAL	
19.7	W8XK	
19.7	DJB	
25.3	GSE	
25.4	I2RO	
25.5	DJD	
25.6	VE9JR	
31.3+	W1XAZ	
31.4	W2XAF	
31.5	GSB	
49.9+	VE9DR	
11 A.M. Eastern Standard Time....Local Time		
16.8+	W3XAL	
19.6+	W2XE	
19.7	W8XK	
19.7	DJB	
25.2	FYA	
25.2	W8XK	
25.3	GSE	
25.4	I2RO	
25.5	DJD	
31.3+	W1XAZ	
49.2	VE9GW	
49.9	VE9BJ	
49.9+	VE9DR	
12 NOON Eastern Standard Time....Local Time		
16.8	W3XAL	
19.6+	W2XE	
19.7	W8XK	
25.2	FYA	
25.4	I2RO	
25.5	DJD	
31.2+	W3XAU	
31.3+	W1XAZ	
49.2	VE9GW	
49.9	VE9BJ	
49.9+	VE9DR	
1 P.M. Eastern Standard Time....Local Time		
16.8	W3XAL	
19.7	W8XK	
25.2	FYA	
25.4	I2RO	
25.5	GSD	
25.5	DJD	
30.4 Sat.	EAQ	
31.2+	W3XAU	
31.3	GSC	
31.3+	W1XAZ	
31.3+	DJA	
31.5	GSB	
49.2	VE9GW	
49.6	GSA	
49.9+	VE9DR	
50.+	HVJ	
2 P.M. Eastern Standard Time....Local Time		
16.8	W3XAL	
25.2	FYA	
25.4	I2RO	
25.5	DJD	
25.5	GSD	
30.4 Sat.	EAQ	
31.2	W3XAU	
31.3	GSC	
31.3	HBL (code)	
31.3+	W1XAZ	
31.3+	DJA	
31.5	GSB	
31.5	OXY	
32.3	RABAT	
49.2	VE9GW	
49.3 Sun.	W9XAA	
49.6	GSA	
49.6+ Sun.	W1XAL	
49.9+	VE9DR	
3 P.M. Eastern Standard Time....Local Time		
16.8	W3XAL	
25.2	W8XK	
25.3+	W2XE	
25.4	I2RO	
25.5	DJD	
25.5	GSD	
25.6	FYA	
30.4 Sat.	EAQ	
31.2+	W3XAU	
31.3	GSC	
31.3+	W1XAZ	
31.3+	DJA	
31.5	GSB	
31.5	OXY	
32.3 Sun.	RABAT	
49.2	VE9GW	
49.3 Sun.	W9XAA	
49.6+ Sun.	W1XAL	
49.9+	VE9DR	
50.0	RV59	
4 P.M. Eastern Standard Time....Local Time		
16.8 Sat.	W3XAL	
25.2	W8XK	
25.3	GSE	
25.3+	W2XE	
25.4	I2RO	
25.5	GSD	
25.5	DJD	
25.6	FYA	
30.4 Sat.	EAQ	
31.2	W3XAU	
31.2+ Tues., Fri.	CT1AA	
31.3	HBL (code)	
31.3	GSC	
31.3+	W1XAZ	
31.3+	DJA	
31.5	GSB	
31.5	OXY	
32.3	RABAT	
48.8+	W8XK	
49.1+	YV1BC	
49.1+	W9XF	
49.2	VE9GW	
49.3+	W9XAA	
49.6	GSA	
49.9+	VE9DR	
50.0	RV59	
5 P.M. Eastern Standard Time....Local Time		
16.8 Sat.	W3XAL	
25.2	W8XK	
25.4	I2RO	
25.5	GSD	
25.6	FYA	
30.4	EAQ	
31.0	TI4NRH	
31.2+	W3XAU	
31.2+ Tues., Fri.	CT1AA	
31.3 Sun.	HBL	
31.3	GSC	
31.3+	W1XAZ	
31.3+	DJA	
31.4	W2XAF	
31.5	GSB	
31.5	OXY	
38.4 Sun.	HBP	
48.8+	W8XK	
49.1+	YV1BC	
49.1+	W9XF	
49.2	VE9GW	
49.3+ Sun.	W9XAA	
49.8	DJC	
49.9	VE9DR	
50.0	RV59	
6 P.M. Eastern Standard Time....Local Time		
16.8 Sat.	W3XAL	
25.2	W8XK	
25.6	FYA	
30.4	EAQ	
31.0	TI4NRH	
31.2+ Tues.,Fri.	CT1AA	
31.3+	W1XAZ	
31.3+	DJA	
31.4+	W2XAF	
31.5	GSB	
48.8+	W8XK	
49.0	W2XE	
49.1+	YV1BC	
49.1+	W9XF	
49.2	VE9GW	
49.6	GSA	
49.8	DJC	
49.9+	VE9DR	
7 P.M. Eastern Standard Time....Local Time		
16.8 Sat.	W3XAL	
25.2	W8XK	
25.6	VE9JR	
25.6	FYA	
30.4	EAQ	
31.2+ Tues., Fri.	CT1AA	
31.3+	W1XAZ	
31.3+	DJA	

31.4+		W2XAF
31.5		GSB
48.8+		W8XK
49.0		W2XE
49.1+		YV1BC
49.1+		W9XF
49.2		VE9GW
49.3+	Sun.	W9XAA
49.5		W3XAU
49.6		GSA
49.9+		VE9DR
8 P.M.	**Eastern Standard Time**	**Local Time**
25.2		W8XK
31.3+		W1XAZ
31.4+		W2XAF
48.8+		W8XK
49.0		W2XE
49.1+		YV1BC
49.1+		W9XF
49.3+	Sun.	W9XAA
49.5		W3XAU
50.5		HJ1ABB
50.6		HJ4ABE
51.0		HJ2ABA
9 P.M.	**Eastern Standard Time**	**Local Time**
25.2		W9XK
31.3+		W1XAZ
31.4+		W2XAF
45.3	Thurs.	PRADO
48.0		VKPR
48.8+		W8XK
49.0		W2XE
49.1+		YV1BC
49.2		VE9GW
49.3+	Sun.	W9XAA
49.5		W3XAU
50.5		HJ1ABB
50.6		HJ4ABE
51.0		HJ2ABA
10 P.M.	**Eastern Standard Time**	**Local Time**
31.3+		W1XAZ
31.4+		W2XAF
45.3	Thurs.	PRADO
48.8+		W8XK
49.0		W2XE
49.1+		W9XF
49.5		W3XAU
11 P.M.	**Eastern Standard Time**	**Local Time**
31.3+		W1XAZ
48.8+		W8XK
49.1+		W9XF
49.5		W3XAU

Station Locations

Wavelengths in Meters	*Call Letters*	*Dial Settings*
16.8	W3XAL	Bound Brook, N. J.
19.6	FYA	Pontoise, France
19.6	W2XE	New York, N. Y.
19.7	W8XK	Pittsburgh, Pa.
19.7	DJB	Zeesen, Germany
23.3		Rabat, Morocco
25.2	FYA	Pontoise, France
25.2	W8XK	Pittsburgh, Pa.
25.3	GSE	Daventry, England
25.3+	W2XE	New York, N. Y.
25.4	I2RO	Rome, Italy
25.5	GSD	Daventry, England
25.5	DJD	Zeesen, Germany
25.6	FYA	Pontoise, France
25.6	VE9JR	Winnipeg, Canada
30.4	JIAA	Japan
30.4	EAQ	Madrid, Spain
31.0	T14NRH	Heredia, Costa Rica
31.2+	W3XAU	Philadelphia, Pa.
31.2+	VK2ME	Sydney, Australia
31.2+	CT1AA	Lisbon, Portugal
31.3	HBL	Geneva, Switzerland
31.3	GSC	Daventry, England
31.3+	W1XAZ	Springfield, Mass.
31.3+	DJA	Zeesen, Germany
31.4+	W2XAF	Schenectady, N. Y.
31.5	VK3ME	Melbourne, Australia
31.5	GSB	Daventry, England
31.5	OXY	Skamleback, Denmark
32.3		Rabat, Morocco
38.4+	HBP	Geneva, Switzerland
45.3	PRADO	Riombamba, Ecuador
48.0	VKPR	Fort Williams, Ont., Can.
48.8	W8XK	Pittsburgh, Pa.
49.0	W2XE	New York, N. Y.
49.1+	YV1BC	Caracas, Venezuela
49.1+	W9XF	Chicago, Ill.
49.2	VE9GW	Bowmanville, Can.
49.3+	W9XAA	Chicago, Ill.
49.5	W3XAU	Philadelphia, Pa.
49.6	GSA	Daventry, England
49.6+	W1XAL	Boston, Mass.
49.8	DJC	Berlin, Germany
49.9	VE9BJ	New Brunswick, Can.
49.9+	VE9DR	Montreal, Can.
50.0+	HVJ	Vatican City
50.5	HJ1ABB	Barranquilla, Colombia
50.6+	HJ4ABE	Medellin, Colombia
50.0	RV59	Moscow USSR
51.0	HJ2ABA	Tunja, Colombia

Germany Reported on 49 Meters

A number of contributors have stated they hear the German station announced as "Deutschland Sender" on about 49.7 or 49.8 meters between the hours of 5 and 6 p. m. E. S. T. broadcasting a verbal program in German and in English. No call letters were given. If our readers can identify this station, we would be very pleased to get the information. (We believe it is DJC.)

VE9GW Back Again

The extremely popular Canadian station VE9GW which broadcasts special programs on Sunday for amateur short-wave listeners is now back on the air with an improved transmitter and they certainly come in strong with excellent modulation. We are indebted to the following listeners for this information: Leo Wilson, Harrisonville, Missouri; W. J. Schindler, Los Angeles, California; D. E. Bame, Long Island, N. Y.; C. R. Chisholm, St. Louis, Missouri; Hermann Maier, Chicago, Illinois; R. O. Lamb, Wilkinsburg, Pennsylvania; C. H. Skatzes, Delaware, Ohio; J. J. Whalley, Cumberland, Maryland; H. R. Peck, Bedford, Ohio; W. H. Reeks, Chicago, Illinois; W. W. Beacham, Du Quoin, Illinois; F. H. Kydd, Ceballes, Cuba; Howard Buck, Wingdale, New York; J. R. Flanigan, Cornersville, Indiana; J. F. Dechert, Eau Gallie, Florida; K. A. Skaats, Aliquippa, Pa.

Short-Wave DX Listeners, Attention!

THIS is the third installment of this department and we wish our readers to know that it is still in the experimental stage. Do you like it? If so just drop a card or letter to the DX Editor, care of RADIO NEWS, giving your suggestions and comments. If the response from readers is sufficient to warrant its being continued, it will be enlarged and made more complete as time goes on.

You can help to make it more perfect and more useful by mentioning in your letter to the DX Editor the stations you receive most favorably on the short waves, giving, wherever possible, the call letters, location, wavelength or frequency and the periods the stations are on the air. It would be advisable to mention in your letter any peculiarities of transmission that might help to identify the foreign station, such as their method of signing on or off, languages used, any station signals, like the tooting of horns, ringing of bells, or the ticking of a clock, etc. If you keep a log of foreign station reception it would be of invaluable aid to us in presenting this information in the coming DX CORNER. Later on RADIO NEWS is to select a number of proficient RADIO NEWS listening posts from amongst its readers who respond to this request and who show their ability in keeping a several months' accurate log of stations. If our readers will co-operate with the DX Editor in this way, we feel we can have the finest DX department possible and one that should be of great value to DX short-wave fans the world over.

GSA's 6 to 8 p.m. Program

A number of reports tell us that the British Empire Broadcasting Station GSA is interfered with by code signals during the entire program. These signals, we have found, emanate from a commercial transmitter GBC, also in Great Britain. North American listeners would certainly be favored if this station's frequency could be shifted slightly as GSA's signals at this time are very strong and steady. American listeners can get the same program, however, without interference, on the GSB wavelength of 31.5 meters which is coming in stronger and steadier as the summer comes on

Foreign Listeners, Attention!

Listeners in foreign countries will be glad to hear that W2XE has increased its program time as indicated in this month's Best Bets. This is also true of W3XAU, W3XAL and VE9DR, who now have programs almost all day long. W8XK and W2XAF are, of course, old standbys.

The Cuckoo on CT1AA

Last month we noted that CT1AA, heard Tuesday and Friday afternoon from 5 to 7 p. m. E. S. T. signed on and off with two falling notes on an auto horn, repeated twice. Listeners have called our attention to the fact that these notes constitute a cuckoo call.

Send in Your Logs

Expert short-wave listeners in the United States, Canada and Mexico are invited to transmit to the DX Editor, any station data on short-wave stations that they receive particularly well and which is not listed in our short-wave best bets. Give their call letters, their location, and the times between which they transmit. Also note any changes or deviations from the listed Best Bets that you are able to find during the month.

T14NRH on 31 Meters

Reception of this station on 31 meters or 9672 kc. is reported by D. W. Parsons of Roanoke, Virginia, on Saturdays between 6 and 7 p. m. E. S. T. Bugle calls between records are the station's identification. The dial setting is slightly above that for EAQ.

Using a Converter

Mr. T. S. Robinson of Watervliet, New York, reports the following stations, DJB, Pontoise, W2XAD, GSF, FYA, I2RO, VE9JR, EAQ, VK2ME, W1XAZ, W2XAF, GSB, VK3ME, HBP, W3XL, W8XK, YV1BC, W3XAL, W9XF, W2XE, W8RAL, GSA, W1XAL, and VE9DR, on a small Midwest converter using four tubes ahead of a Radiola 80. Enclosed with his letter is a question, "Don't you think this is pretty good for an inexpensive converter?"

Station VK3ME, Australia

This station is on the air from 5 to 6:30 a. m. Wednesdays and Saturdays. At certain times of the year it is only heard for a few minutes beginning at 5 a. m. Then there is a dead spot of about 30 minutes and during this time it is impossible to pick up their carrier. They come in very well at 6 a. m. This information is furnished by F. L. Stitzinger, Erie, Pennsylvania.

Some Excellent Information

VK2ME, HBL, HBP and RABAT operate only on Sundays. VK3ME from 5 to 6:30 a. m. on Wednesdays and 5 to 7 a. m. on Saturdays. PRADO operates on Thursdays. CKPR, Ft. Williams, Ontario, has no short-wave transmitter but has a harmonic on 48 meters. The Daventry stations GSA on 49.6 meters and GSB on 31.5 meters are now on from 6 to 8 p. m. HKA is off the air since October. The owner of the station S.R. Jesus Amorteguy P. now has charge of radio installations on board warships during the present dispute between Colombia and Peru. The call letters FYA really do not belong to the station, Pontoise, which now operates as RADIO COLONIALE. Radio station TI4NRH, Heredia, Costa Rica, is now using 200 watts on 31 meters daily from 9 to 11 p. m. and irregularly from 5:30 to 6:30 p. m. Station HJ3ABF, which operated on 39 meters as HKF, is now on 48 meters from 7 to 11 p. m. This station is located at Bogota, Colombia. All time is E. S. T. W. H. Reeks,

Chicago Short-Wave Radio Club, Chicago, Illinois.

On a One-Tube Converter

My receiver is a one-tube, one-coil converter ahead of a seven-tube radio and with this small outfit I have recently verified reception from VK2ME, VK3ME, I2RO, EAQ, DIQ, DJA, GSA, GSB, HRB, Pontoise, HBL, KEJ and the usual run of U. S. stations. I keep a detailed log as to time and numbers played. The converter is of my own design and I would be glad to send all details to any interested RADIO NEWS reader. K. A. Staats, Aliquippa, Pa.

Best Reception in Brooklyn

My receiver is a Hammarlund Comet "Pro". Listed below are the ones I hear best. Pontoise, France on 19.68 meters, GSE, I2RO, DJD. DJD comes in the bset. His strength lately is like a local. GSA is the most powerful station on the 49 meter band. Arthur C. Gluck, Brooklyn, N. Y.

Pontoise, in French and English

Pontoise (FYA) gives the news daily from 8:30 till 9 a. m. E. S. T. The first 15 minutes it is given in French and in the remaining 15 minutes the news is given in English. C. H. Skatzes, Delaware, O.

A Few Corrections

Am sending in a few corrections of last month's Best Bets. DJB is on from 8 to 11:30 a. m. daily. EAQ is on from 5:30 to 7 p. m. daily. DJD (Deutschland Sender) on 25.5 meters, 2 to 5 p. m. daily. F. G. Hehr, Sayville, L. I.

Some Station Notes

Germany, on 49.83 meters has been testing recently, probably for regular transmission. DJC is the station call. TI4NRH, Costa Rica, uses a bugle call between selections. RV59, Russia, on 50 meters, comes in very well Sunday afternoons, from 3 to about 5:30 p. m. E. S. T. HJ2ABA, Tunja, Colombia, on 51.05 meters are nightly visitors with their Spanish music. I check our clocks in my home, nightly, by Big Ben from GSA. I use a Scott all-wave set, antenna 120 feet long, pointed northwest, with a 37-foot transmission-type lead-in. H. Weston Taylor, Philadelphia, Pa.

Station Identifications

The following are a list of announcements and station designations by which short-wave stations may be identified: HVJ announces "Radio Vaticano"; CT1AA, "cuckoo calls at intervals"; Pontoise "Allo, Allo ici Paris, Station D'etat Radio Coloniale", opens and closes with the Marsellaisse, news in English at about noon E. S. T.; TI4NRH, bugle calls and telegraph dashes; VK2ME, call of Kookaburra bird (laughing notes); I2RO announces "Radio Roma Napoli" and has lady and man announcers; RV59, relays chimes of Kremlin at 4 p. m. E. S. T., with programs in various languages and when in English begins "Hullo this is Moscow calling, this is Moscow calling". I have not heard PRBA, Rio de Janeiro, since last June. LSX, Buenos Aires, not heard regularly since last summer. CMCI, Havana, Cuba, not heard lately. A. G. Taggart, Member International Short-Wave Club, Reedy, Creek, Manitoba, Canada.

Caracas Announcements

This station announces thus: Ya-Vay-Una-Bay-Say. W. C. Couch, Asheville, N. C.

German Short-Wave Stations

Effective April 1, all German short-wave stations, on order from Chancellor Hitler, must announce English and German for the benefit of American listeners. These stations may be identified by the following announcements: Heir ist Berlin angeschlossen zu alle sender. This means, Here is Berlin, broadcasting over the entire German network. Sometimes they announce thus: Mittdeutscher Kurwellen sender Koenigswusterhausen, which is, Middle German short-wave sender at Koenigswusterhausen. DJD on 25.5 meters is received best in the afternoon. DJB, 19.7 is best in the morning. DJC (irregular) 49.8 meters is best in the evening. William F. Buhe, Newark, N. J.

Radio Coloniale

I have had a letter from Radio Coloniale, France, giving their latest schedule as follows: 19.68 meters, 7 to 10 a. m.; 25.2 meters, 11 a. m. to 2 p. m.; 25.6 meters, 3:30 to 7:30 p. m. All E. S. T. 19.68 meters is directed towards Asia. 25.2 meters is directed toward Africa. 25.6 meters is directed towards America. This will probably help fellows tuning in for these stations. I am using a Scott all-wave receiver. C. R. Chisholm, St. Louis, Mo.

Australia in the Wee Hours

VK3ME comes in well here from 3 to 4 a. m. M. S. T. Wednesday mornings on 31.5 meters. F. A. Nelson, Denver, Colo.

Best Reception in Florida

Stations received best here during the last month are: W8XK, W1XAZ, I2RO, DJA, XDA, VE9DR, VK3ME, DJB, EAQ, HJB, PRADO, W3XAU, W9XF, W3XAL, W2XE, W2XAF, W4XB, VK2ME, FYA, GSA, GSC, GSB, YV1BC, DJD. All stations listed above come in with good loudspeaker volume. Equipment used: Model 112 Philco BC receiver with Philco 4C converter. E. M. Law, Miami, Fla.

DX Reception in Oregon

The best short-wave reception, here, is Pontoise, EAQ, VK2ME, VK3ME, W8XK. My receiver is home-made. On the long waves I have DX'ed the following: JOJK, Kanazawa; JOQK, Nugata; XGOA, Nanking, China; 2YA, Wellington, Australia; 2CO, Corowa, Australia; 3AR, Melbourne, Australia; 5CK, Crystalbrook, Australia; 4QG, Brisbane, Australia; 2BL, Sydney, Australia; 4RK, Rockhampton, Australia. Best reception from Australia and the Orient on the broadcast band is gotten from 1:30 to 3 a. m. M. S. T. G. E. Dubbe, Freewater, Ore.

Best Stations for South Carolina

Some of the best receptions I have are from EAQ, GSA, GSB, I2RO, FYA, DJB, CT1AA, VK3ME. I use a National NC5 converter with a good broadcast set and also a Scott DeLuxe all-wave set. E. F. Bahan, Greenville, S. C.

Reception in New Mexico

I have the L16 Midwest set and have no trouble at all bringing in VK2ME, VK3ME, Venezuela, and a station in New Zealand. New York stations come in loud enough to drive one out of the house. B. L. Ward, Albuquerque, N. Mex.

On Ten Tubes

My best stations here I consider VK2ME, F3ICD and HJ1ABB. I get all the European and American stations. VE9GW is the most powerful Canadian. I have a ten-tube Silver-Marshall all-wave model. W. J. Schindler, Los Angeles, Calif.

DX in New York State

RV59 is very good here lately, 3:30 to 4 p. m. and in some cases up to 5 p. m. E. S. T. on 50 meters. I noted last month you listed CKPR on 48 meters. This is a harmonic. I wrote them regarding this and they verified it, 48 meter harmonic. YV1BC is as strong as a local. They play chimes each quarter hour. HJ1ABB (formerly HKD) is heard very strong now. HJ4ABE is right on 51 meters at present. H. S. Bradley, Hamilton, N. Y.

His First European DX

As a result of using your list the first European station I picked up was EAQ. I have a new Silver-Marshall model Q. H. C. Sweger, Peru, Ill.

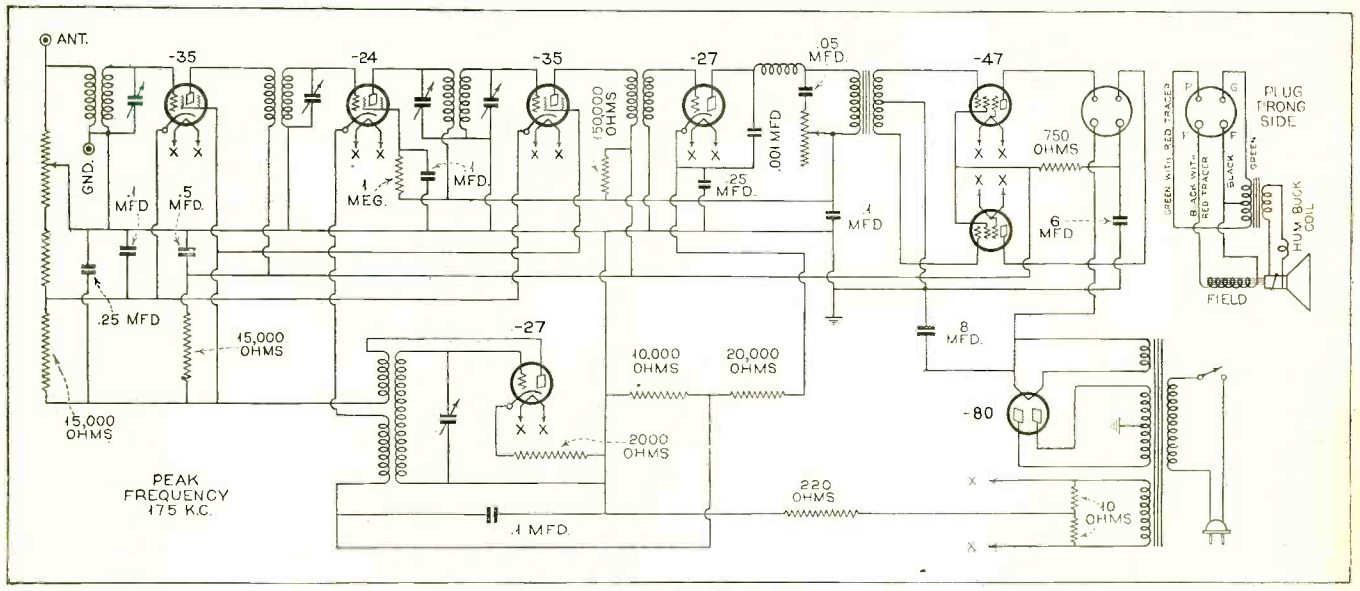
Reception in Missouri

I get a new German station on practically the same wave as old G5SW, daily, from 1:30 to 3:30 p. m. The signal is exceptionally strong, far above the noise level. VK2ME and VK3ME are now being received with great strength. GSA on 49.6 meters is being very strongly received. GSB on 31.54 meters is not so well received. FYA on 25.2 and 25.6 meters is being strongly received daily. Other strong stations are I2RO, VE9JR and VE9DR as well as YV1BC and EAQ. C. H. Long, Winston, Mo.

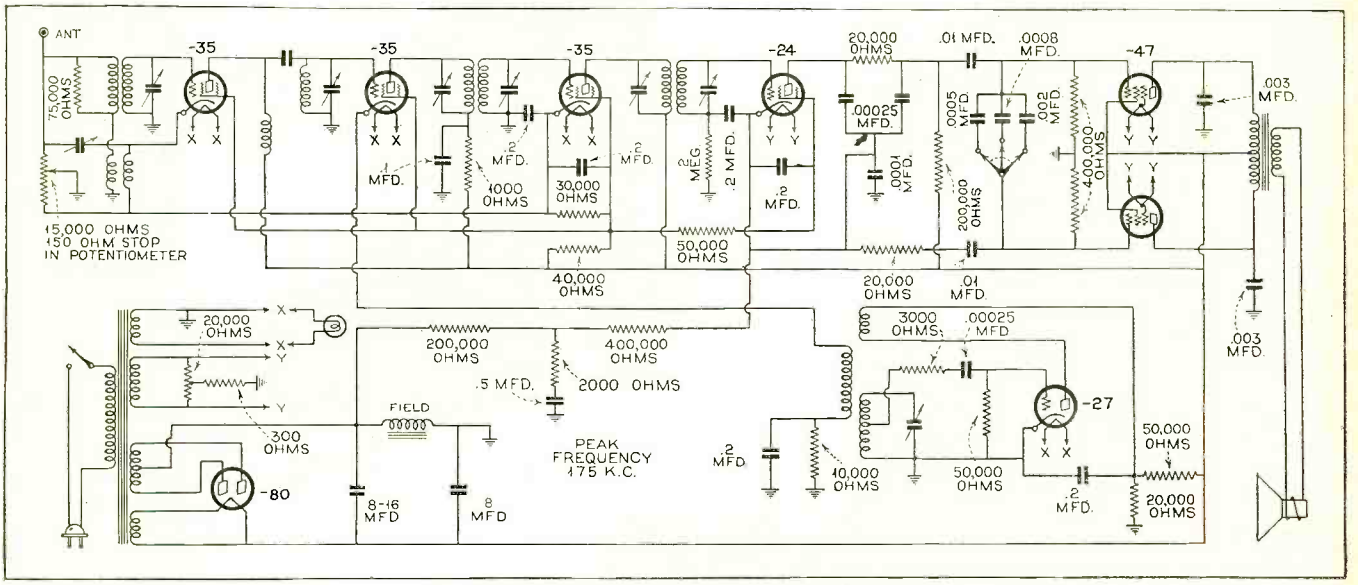
Radio's Road to Fame

MAYBE you, too, have the ability to scale the heights of radio stardom. Broadcasters are ever on the alert for new "finds." There are big rewards awaiting those microphone recruits who make the grade. Within the next few seasons, a new crop of entertainers will join the ranks of the Rudy Vallees, the Ed Wynns and the Jessica Dragonettes of the air. The wide scope of broadcasting, far greater in entertainment possibilities than either the stage or talking screen, is continually attracting thousands of persons, young and old, to the broadcasting studios for program auditions. Many readers of RADIO NEWS have written to the editor asking for advice on breaking into radio. The July issue of RADIO NEWS, on sale the tenth of June, will contain an informative article by Samuel Kaufman entitled "Radio's Road to Fame." The huge possibilities in the talent end of broadcasting are outlined in Mr. Kaufman's article. Many invaluable hints in broadcast procedure are included. Have you a good program idea? Do you believe you can do better than some of the entertainers you hear on the air? Read "Radio's Road to Fame."

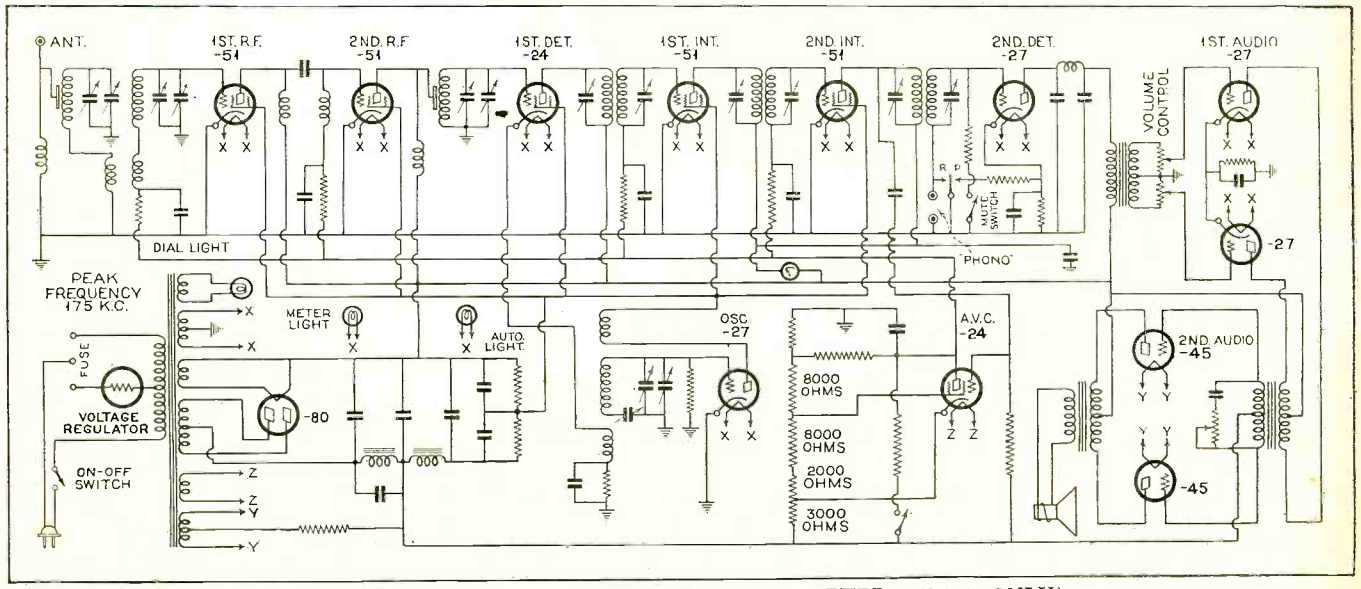
Service Data for Servicemen



CROSLEY, MODEL 124



SILVERTONE, MODELS 1320, 1322 AND 1324



ZENITH, MODEL 103 (SERIAL NUMBERS AFTER 450,451 ONLY)

Compiled from J. F. Rider's Perpetual Trouble Shooter's Manual.

An Improved I. F. Transformer Design

Information presented in this article is probably the most specific and authentic ever published on i.f. tuning condensers. Engineers have long suspected some of the facts shown here, but many have heretofore lacked exact quantitative data

[*By* A. A. Webster]

LAST month the writer presented a general discussion of i.f. transformer design with special discussion of the new Hammarlund transformers, and on the important advantages of air-dielectric tuning condensers over the mica-dielectric, compression type. Charts were presented, showing the average frequency drift of transformers using compression type condensers to be six times as great as that of the same transformers employing air-dielectric tuning condensers, when exposed to a high degree of humidity.

Since preparing the first article a detailed set of measurements, amplifying those shown last month, have been made by one of the outstanding testing laboratories of the world. The curves herewith present the results of this further study. As will be noted, these curves show the effect of humidity, temperature and vibration on the gain and selectivity characteristics of i.f. transformers employing mica-dielectric compression condensers as compared with the effect on similar transformers employing air-dielectric variable tuning condensers.

Figures 1 to 5 inclusive show curves of single transformers. In normal superheterodyne circuits, anywhere from 2 to 6 transformers would be employed. In analyzing these five sets of curves the reader should bear in mind that the detrimental effects of humidity, vibration, etc., would be far greater in a complete amplifier than they are shown here for single transformers. To illustrate this, Figure 6 shows curves (C) and (D) of Figure 1 extended by calculation to show the response characteristic of two complete 2-stage i.f. amplifiers using transformers identical with the single transformers of each type represented by curves (C) and (D) of Figure 1. These calculated curves of Figure 6 are obtained by simply cubing the actual measurements of Figure 1.

In making the measurements illustrated in Figures 1 to 5, 6 transformers of each type were used and curves run on all of them. The curves shown here for both the air-tuned and mica-tuned type *are the worst of each lot.* Using the worst curves is more logical than showing the best or even the average, because it better indicates the extremes of inconsistency for each type.

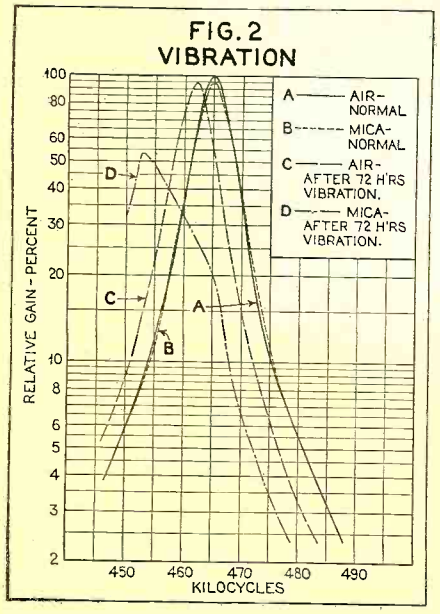
For the humidity test, the results of which appear in Figure 1, the transformers were first tuned to exact resonance at 465 kc. and the response characteristic measured under normal room conditions to obtain data for curves (A) and (B). They were then placed in a "humidity box" and subjected to 90 percent humidity for 24 hours, after which they were removed and immediately measured to obtain curves (C) and (D).

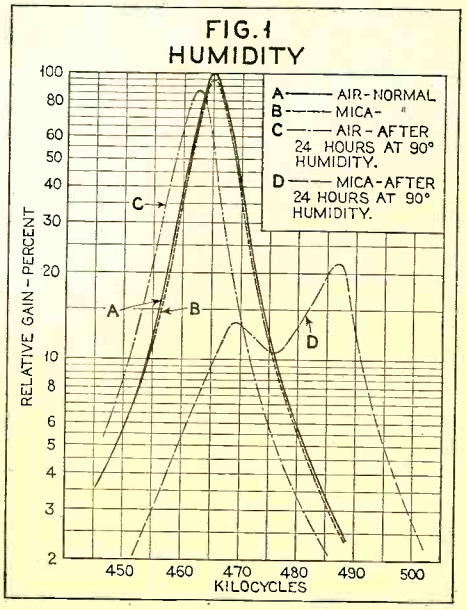
The vibration test measurements (Figure 2) followed the same plan, but in this case the transformers were placed in a vibrator for 72 hours, this treatment being designed to represent the vibration to which a finished receiver might be subjected in shipment.

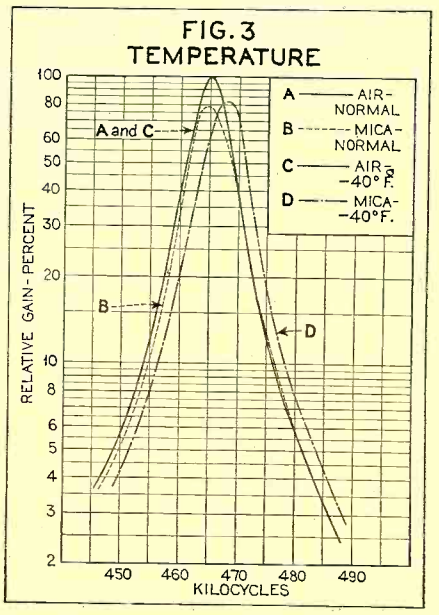
The temperature test (Figure 3) consisted of first running curves at a normal room temperature of 70 degrees Fahrenheit, then placing the transformers in a refrigeration box in which the temperature was maintained constant at 40 degrees below zero for several hours, and again measuring them.

It is of course true that these test conditions cover ranges greater than those encountered by the average receiver, but this was considered advisable if the tests were to be really indicative. For lesser variations in humidity, etc., the effects indicated by the curves would be somewhat modified.

Referring to Fig. 1, curve (A) represents normal response of the new Hammarlund i.f. transformer using air-dielectric condensers, and curve (B) that of a similar transformer using compression type mica-condensers, (C) and (D) represent the measurements obtained on the same transformers after 24-hour humidity exposure. A study of these curves will show that the air-tuned transformer fell off 15% in gain, with relatively small change in the shape of the characteristic, and a frequency drift of but 2½ kc. Curve (D) on the other hand shows a gain reduction of 78%, a radical change in the shape of the curve *and a frequency drift of 22 kc.* To further complicate matters,



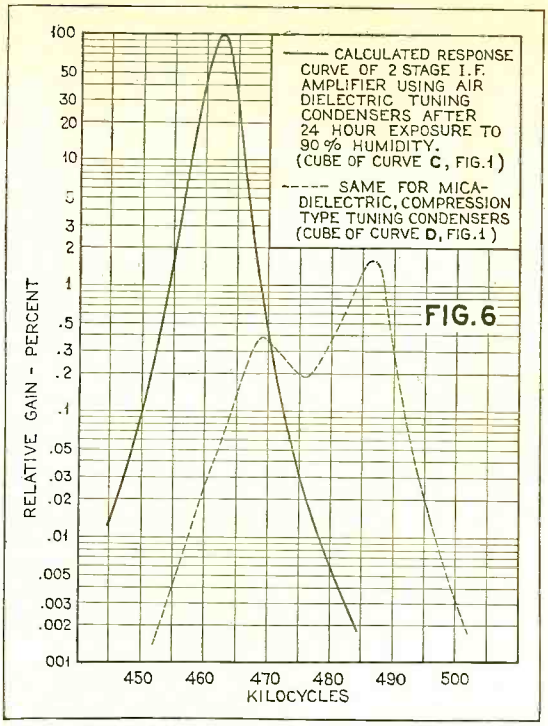




curve (D) takes on a double hump form which means that the tuning of a receiver employing this transformer would become extremely broad and, in the case of reception of weak signals, a given signal would probably appear at 2 points 18 kc. apart on the oscillator dial, the frequency difference between these two humps.

Effect of Humidity

An interesting point brought out by curve (D) is that the mica-compression condensers are not equally affected by humidity. Had they been equally affected the frequency drift of the two tuned circuits would have been similar and the loss in gain would have been considerably less. From this curve it is evident that one of the tuned circuits shifted enough to produce a peak approximately 4 kc. above the original resonant frequency, while the other produced a peak at 22 kc. above. This explains the double hump characteristic. It will be noticed in the case of curve (C) that there is no indication of a double hump. In fact the shape and amplitude of this curve shows conclusively that the change which took place was very nearly the same in the two circuits tuned by air-dielectric condensers.



In the vibration tests, Figure 2, the transformer tuned by air-dielectric condensers (curves (A) and (C)) dropped only 5% in gain and suffered a resonance shift of only 3 kc. Curve (D) shows that the transformer tuned by the mica-compression condensers underwent an important change, falling off 47% in gain and shifting 12 kc. off resonance. The skirt of the curve assumed a much more gradual slope and this would, of course, be attended by a considerable loss in selectivity.

The effect of temperature change was less important than the change in humidity or vibration. As shown in Figure 3, (Curve (A)) the air-dielectric tuned transformer showed no change whatsoever, over the variation of 110 degrees Fahrenheit. The mica-tuned transformer (curves (B) and (D)) actually showed a slight improvement in gain, in spite of a resonance shift of 3 kc. It should be noted here that this particular mica-tuned transformer, measured under normal conditions, was about 20% below the air-tuned transformer gain. This suggests that there was something wrong to begin with, and this, coupled with an increase in gain after drifting 3 kc. off resonance, indicates that measurements on this particular unit have little value.

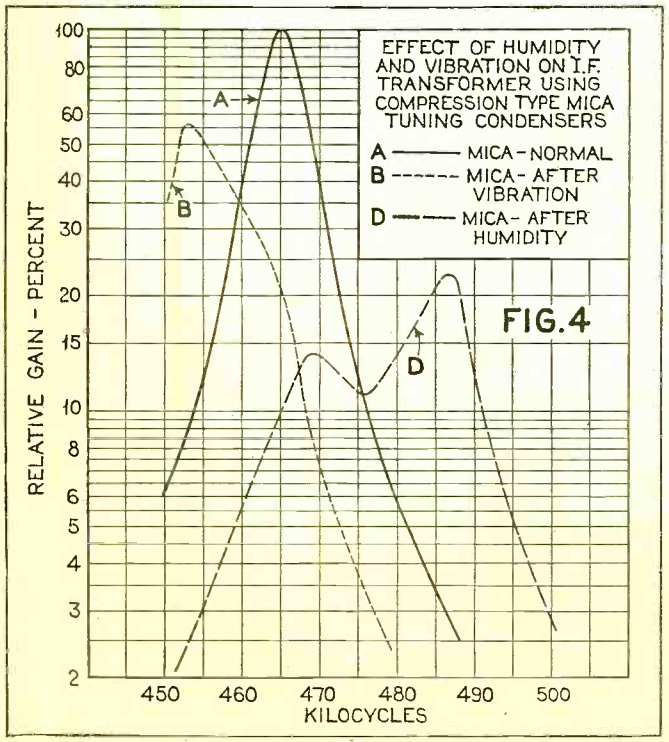
Coming to Figure 4 we find at (A) the normal response curve of a mica-tuned transformer, at (B) the change resulting from vibration and at (D) the effect of high humidity on the response characteristic. It will be noted that curves (B) and (D) are those taken from Figures 1 and 2 covering this type of transformer. From this graph it is apparent that the mica-tuned transformers are subject to wide variation under different conditions and that vibration and humidity are particularly detrimental to the efficient functioning of a circuit in which they are employed.

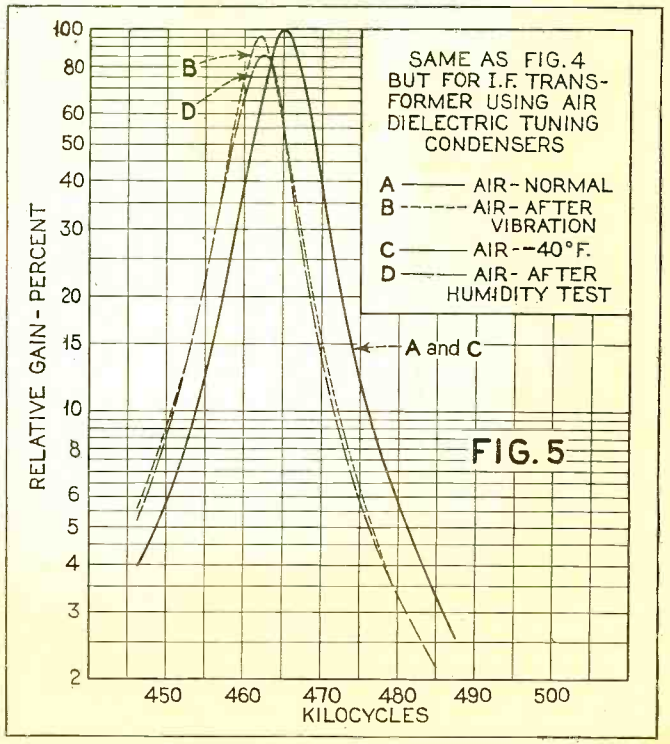
Summing Up

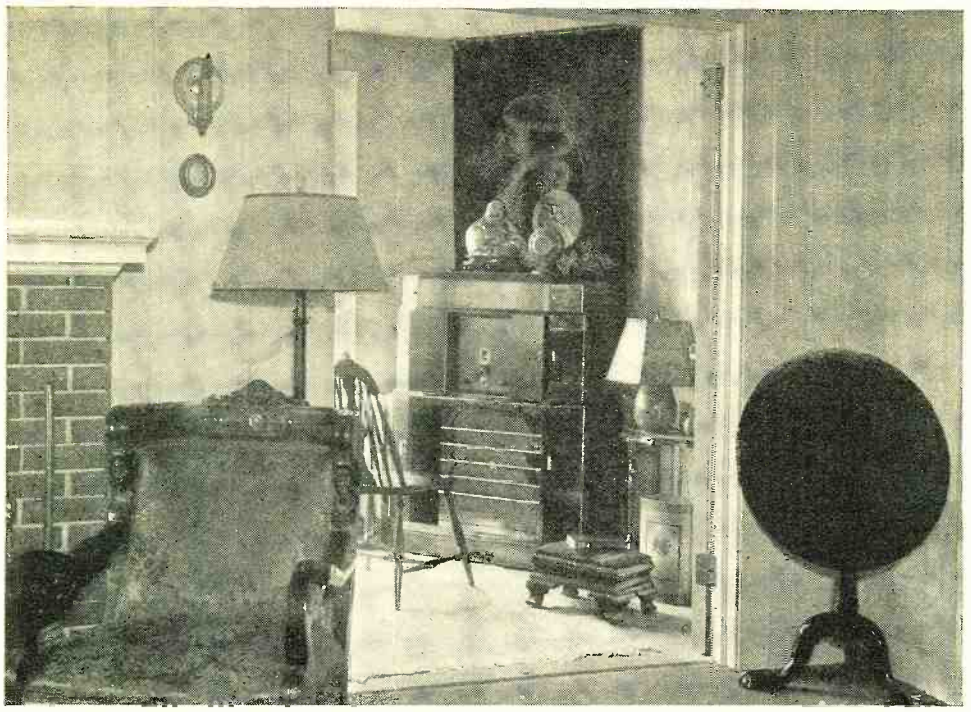
Comparing the curves of Figure 4 with those of Figure 5 show a startling contrast. In Figure 5, change in the response characteristic of the air-tuned transformers is entirely absent under temperature change and relatively slight when subjected to vibration. Humidity has the most harmful effect, but comparing this with curve (D) of Figure 4 shows that even this is relatively small.

A careful analysis of these various curves will show other points of interest which space does not permit discussing here. The overall result of these measurements is made clear by the discussion already presented. This series of curves leaves little doubt as to the superiority of the air-dielectric tuning condensers, and provides one interesting explanation of why so many superheterodynes provide much better sensitivity and selectivity one day than they do another; also why realignment of the i.f. stages of many superheterodynes is so frequently required.

It is pertinent to call attention to the fact that all of these measurements are made on i.f. transformers which provide relatively high gain and good selectivity. In many broadcast receivers of the factory-built type i.f. (*Continued on page* 759)







Three Months' Test On a A New

CONSOLE RECEIVER

THE tests outlined below were made on a Scott Imperial Grand Console which was shipped to the RADIO NEWS Westchester short-wave listening post laboratory at the end of December 1932. The console itself houses complete electro-musical apparatus including the new Scott all-wave superheterodyne chassis covering wavelengths from 15–550 meters, along with power amplifier and power-pack equipment, a complete electric phonograph reproducing unit and record changer that will continuously play ten records, and recording apparatus on which can be recorded disc records of incoming programs as well as records made at home by amateur performers and an auditorium type dynamic loudspeaker. The console is a handsome piece of furniture of sturdy construction finished in a modern design that is at the same time extremely dignified and really beautiful. All of the handles, trim decorations and hinges are of German silver, with a brushed finish. The construction of the console evidently has been carefully worked out both from the acoustic and beauty angles. The console alone, without the apparatus, weighs over 150 pounds.

THIS report on results obtained with this new receiver is based on tests made by the RADIO NEWS staff, under the direct supervision of Laurence M. Cockaday and S. Gordon Taylor.

During the last 90 days this receiver has been put through its paces and weekly logs of stations from all over the world on the short-waves have been kept. This is also true of transmitting stations on the regular broadcast band. Records have been made with the recording apparatus of local transmissions as well as of transmissions received from stations 9,000 to 10,000 miles away. Also a series of records have been made with local talent. The record changing and reproducing apparatus has been used regularly for this same period of time. The results obtained have been so exceptional that we are glad to recommend the unit as the finest complete electro-musical combination the laboratory has had a chance to test.

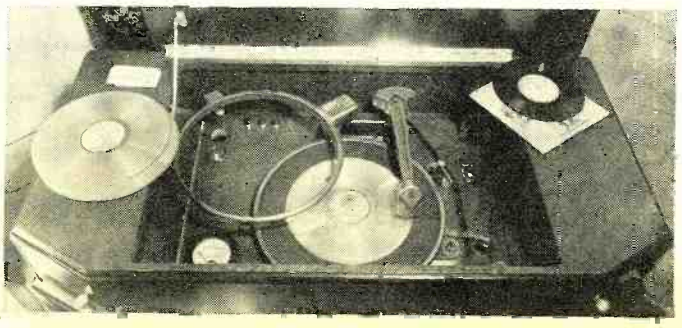
The chassis is the latest model all-wave superheterodyne already described in an article by S. Gordon Taylor and John M. Borst in the March 1933 issue of RADIO NEWS. That article contains also the fidelity, power output, selectivity and sensitivity curves for this unit. The wiring diagram is shown in Figure 1. The recording and reproducing apparatus located in the top compartment of the console is shown in Figure 2 and diagrammatically in Figure 3. A rear view of the cabinet prior to final installation is shown in Figure 4.

During these tests the set was operated on two antennas; one for the regular broadcast band and the other for the short-wave bands. The broadcast antenna was a single wire flat top, 65 feet in length with a 35 foot lead-in, the flat top ran east and west. The short-wave antenna was a sloping single wire of 120 feet in length with a feeder type lead-in of 35 feet. This antenna was directed northeast and southwest for world-wide reception from this location. Figure 5 shows how this feeder was attached to the short-wave tuned input circuits of the receiver. Figure 5 also shows how a regular single lead-in antenna was tried with the tuned feeder circuit connected between it and ground. The former method is recommended, but the second method gave much better results than using a single antenna for long and short waves without the tuned feeder input circuit.

On the short waves, it was an easy matter to log

THE RECORDING EQUIPMENT

Figure 2. View of the recording and reproducing apparatus which shows the controls and output meter clearly



stations in many countries regularly. The weekly logs showed regular reception at loudspeaker volume without ever once requiring the full amplification of which the set was capable. Listed below are some of the regularly heard countries: Four stations in Germany; three in France; eight in England; two Spanish stations; one Portuguese station; two Italian stations; one Danish station; two Swiss stations; one Dutch station; two stations in Russia; two stations in Morocco, Africa; one station in the Canary Islands; one station in South Africa; one station in Central Africa; two stations in Java; one station in the Philippine Islands; one station in Japan; two stations in Australia; one station in Costa Rica; one station in the Argentine; five stations in Colombia; one station in Venezuela; two stations in Ecuador; one station in Guatamala; two stations in Mexico and six in Canada; as well as all the principal short-wave stations in the United States. These were all short-wave broadcasting stations. Besides these many of the commercial, code and telephone stations of the world-wide systems were brought in and logged. On the police bands all of the American police transmitters were logged at various times. On the amateur bands of 20, 40 and 80 meters as well as some special wavelengths between these, amateurs were logged from all parts of the United States and some in foreign countries. Aviation stations all over the United States were recorded from time to time. Planes equipped with transmitters were often heard giving position reports and asking for weather advice. The operators conducting the test report that they had never gone after a station that was known to be on the air without picking it up at some time during the tests.

Unfortunately, from the listeners' viewpoint, we picked up regularly the aviation beacons with their vibrating and steady buzzes (certainly nothing very pleasant to listen to but we agree, of vital importance to aviation). Of course, in this small space we could not publish the complete log of stations heard during this period so what we have done has been to summarize, giving the reader the essential information as to the set's sensitivity and DX ability on the short waves.

On the broadcast band it has been possible during this period to log regularly in the evening hours stations on all channels and in many instances three or four stations sharing time on a channel have been logged. All of the clear channel stations throughout the United States are available during this time. It has also been possible to log broadcasting stations outside of the United States in Canada, Cuba, Mexico and other countries, some times with a difference of only 5 kilocycles from the American stations. The log includes reception of stations straight across the southern part of the United States, the west coast stations, major Canadian stations and of course Central American and all the eastern stations. Stations such as KFI, KNX, KPO, of the west coast are nightly visitors after the eastern stations shut down in mid-evening. The selectivity in New York on this wave band is great enough to permit of hearing WGN and WLW without interference from WOR. This is also true of stations in the two adjacent frequency bands of WEAF, WJZ and WABC. As to DX reception in daylight it is always possible to get the Philadelphia stations, WGY, WTIC in Hartford, WBZ in Springfield, KDKA in Pittsburgh regularly. And the log shows from time to time reception from Cleveland, Washington, Boston, Cincinnati, Columbus, Chicago, etc.

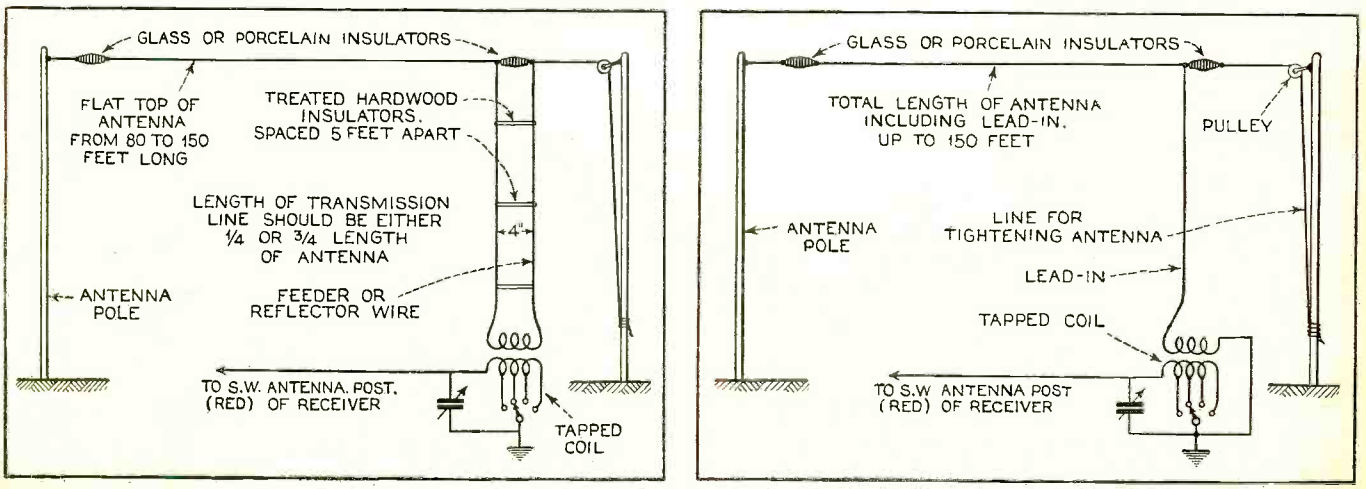
The automatic volume control with which the set is equipped is excellent in reducing fading from stations on all bands and it is also excellent as a tuning aid when fishing for distance. In passing over the local stations they are cut down to a volume only slightly louder than the distance stations themselves. The meter tuning indicator gives insurance that the stations are properly tuned in, and has been found to give a noticeable deflection even on stations as far away as Australia. One example of the effectiveness of the automatic volume control was indicated on the log when the operator

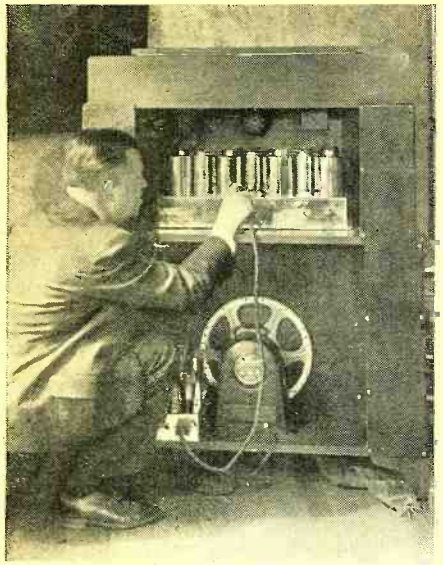
RECORDING THE FAMILY'S VOICES AT HOME

Home-made records of excellent quality may be made with a suitable two-button microphone attached to the recording apparatus in the console. The photograph shows a recording being made of a child singing under his parents' direction

HOW THE ANTENNA FEEDER SYSTEM MAY BE USED

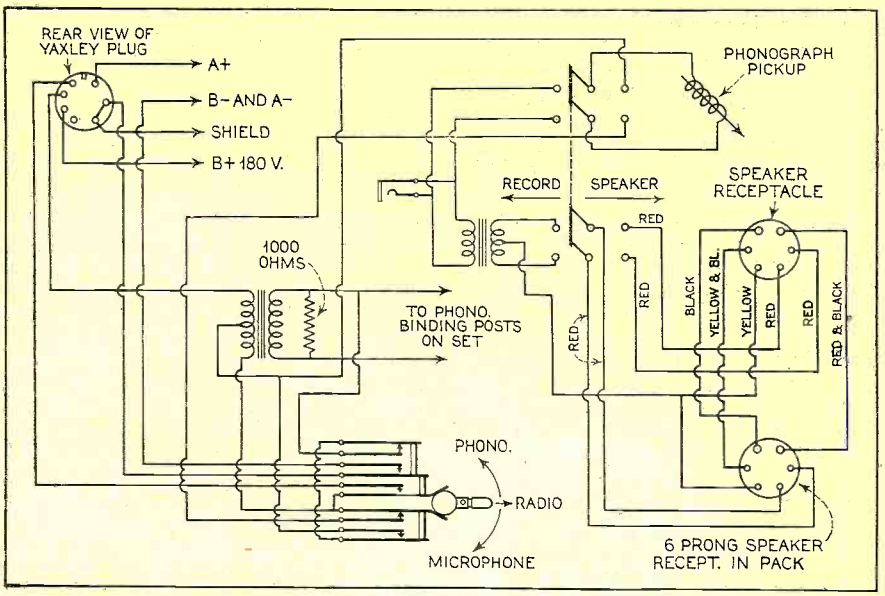
Figure 5. At left, the connections for using a feeder with a tuned input system for S-W reception. Diagram at right shows how the tuned input system may be used without a feeder by connecting one side of the primary coils to ground





INSTALLING THE SET

Figure 4. Rear view of the console, showing the chassis and other components



CIRCUITS FOR RECORDING AND REPRODUCING

Figure 3. This is the diagrammatic layout of the recording section, showing connections to the loudspeaker, the set and the power pack

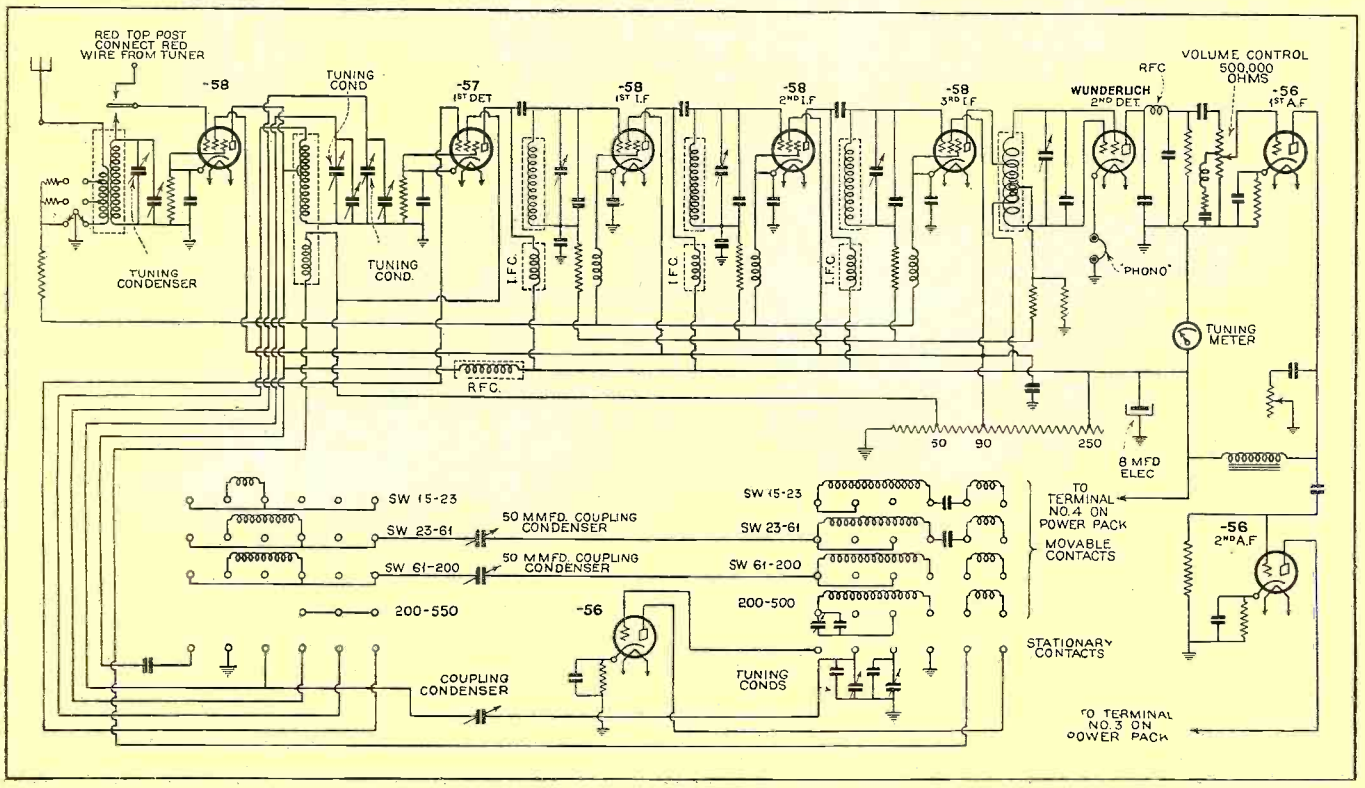
had written down that he had started to listen for KOA on 830 kc. just before the time the three Eastern stations on that wavelength were scheduled to shut down. He heard the Boston station sign off with no noticeable interference and immediately upon the carrier going off he heard another program with equal loudness. This also was without noticeable interference. This station in turn signed off and a moment later a third station was heard just in the act of signing off. Following this KOA came in clear and strong with no noticeable change in volume than with the nearer stations. Of course, this was a case that would happen once in a lifetime and what happened was that the automatic volume control increased the set's sensitivity upon the shutting down of the successively weaker carriers finally giving maximum sensitivity for KOA.

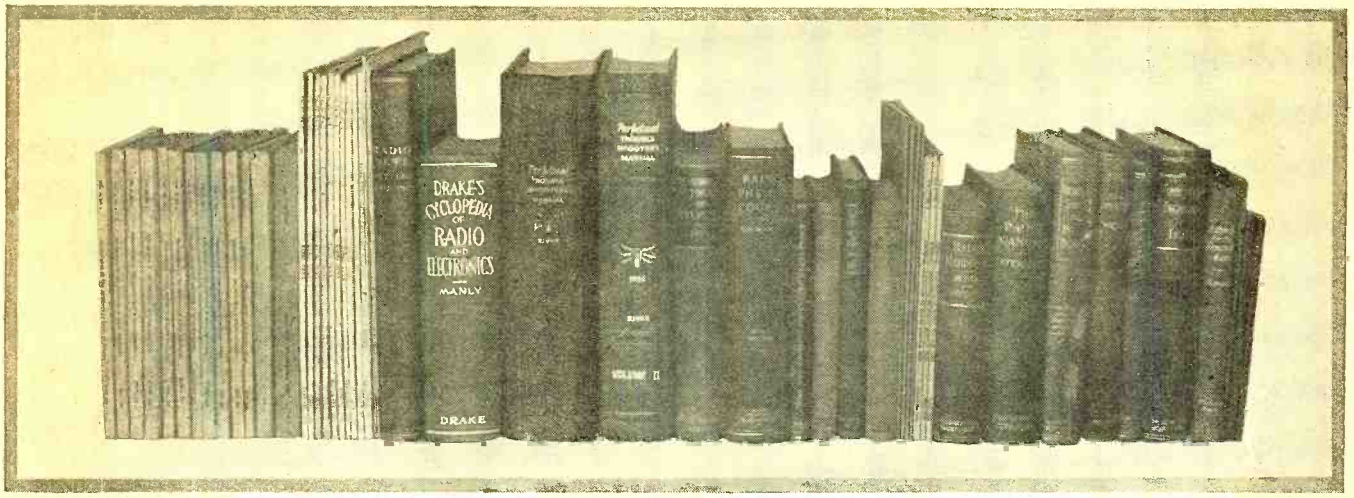
The tone quality of this complete unit both with radio and phonograph reproduction leaves nothing to be desired. The use of the large auditorium dynamic with its well-designed baffle of extremely heavy material prevents any suggestion of reverberation or rumble even on extremely high volume. Even when turned full up there are no parts of the cabinet that tend to vibrate at resonant frequencies although the windows of the test room vibrated tremendously.

The top compartment of the set contains the phonograph turn table and the controls for operating this equipment in either reproducing or recording. At the righthand side of Figure 2 may be seen the switch for radio, phonograph or microphone input to the set. When this switch is flipped back the receiver is set for phonograph reproduction. In the upright position the amplifier is attached to the radio receiver and when switched forward the microphone is in the circuit. A double-button carbon microphone is connected to the three binding posts at the left rear of this compartment.

Located immediately forward of the control switch is a control for switching from loudspeaker operation to recording. This substitutes the combination pickup and recorder in place of the loudspeaker for record mak- (*Continued on page 760*)

FIGURE 1. SCHEMATIC WIRING DIAGRAM OF THE ALL-WAVE CHASSIS





Technical Review

RADIO SCIENCE ABSTRACTS

Radio engineers, laboratory and research workers will find this department helpful in reviewing important current radio literature, books, Institute and Club proceedings and free technical booklets

Conducted by

Joseph Calcaterra

Communication Agencies and Social Life, by Malcolm M. Willey and Stuart A. Rice. McGraw-Hill Book Co., 1933.

This is one of a series of monographs prepared under the direction of the President's Research Committee on Social Trends. The book deals with the development and utilization of the media of communication, and interrelationships and their social effects.

There are four parts: The transportation agencies and their utilization, Part I; The agencies of point to point communication, Part II; The agencies of mass impression, Part III; The integration of Communication, Part IV.

Starting with the railroads, the book traces the development of the various agencies of communication: the mail, the telegraph, telephone, radio, newspapers and motion pictures.

There are some very interesting statistics as a result of a survey of radio listeners as well as the power used by stations in the past. To anyone interested in the present social problems as well as to those interested in communication the monograph is well worth studying.

The Radio Amateur's Handbook, by A. Frederick Collins, Seventh Edition, revised by George C. Baxter Rowe. Thomas Y. Crowell Co., 1933.

This handbook is intended for the beginner in radio who wishes to build his own experimental receivers and transmitters. The new edition has been enlarged by chapters on the use of photocells and the problems of television. In his efforts to present the theory to the layman in easy language I feel the author has gone too far sometimes. There are occasions where explanations are not quite correct and sometimes no explanations are given. The first chapters of the book were apparently written a long time ago and describe equipment that is since long out of date. They are, however, of interest to those who wish to trace the development of radio in the last 20 years.

The latter part of the book is the more interesting. One finds chapters on vacuum tubes and their function, radio vision, talking pictures, the photo-cell and ultra-short waves. Several types of the newer television systems are explained as well as projection machines for talking pictures.

In the back of the book are some regulations, the Insurance Underwriters' requirements, U. S. laws and regulations, tube tables and a few other tables.

Abstract of One Article from the Proceedings of the Radio Club of America, for March, 1933

Recent Developments in Cathode Ray Tubes and Associated Apparatus, by Allen B. Dumont. This paper discusses the characteristics of the cathode ray tube, means of obtaining the most brilliant spot, focussing and applications. The time delay screen is introduced which makes possible the cathoutograph. Several applications are described; use of the tube as an oscillograph, photographic recording of the wave form, checking modulation percentage, depth measurements and the radio compass.

Review of Articles in the March, 1933, Issue of The Proceedings of the Institute of Radio Engineers

The Study of the Propagation of Wavelengths Between Three and Eight Meters, by L. F. Jones. This paper contains descriptions of the equipment used to measure the propagation characteristics of wavelengths between three and eight meters. The majority of the observations were of television transmissions from the Empire State Building. Field strength and interference were obtained by receivers installed in an airplane, a dirigible, an automobile and an indoor installation.

Ultra-Short-Wave Propagation, by J. C. Schelleng, C. R. Burrows, and E. B. Ferrell. A method for measuring field strength and attenuation in the ultra-short-wave range is given in this paper, for distances up to 100 kilometers. Results are given for both "optical" paths over sea water and "non-optical" paths over level and hilly country. The subjects of reflection, diffraction, and refraction are discussed.

Some Results of a Study of Ultra-Short-Wave Transmission Phenomena, by Carl R. Englund, Arthur B. Crawford, and W. M. Mumford. This paper reports the results of a series of transmission experiments made in the range of 3.7 to 4.7 meters and over distances up to 125 miles. The effects of reflection and diffraction under such conditions are explained.

Review of Contemporary Literature

Tuned-Transformer Coupling Circuits, by A. J. Christopher. Bell Laboratories Record, March, 1933. This paper discusses the important characteristics required in tuned transformers and circuits designed to operate most efficiently on a narrow frequency band, without loss of quality. The circuits covered are specially adapted for power-line carrier-telephone systems.

Mounting Quartz Plates, by F. R. Lack. Bell Laboratories Record, March, 1933. The importance of proper mounting and rigid clamping of quartz crystals is discussed in this report. Curves and test data showing the effects of rigid and non-rigid mounting are given.

Western Electric Vacuum Tubes for use with Amateur Radio Telephone Transmitting Equipment. Obtainable at the offices of the Graybar Electric Company (for licensed amateurs).

This booklet supplies information on Western Electric vacuum tubes suitable for amateur transmitters. A double page is devoted to each tube. It shows a picture and dimensions of the tube, a brief statement of the purpose for which it is designed, ratings, characteristic data and some curves.

A Radio Distribution System for Apartment Buildings, by C. F. Boeck. Bell Laboratories Record, March, 1933. The new No. 3A Radio Distribution System, perfected by

the Bell Laboratories, designed to provide means whereby a single antenna installation can be used to supply as many as 3,000 receivers is described in this article. The coupling systems, and amplifiers required in installations where many receivers are to be connected to the system are explained.

Mixer Controls for Dynamic and Ribbon Microphones. General Radio Experimenter, February, 1933. A new mixer control designed to give noiseless electrical operation, rigid mechanical construction, small size and good frequency characteristics is described in this article.

Receiver Testing in the Ultra-High-Frequency Bands, by E. Karplus. General Radio Experimenter, February, 1933. A description of a new standard-signal generator designed for use at frequencies from 3 megacycles (100 meters) to as high as 100 megacycles (3 meters) is described in this article.

A Multi-Range Mains Operated Valve Voltmeter, by C. N. Smyth. The Wireless Engineer and Experimental Wireless, March, 1933. The tube voltmeter described in this article is designed to cover a range of from 0.5 to 150 volts and derives its source of power from the lighting line. It has a high effective shunt impedance and is suitable for use up to radio frequencies.

The Relation Between Loudness and the Minimum Perceptible Increment of Intensity, by R. R. Riesz. The Journal of the Acoustical Society of America, January, 1933. This paper brings out the fact that with certain restrictions, loudness and the minimum perceptible increment of intensity are related.

Review of Technical Booklets Available

1. *Parts and Sets, 1933 Spring and Summer Catalog No. 54.* A catalog of 152 pages, issued by the Wholesale Radio Service Co., one of the oldest mail order houses. The catalog contains illustrations, descriptions, specifications, list and net prices of a variety of radio parts, tools, replacement items, receiver chassis, complete sets, public-address systems and electrical merchandise required by dealers, servicemen, set builders, amateur and commercial operators, experimenters and engineers.

2, *1933 R. F. Parts Catalog.* An 8-page folder containing complete specifications on the entire line of Hammarlund variable and adjustable condensers, r.f. transformers, sockets, shields and miscellaneous parts for broadcast and short-wave receivers, complete short-wave receivers and transmitting variable condensers.

4. *A 15 to 200-Meter Comet "Pro" Superheterodyne.* A description of the outstanding features of the Hammarlund-Roberts high-frequency superheterodyyne designed especially for commercial operators for laboratory, newspaper, police, airport and steamship use.

5. *A 1933 Volume Control, Fixed and Variable Resistor Catalog.* This 12-page catalog, issued by Electrad, Inc., gives data on standard and special replacement volume controls, Truvolt adjustable resistors, vitreous wire-wound fixed resistors, voltage dividers and other resistor specialties and public address amplifiers (using new tubes). Many revisions and additions to the 1932 line are included.

6. *Line Voltage Control.* Characteristics and uses of a real voltage regulator and a chart showing the correct Amperite recommended by set manufacturers for their receivers. Also tells how to improve your customers' sets and make a profit besides.

Use of Pressure Gradient Microphones for Acoustical Measurements, by Irving Wolff and Frank Massa. The Journal of the Acoustical Society of America, January, 1933 The advantages of the pressure gradient microphone in making loudspeaker measurements, particularly outdoors, are pointed out in this paper. A number of arrangements of such microphones which were used in the tests, and the experimental results obtained are described.

Radio Statistics—Production and Use. Electronics, March, 1933. A statistical resumé of the present condition of the sale and use of radio products and services with special reference to the percentages of homes in the U. S. which are radio equipped.

Free Technical Booklet Service

THROUGH the courtesy of a group of manufacturers, RADIO NEWS offers to its readers this Free Technical Booklet Service. By means of this service, readers of RADIO NEWS are able to obtain quickly and absolutely free of charge many interesting, instructive and valuable booklets and other literature which formerly required considerable time, effort and postage to collect. To obtain any of the booklets listed in the following section, simply write the numbers of the books you desire on the coupon appearing at the end of this department. Be sure to print your name and address plainly, in pencil, and mail the coupon to the RADIO NEWS Free Technical Booklet Service. Stocks of these booklets are kept on hand and will be sent to you promptly as long as the supply lasts. To avoid delay, please use the coupon provided for the purpose and inclose it in an envelope, by itself, or paste it on the back of a penny postcard. The use of a letter asking for other information will delay the filling of your request for booklets and catalogs.

7. *Rich Rewards in Radio.* This 64-page book is filled with valuable and interesting information on the growth of radio and the opportunities existing in the fields of radio manufacturing, radio servicing, broadcasting, talking pictures, television, public-address systems and commercial-station operation on land and sea, for men who are trained to fill the many jobs created by the radio and allied industries. The book also contains information on the home-study courses in radio and allied subjects offered by the National Radio Institute. This book is available only to RADIO NEWS readers who are over 16 years of age and who are residents of the United States or Canada.

9. *Catalog of Fixed, Metallized and Precison Resistors.* This 16-page catalog gives specifications of the International Resistance Co. 1933 line of metallized, wire wound and precision wire-wound resistors, motor-radio suppressors, handy servicemen's kits, valuable technical data and list of free bulletins available on the building of servicemen's test equipment.

10. *Information on the Suppression of Motor Radio Noises.* This interesting and useful folder of the International Resistance Co. gives information on how to overcome motor-generator, ignition coil, interrupter and spark plug noises in automobile radio installations.

Proper Sites for Broadcast Stations, by C. W. Horn. Electronics, March, 1933. This article argues the cause of locating high-power transmitters in the centers of the areas which they are designed to serve in order to reduce electrical disturbances and fading effects. The claim is made that developments in transmitter and receiver frequency characteristics make this possible without introducing interference problems.

Time-Frequency DX Chart. QST, March, 1933. This handy chart shows the best times of day for communications between North America and certain points in the other five continents, on frequencies of from 14 to 3.5 mc.

Electrolytic Condensers, by R. O. Lewis. Radio Retailing, March, 1933. This article gives information and diagrams showing how to measure a.c. resistance, ripple, surge and working-voltage, capacity and leakage of electrolytic condensers. Permissable values are indicated.

How to Get Copies of Articles Abstracted in This Department

The abstracts of articles featured in this department are intended to serve as a guide to the most interesting and instructive material appearing in contemporary magazines and reports. These publications may be consulted at most of the larger public libraries, or copies may be ordered direct from the publishers of the magazines mentioned.

RADIO NEWS *cannot undertake to supply copies of these articles. They are NOT included in the* RADIO NEWS *Free Technical Booklet Service.*

16. *RMA Standard Resistor Color Code Chart.* A handy postcard size color code chart designed by the Lynch Mfg. Co. to simplify the job of identifying the resistance values of resistors used in most of the standard receivers. It also contains a list of the most commonly used values of resistors with their corresponding color designations. A catalog of products is included.

18. *Volume Controls, Fixed Resistors, Motor-Radio Spark Suppressors and Power Rheostats.* A 1933 catalog containing descriptions, specifications and prices of a line of Centralab standard, special and replacement volume controls for receivers, amplifiers, public-address systems and Talkie installations, fixed resistors, motor-radio spark suppressors, wire-wound rheostats and potentiometers. Details are given on how to obtain, without charge, a copy of the 64-page volume-control guide for servicemen.

25. *Noise-Reducing Antenna Systems.* This folder describes in detail the two types of noise-reducing systems perfected by the Lynch Mfg. Co. for both broadcast and short-wave reception. The transposition type can be used on both long and short waves and is specially adapted for use in connection with all-wave and amateur receivers. The shielded transmission type is especially suited for use on broadcast receivers.

29. *Practical Radio Engineering.* This 32-page catalog gives details on the courses offered by the Capitol Radio Engineering Institute of Washington, D. C., to fit the requirements of professional radiomen, radio servicemen, operators and technicians, who are ambitious to get into the higher paid positions in radio reserved for those with advanced training. Three types of courses are offered: (1) an intensive 9-months full-time resident course requiring regular attendance at classes; (2) a complete home-study course which can be mastered entirely at home and (3) a combination home-study and post-graduate resident course consisting of the regular home-study course followed

by 10 weeks practical training at the school with regular full-time attendance at classes. (Please do not write for this catalog unless you are interested in taking up a course on radio.)

30. *Shielded "Noise-Reducing" Antenna System for Broadcast Waves.* A description of a new Lynch low-cost, impedance-matching system of unique design—including impedance-matching transformers for the antenna and for each receiver—which now makes possible the use of a shielded transmission line of any length, without loss of signal strength. This system is designed for the elimination of "man-made" electrical interference on the broadcast frequencies. It is easy to install and provides for using several receivers on a single aerial. It offers many opportunities for profitable jobs to dealers and servicemen.

34. *Service Man's Replacement Volume-Control Chart.* A revised complete list, in alphabetical order, of all old and new receivers showing model number, value of control in ohms and a recommended Electrad control for replacement purposes. Contains specifications for over 2,000 different receiver models. A handy chart which should be in every serviceman's kit.

39. *Radio Servicing and Radio Physics.* A 4-page folder which gives descriptions and tables of contents of two of the most complete, easily-understood and inexpensive books on every phase of radio. The books are written by A. A. Ghirardi and Bertram M. Freed and should be in the libraries of every radio student, experimenter and serviceman. The fact that they are used as standard tests by many radio schools and that chapters have been reprinted in RADIO NEWS Magazine is an indication of their value.

40. *Resistor Indicator.* A complete description of an instrument designed by the International Resistance Co. to enable servicemen and other radio men to determine the resistance value of a defective resistor without the use of meters, wiring diagrams or specifications of the receiver circuit. This small, handy instrument should be in every serviceman's kit.

June, 1933
RADIO NEWS Free Technical
Booklet Service
222 West 39th Street
New York, N. Y.

Gentlemen: Please send me, without charge, the booklets or folders I have filled in below:

Numbers.....
.....

☐ Serviceman in Business for Myself
☐ Serviceman Employed by: ☐ Manufacturer, ☐ Jobber, ☐ Dealer, ☐ Service Organization
☐ Radio Engineer
☐ Experimenter
☐ Laboratory Technician
☐ Dealer
☐ Jobber
☐ Professional or Amateur Set Builder
☐ Licensed Amateur
☐ Station Operator
☐ .....
☐ .....

I am a ☐ subscriber ☐ newsstand reader.

I buy approximately $..... of radio material a month.

Name.....

Address.....

City.....State.....

PLEASE USE PENCIL AND PRINT, IN FILLING IN COUPON

41. *How to Build the Economy "Eight".* A folder prepared by Wholesale Radio Service Co. giving constructional information, diagrams, list of parts, etc., of an efficient 8-tube receiver which can be built from a kit which sells for $13.75. Servicemen and set builders can put in their spare time to advantage building and selling these sets.

42. *How to Build Useful Servicing and Testing Instruments with Simple, Standard Meters.* This bulletin gives complete data, with diagrams, show how any meter—preferably a low range milliammeter can be used to measure amperes, volts and ohms over any desired range through the use of proper shunt and series resistors. The bulletin has been prepared by the Lynch Mfg. Co.

43. *How to Modernize Old Set Analyzers.* This valuable folder describes in detail the new set analyzer remanufacture plan perfected by the Supreme Instruments Corp. for the conversion of obsolete set analyzers such as the Jewell Pattern 198, 199, 408 and 409 analyzers; Weston Model 537, 547, 565 and 566 set testers; and Supreme 99-A, 400-A and 400-B diagnometers into efficient, up-to-date testing equipment, at low cost. Servicemen and experimenters, who have been working under the handicaps imposed by the use of analyzers which are no longer able to cope efficiently with the problems introduced by new tubes and receivers, will find this folder of great value. Special auxiliary units for increasing the usefulness of standard analyzers are also described.

A New Professional Serviceman's Course

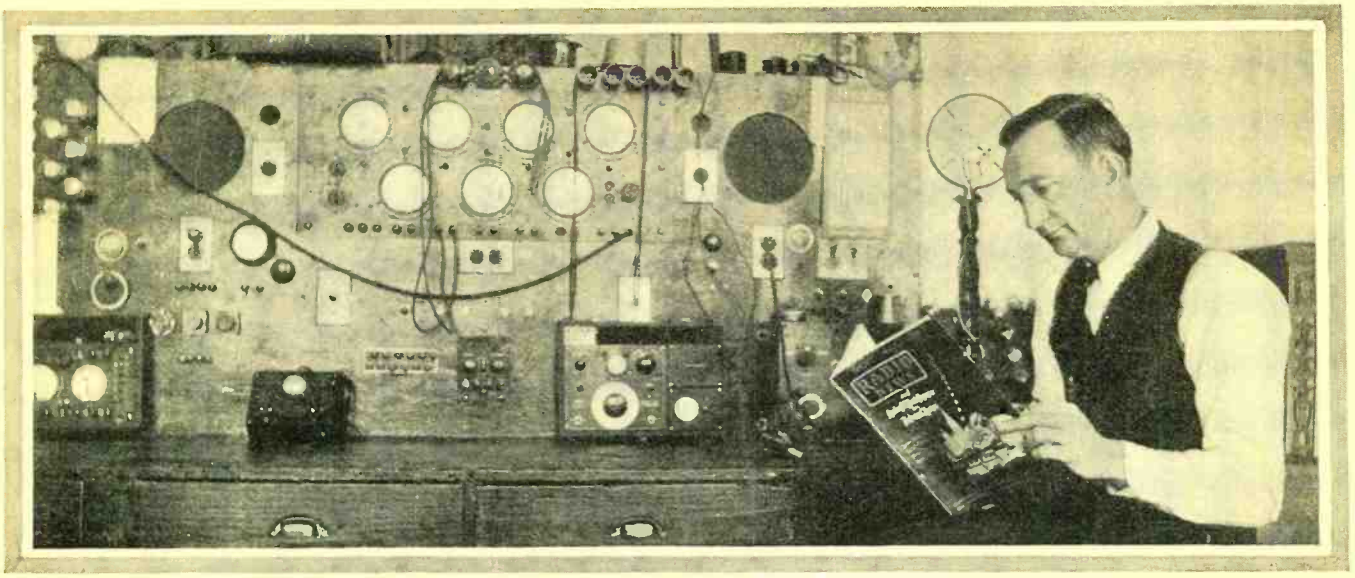
Servicemen have long realized the necessity for having a good groundwork of the theoretical side of radio as well as practical and general information in service working. And servicemen are now realizing that this information cannot be picked up "out of the air."

The National Radio Institute has recently prepared a new course for professional servicemen in which theory and practice are presented in a new way. The new course includes 52 lessons, including such subjects as: the fundamentals of electricity, magnetism, energy conversion, information and operating characteristics of tubes, all kinds of measurements in radio and tube circuits, testing of radio instruments and circuits, laboratory procedure, trouble shooting, repair notes for the serviceman, practical application of accessories, mathematics in radio, photo-cells and other associated apparatus. All in all, there are close to 200 subjects taken up in the course. There is also a lesson-grading service and a series of 12 special reference books and 8 service manuals. The course includes free consultation service, the National Radio News and offers a diploma on graduation. Two years are given in which to complete the course. During this time, if it is requested, promotion and advancement reports will be sent by the Institute to the student's employer covering the general quality of the work done and the progress being made by the student.

The course is recommended to servicemen in a recent issue of the Philco Service Bulletin sent out by the Philadelphia Storage Battery Company.

The Listener's Tax in France

PARIS—With the beginning of the year 1933 a listener's tax will probably be introduced in France. The proposed tax amounts to 50 francs per year for tube receivers and 15 francs per year for single-detector receivers. The French Minister of Posts and Telegraphs said, in one of his last speeches, that the total revenue of the tax will not exceed the expenditures for the French broadcast network.



The Service Bench

Mobile P. A. Systems—Service Letterheads—Servicing Radiolas, Steinite, Crosley, Atwater Kent, Silver, Brunswick, Knight, Stewart Warner—Miscellaneous Service Hints and Kinks

Conducted by
Zeh Bouck

THE serviceman is rapidly recognizing the possibilities of mobile public-address systems, both as a source of sideline income and as an advertisement for his service business. A typical installation is shown in Figures 1 and 2—an attractive vehicle that cruises over a good bit of West Coast territory and is known as the "Crimson Crier Broadcasting Car". This beautifully conceived installation was built about a Chevrolet de luxe delivery car by W. E. Ellinger, of Los Gatos, California. Three speakers are used, two large exponentials atop the truck, connected through short goose-necks to dynamic pots within, and one large dynamic mounted on the rear door, which acts as a baffle.

The body of the truck is divided into rear and front compartments. The after section is lined with celotex, bound with aluminum moulding, and houses the auxiliary and main power plants. A 600-watt alternator is driven by a precision-balanced gas engine through an automatic clutch. The emergency equipment—which has occasionally saved the day—comprises a complete d.c. amplifier with all associated batteries.

FIGURE 1

The main amplifying panel, with controls and a turntable, is mounted in the forward compartment for convenient operation from the driver's seat. A 4-position mixer provides adequate change-over facilities for remote-control points, radio, phonograph and local announcements. Condenser microphones—R. C. A. and the latest Remler types—are used exclusively.

Special attention has been directed to the design of the phonograph equipment in a successful effort to solve the problems associated with mobile operation. By careful suspension, rather than the use of weights and brute-force technique, it is possible to secure satisfactory phono operation at speeds as high as 45 miles-an-hour on good roads, and to make right-angle turns at 20 miles-per-hour without upsetting the position of the needle in the record groove.

FIGURE 2

One electrical feature worthy of emphasis in Mr. Ellinger's installation is the high-pass filter incorporated in the mixing circuit which is used when extremely high output on voice is required. The reduction of bass-note response in no way affects intelligibility and raises the overload point of the speakers considerably above the already high output of the giant pots.

FIGURE 3

The "Crimson Crier" finds profitable outlets in fairs, automobile races and local publicity campaigns. The flat panelling of the car provides ample room for sign advertising. This is occasionally augmented by additional placards, as shown in Figure 2. On this particular job, the "Crimson Crier" was used to advertise the A. A. A. sponsored Northern California auto races, held at the Oakland speedway, and as a P. A. set-up during the races themselves.

A variation of this general idea, which will appeal to many servicemen who do not care to sacrifice what may possibly be the family car on the altar of audible broadcasting, is illustrated in the trailer photographed in Figure 3. This trailer, which was built by C. L. Johnston of Oneonta, N. Y., contains two 15-watt amplifiers, ten stadium speakers with night flares, six microphones, phonograph equipment, a 32-volt lighting plant and a converter. Sleeping quarters are also provided for convenience when on location. In this particular instance, P. A. equipment is also mounted in the car, which can be operated separately from the trailer on jobs requiring less elaborate apparatus. Small flag poles can be inserted at the tips of each bumper, carrying advertising pennants and banners.

FIGURE 4

The "Voice of Electrux" band wagon shown in Figure 4 borrows a few ideas from the circus parade. The transparent letters, which can be rearranged to put over any

idea within the limits of the panels and a 10-inch alphabet, are illuminated at night, and supplement the sound features broadcast through four well-loaded dynamics. Incidentally, this job, one of several similar units, is for sale, and interested readers might find it worth while to communicate with the "Voice of Electrux" at 616 Fifth Street North, Minneapolis.

And just to prove that a 5-ton truck is not essential to sound advertising, Dave Whitehead, of Whitehead's Radio Service, Greenville, Texas, sends us Figure 5—a photo

FIGURE 5

of his Austin, which also performs the indispensable service of pick-up and delivery. The dynamic speaker is hidden and baffled against the bottom of the car, the sound being deflected outward by the pavement. The Austin is more or less of a curiosity itself, and when it gives vent to mysterious music as it rolls along, its advertising value is more than doubled.

Touching-Up the Letterhead and Business Card

The more attractive business stationery, as well as business cards, postals and circulars, carry distinctive embellishments not available in standard type fonts. Many samples of such have been illustrated in the *Service Bench* in its campaign to apply sound merchandising principles to the business of radio servicing. Appreciating the difficulty and expense of obtaining these cuts, especially where original art work is concerned, the *Service Bench* has prepared the illustrations shown in Figures 6 to 10 inclusive.

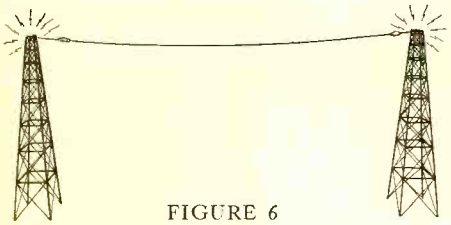


FIGURE 6

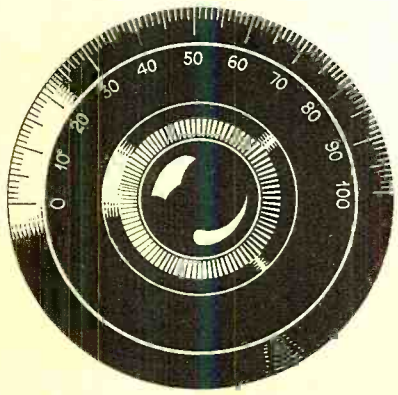


FIGURE 7

Cuts of any size desired can be made from these reproductions by your local engraver, at a very low cost, and incorporated, by your printer, in whatever literature or letterheads he prepares.

Figure 6 is well adapted to a letterhead,

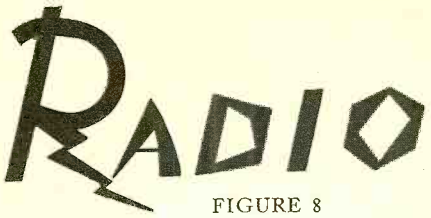


FIGURE 8

the cut being mortised and the type set up under the antenna between the towers. A smaller cut made from this illustration will also be suitable for the business card.

The dial drawing, Figure 7, lends itself to a variety of uses. With the addition of a few type set words, it makes an attractive trade-mark, and placed almost anywhere on

FIGURE 9

your letterhead—in a corner, or top center—it emphasizes pictorially the nature of your business. Figures 8, 9 and 10 offer further embellishments that get away from the sameness of ordinary type forms—at least so far as the significant word "Radio" is concerned.

To prepare these reproductions for the engraver, cut out those that appeal to you, and paste them on a piece of stiff cardboard. Designate the size of the desired cut in any *one* direction in pencil on the cardboard.

FIGURE 10

The cuts can be made smaller or larger than the reproductions shown here.

ALL IN THE DAY'S WORK

James A. Robinson of Methuen, Mass., and Alexander Walker, River Jordan, B. C., Canada, both find fault with the bleeder resistors in Radiola supers—Mr. Robinson registering his complaint against the Radiola 66 and Mr. Walker against the 60. Writes Mr. Robinson:

"Suspect this resistor if the efficiency of the receiver falls below normal. Test will show a decrease in plate voltage on all tubes, particularly the radio-frequency tubes. The bleeder resistors should have a resistance of 6000 ohms. (In the Radiola 60 the correct value is 20,000 ohms.)

"Whether or not faulty, the removal of this resistor will increase the efficiency of the receiver, providing the serviceman observes

(*Continued on page* 765)

Radio Physics Course

LESSON EIGHTEEN—MAGNETIC FIELDS

By Alfred A. Ghirardi

WHILE permanent magnets have definite uses in radio and electrical work, magnetism produced by electric currents flowing through electrical conductors is employed far more in practical electric devices because it is possible by this means to create much stronger magnetic fields. Also, many of these devices, for example the transformer, depend for their operation on a changing or varying field which cannot be obtained practically with a permanent magnet. Almost every part and wire in a radio transmitter and receiver has around it an associated magnet field produced by the current flowing through it. Electromagnetic fields, more intense than could be obtained by the permanent magnets made of the alloys available at the present time, are in daily use in the fields of electrodynamic speakers, in transformer cores and in the field frames of electric motors and dynamos.

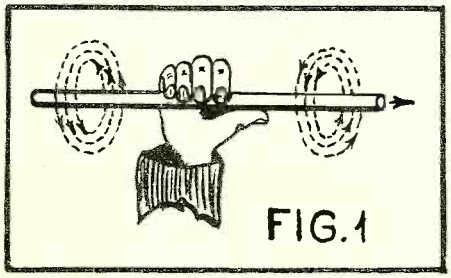


Figure 1. Right-hand rule for finding the direction of the current through or the direction of the magnetic field around a conductor

Most of the facts concerning magnetism and permanent magnets explained in the previous chapter were set forth by Gilbert as early as 1600. Of course the development of the various special steel and nickel alloys which have made possible the manufacture of very small permanent magnets having remarkably high strength, came only recently. Many of the early electrical experimenters suspected that there was a relation of some kind between magnetism and electricity, but it was not until 1819 that Oersted, a Danish physicist, discovered a definite relation between the two, namely, that a flow of electric current is *always* accompanied by surrounding lines of magnetic force which have exactly the same properties as those which surround permanent magnets. This quickly led to a tie-up of the studies of magnetism and electricity, which, up to that time had been considered separately.

Magnetic Field Around a Straight Current-Carrying Conductor

Oersted found that an electric current, which represents charges of electricity in motion, produced a magnetic field. This was easily demonstrated by placing a small compass needle (a small permanent magnet pivoted on a bearing having very little friction) in the vicinity of the wire. The fact that the needle would always turn around to a position at right angles to the length of the wire, indicated that it was being acted upon by some force. Since the only thing which will act upon a magnet not in contact with anything other than the air is a magnetic field, it was evident that the electric current produced a magnetic field in the space around the wire.

Simple experiments show clearly that when a current flows through a conducting path, magnetic lines of force surround it in concentric circles. (These are sometimes called *magnetic whirls* because of their circular form.) The direction of these lines of force depends upon the direction of the current. The greater the strength of the current (number of amperes) the stronger is the magnetic field. The magnetic lines of force are distributed uniformly along the entire length of the conductor. No *magnetic poles* exist around a *straight* current-carrying wire because the lines do not enter or leave the wire at any points. The direction of the lines of force around a wire may be determined by using the following Right Hand Rule for Wires:

"Grasp the wire with the right hand with the thumb extended in the direction in which the current is flowing, then the fingers will be pointing in the direction in which the magnetic lines of force encircle the wire."

If it is desired to determine the direction in which a current is flowing through a wire, a compass needle can be placed near the wire, and by noting the position it takes and applying this rule the direction of the current can be determined.

Magnetic Field of Solenoid

A solenoid is a coil of wire of more than one turn wound like a coiled spring as shown in (B) and (C) of Figure 2, and having a non-magnetic core. A solenoid having but one turn (A of Figure 2) is called a *loop* or *helix*. In electrical work the term *solenoid* is used extensively, but in radio work the terms coil, and *inductor* have come into rather popular use. The student must remember these names, and remember that they are all used rather loosely to refer to the same thing, although each really has a definite meaning as will be pointed out later.

If a wire or conductor is made into a single-turn loop, as shown at (A) of Figure 2, all the circular magnetic lines of force which surround the wire will pass through the center of the loop as shown. The magnetic field within the loop is *more dense* than on the outside, since all the lines of force are concentrated into a smaller area here than on the outside where they spread out. However, the *total number* of lines of force is the same inside the loop as it is outside.

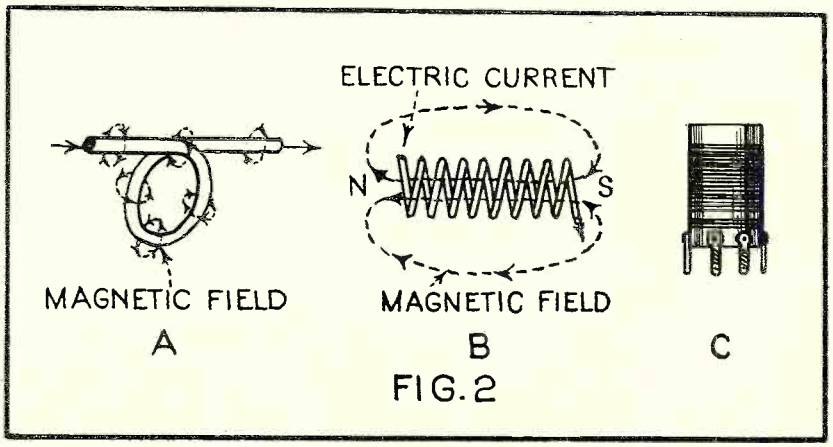


Figure 2. Magnetic fields around (A) a single turn coil; (B) a solenoid. (C) A form of solenoid tuning coil used in radio receivers

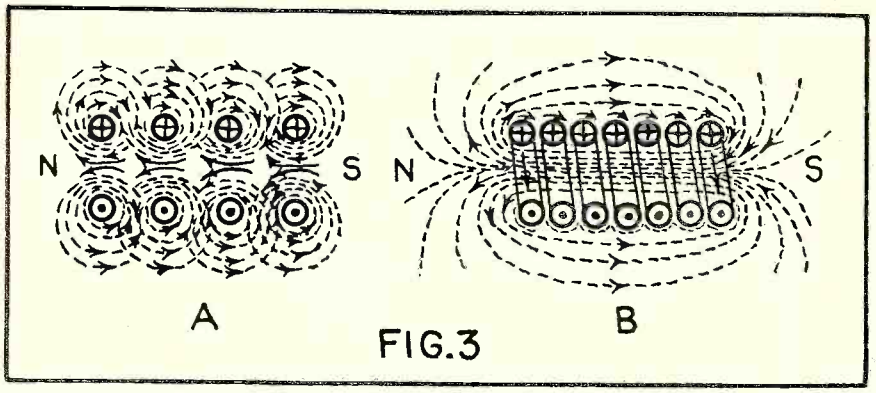


Figure 3. How the magnetic fields or forces around the individual turns of wire in a solenoid coil, as shown at (A), combine to form the resultant field shown at (B)

By winding a number of these loops together as shown at B, a solenoid is formed having properties similar to a bar magnet. The magnetic fields or forces surrounding the individual turns of wire unite to form

* Radio Technical Pub. Co. Publishers' Radio Physics Course.

a resultant magnetic field of force around the entire coil. In C of Figure 2 is shown a type of solenoid tuning coil used in radio receivers. This contains many turns of fine silk-covered copper wire wound on a thin form of Bakelite.

We must remember that magnetic fields are really magnetic *forces*. "Forces" acting in the same direction combine to form a stronger resultant force equal to the sum of the individual forces. "Forces" acting in opposite directions oppose each other and their resultant force is equal to the difference between them. When a wire is wound into the form of a solenoid the magnetic forces around the individual turns act on each other. In Figure 3 is shown a cross section view of a solenoid cut along its center axis, with the top half removed. The direction of current flow is down the back ends of the turns and up the front. A cross mark on the end of a wire indicates that the current is flowing down from that point, (the tail of the arrow used for showing current direction). A dot on a wire indicates that the current is flowing up to that point (head of the arrow coming up).

At (A) of Figure 3 are shown the lines of force actually existing around a few turns of the solenoid. The turns are shown spaced to make the illustration clear. Remember that the circular magnetic field exists all along the length of the wire of the solenoid. The direction of these lines of force is determined by the right hand rule. It will be noticed that inside the solenoid all the lines of force are in the same direction, therefore combining to produce a strong field through it as shown in (B). In the space between each two adjacent turns, the lines of force are equal in strength and opposite in direction as shown, so they cancel each other (the magnetic *forces* really neutralize each other) that is, there is no field between the turns. On the outside of the coil the lines of force of adjacent turns are all in the same direction, so they add or combine to produce a resultant field around the outside of the solenoid in the direction shown in (B).

Poles of a Solenoid

Examination of (B) shows that the lines of force go through the center of the solenoid, out at one end, around the outside, and back into the other end. Thus a magnetic pole is formed at each end—one where the lines of force come out of the coil (N pole), and one where they enter the coil (S pole), just as in the permanent steel magnet. It is evident that the direction of the *current* determines the direction of the lines of force and also the poles.

Condenser "Mike"

(*Continued from page 715*)

have a microphone transformer in its input.

The attenuator R3, is not essential if there is one in the main amplifier. However, there is often occasion to locate the microphone at some distance from the main amplifier and it is therefore a decided convenience to be able to regulate volume at the microphone, without having to run back and forth between the "mike" and the main amplifier in making this adjustment.

With the equipment described here an extremely good frequency characteristic is obtained—far surpassing that of the average carbon microphone employed with "ham" transmitters and in public address systems. Not only are the low frequencies faithfully reproduced but a decided improvement is obtained in the case of the high frequencies, which lend richness and natural tone in the reproduction of speech and music.

List of Parts

C1, C2—Fixed condensers, .02 mfd., (mica dielectric recommended)
M—Bruno condenser microphone, Type AM
R1—Resistor, 10 megohms
R2, R4—Resistor, 2 megohms
R3—100,000 ohm wire wound potentiometer with battery switch
R5—Amperite 0.9 ohm ballast resistor
SW—Switch (See R3)
T—Kenyon output transformer, Type KPO
2 Tube sockets, 4 prongs
2 RCA Type 864 tubes
1 Bruno head-amplifier case (see Figure 7) or Alcoa standard 5 inch aluminum box shield (Figure 4)
1 Shielded cable, 6 wire, of desired length

A 2A3 Amplifier

(*Continued from page 723*)

more critical of the two, but it is evident that even here minor variations will not be of great importance, unless the attenuator is being used for accurate or laboratory work. 25 ohms is the nearest commercial resistor available for B. If we check carefully to find the error entailed by this change, we find that the attenuation will be slightly over 24 DB instead of 25 DB, which is obviously of little consequence in P.A. or broadcast work.

There are many cases in P.A. work where it is found desirable to couple a number of microphones into an amplifier without too complicated an intervening mixing circuit. Through the use of simple attenuators as described above, all the microphones can be brought down to an equal level and then a single volume control can govern the group.

The rated power output of 15 watts for the 2A3 tubes is based on fixed bias. Based on sine-wave input, however, self bias would be identical in operation. Unfortunately, music or speech is not sine wave. Instead of a peak-to-effective-voltage ratio of 1.41 as in a sine wave, ratios of 5:1 or so have to be contended with in music. It is evident therefore, that there will be times when the grid will be driven positive. On such occasions there will be an appreciable grid current, an appreciable increase in plate current, and a proportional increase in bias voltage. This would tend to cause high distortion on positive grid excursions. To minimize this effect a condenser of fairly large value should parallel the 2A3 bias resistor. This will minimize the fluctuating bias condition. If it is desired to use fixed bias, connect the 2A3 filament center-tap to ground and insert a C battery between the grid return of the input transformer and ground.

In the actual construction of the amplifier, it will be noted that quite a large number of 2 mfd. condensers were used. These were incorporated in two triple-2 mfd. electrolytic units. A 5Z3 rectifier tube was used. This tube has characteristics practically the same as that of the 83, but is of the high-vacuum type using no mercury. This eliminates the possibility of so-called "tunable hum."

Choke input is used in the filter circuit as this improves regulation. However, if it is desired to excite a speaker field of 1000 to 1500 ohms, the field can be inserted in place of the first choke and a 2 mfd. condenser connected between the rectifier filament and ground. An additional 100 volts is obtainable with this condenser input, which balances out the drop in the speaker field. This condenser can also be left in the circuit (as shown) if it is desired to obtain higher power output from the amplifier.

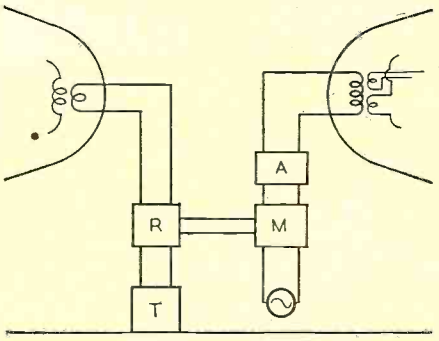
Latest Radio Patents

A description of the outstanding patented inventions on radio, television, acoustics and electronics as they are granted by the United States Patent Office. This information will be found a handy radio reference for inventors, engineers, set designers and production men in establishing the dates of record, as weil as describing the important radio inventions

By Ben J. Chromy*

1,876,694. RADIO SYSTEM AND METHOD. GEOFFREY GOTTLIEB KRUESI, Palo Alto, Calif., assignor to Federal Telegraph Company, San Francisco, Calif, a Corporation of California. Filed May 21, 1928. Serial No. 279,293. 2 Claims.

2. A radio communication system comprising a transmitting and a receiving station, a paraboloidal reflector having its axis sub-



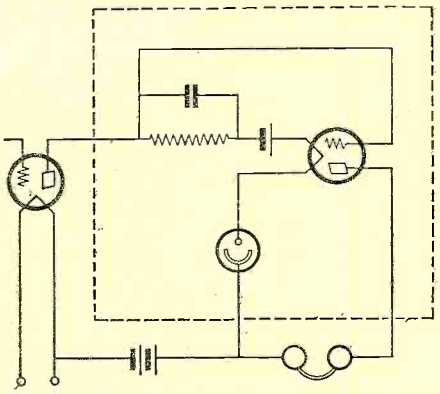
stantially tangent to the earth's surface with radiating means mounted therein having both a horizontal and vertical component at the transmitter, and a paraboloidal reflector at the receiver having its axis substantially tangent to the earth's surface and having therein as the sole essential absorbing element, a conductor lying in a vertical plane intersecting the transmitter and receiving stations.

1,874,191. ELECTRO-OPTICAL SYSTEM. HERBERT E. IVES, Montclair, N. J., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a Corporation of New York. Filed Oct. 4, 1930. Serial No. 486,363. 10 Claims.

1. An apparatus for producing image currents for controlling the production of images in color comprising light-sensitive electric elements, a record representative of an object or view having unlike portions corresponding to different color characteristics of the same part of the object or view, means for successively scanning elemental areas of said record, and means for directing light simultaneously from said portions to different ones respectively of said light-sensitive electric elements to produce separate image currents.

1,877,165. ELECTRIC CONTROL CIRCUIT. OLIVER T. FRANCIS, Quantico, Va. Filed Dec. 27, 1928. Serial No. 328,662. 6 Claims.

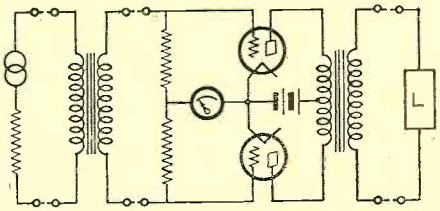
1. In an electric circuit, a vacuum tube amplifier having an input and an output circuit, a source of signals for said input circuit, a source of voltage for said output circuit, a load in said output circuit, means for controlling the plate voltage impressed on said vacuum tube in accordance with the envelope of said signals, said means comprising a second vacuum tube having an anode,



a cathode and a control electrode, said anode and said cathode being connected in said output circuit in series with said load, and an impedance connected between said cathode and said control electrode and common to said output circuit.

1,878,740. PUSH-PULL AMPLIFIER. HAROLD A. WHEELER, Great Neck, N. Y., assignor to Hazeltine Corporation, a Corporation of Delaware. Filed July 16, 1929. Serial No. 378,630, and in Canada June 26, 1930. 32 Claims.

1. An electric wave repeating apparatus comprising divided input and divided output sections with a pair of electron discharge devices each including a control electrode connected in opposition there between, and high impedance means associated with said input section adapted to cause a signal



wave applied between said control electrodes to be repeated at each instant in substantial entirety by the said device which receives a negative potential therefrom.

1,873,790. SOUND-REPRODUCING APPARATUS FOR ADVERTISING PURPOSES. FERDINAND GEORGE SALCEDO, Quantico, Va. Filed Dec. 13, 1929. Serial No. 413,911. 1 Claim.

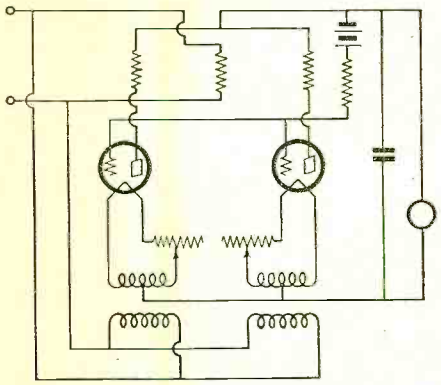
In combination, a theatre having a sound and picture reproduction apparatus located therein, loudspeaker units located exteriorly of the theatre, microphones located within the theatre, an amplifier for the microphones, a control switch in the theatre, an electrical circuit between the loudspeaker units and the sound and picture reproduction apparatus and controlled by the switch, and

* Patent Attorney, Washington, D. C.

an electrical circuit between the loudspeaker units and the microphones and the amplifier therefor and controlled by said switch whereby either music and applause within the theatre or movietones from the sound-reproduction apparatus may be transmitted exteriorly of the theatre.

1,866,679. DIRECT CURRENT SUPPLY SYSTEM. JOSEPH SLEPIAN, Swissvale, Pa., assignor to Westinghouse Electric & Manufacturing Company, a Corporation of Pennsylvania. Filed Mar. 31, 1926. Serial No. 98,853. 9 Claims.

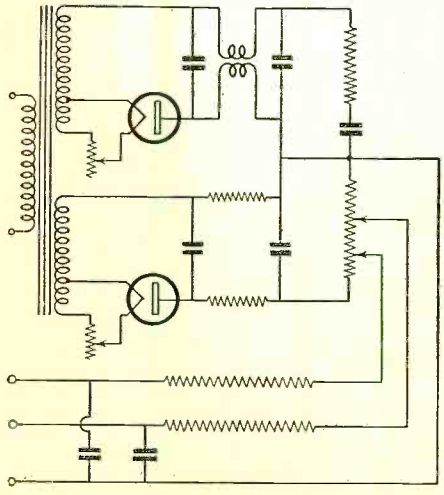
7. The combination with an alternating-current source, a rectifying space-current device and a direct-current load connected in



operative relation, the space-current device being of a type having an anode, a cathode and a grid susceptible of increasing the internal impedance of the device when it is negative with respect to the cathode, of a fixed resistor and a variable-resistance device connected in shunt across the load, and a connection between the grid and the common terminal of said fixed and variable resistors, the connections being such and said variable-resistance device being of such nature as to inherently operate to render said grid negative with respect to said cathode only whenever excessive rectified potentials are impressed upon said load.

1,875,123. GRID-BIASING UNIT FED BY ALTERNATING CURRENT. EKKO OOSTERHUIS and JACOB MARINUS UNK, Eindhoven, Netherlands, assignors to Radio Corporation of America, a Corporation of Delaware. Filed Nov. 26, 1927. Serial No. 235,925, and in the Netherlands Dec. 14, 1926. 6 Claims.

1. A circuit arrangement for supplying plate and grid potentials from an alternating current supply comprising a transformer



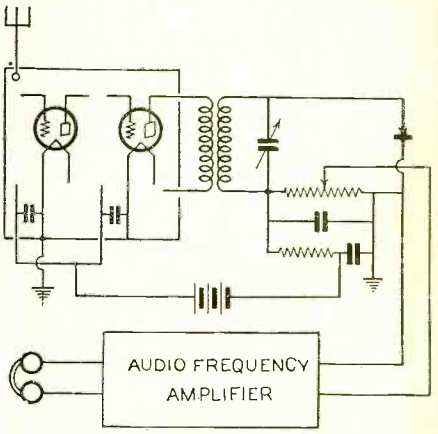
having a primary winding connected to the alternating current supply, a grid potential source including a rectifying device fed by a secondary winding on said transformer, a smoothing out circuit composed of condenser and resistances connected to the output elements of said rectifying device, a resistance connected across the terminals of said smoothing out device, a plurality of connectors tapped to variable points on said resistances, a resistance in each of said connectors, a plate potential source including a rectifying device fed by said transformer, a smoothing out circuit composed of condensers and inductances connected to the output elements of said last named rectifying device, a resistance and condenser connected in series across the terminals of said last named smoothing out circuit, and a connection between said smoothing out circuits.

1,874,111. ELECTROLYTIC CONDENSER. RALPH D. MERSHON, New York, N. Y. Original application filed Dec. 31, 1925, Serial No. 78,534, Patent No. 1,773,492. Divided and this application filed Jan. 25, 1928. Serial No. 249,314. 4 Claims.

1. In an electrolytic condenser, a filmed metal anode, an electrolyte in which the anode is immersed, an unfilmed metal cathode surrounding the anode and in contact with the electrolyte, and a sheet of flexible non-conducting material, harmless to the electrolyte and unharmed thereby, surrounding the anode between the same and the cathode.

1,869,331. AUTOMATIC CONTROL FOR AUDION AMPLIFIERS. STUART BALLANTINE, Mountain Lakes, N. J., assignor to Boonton Research Corporation, Boonton, N. J., a Corporation of New Jersey. Filed Nov. 5, 1927. Serial No. 231,273. 12 Claims.

1. An audio amplifier including an audion for signal wave amplification, an output circuit, and means suppressing fluctuations in said output circuit due to variations in the strength of an incoming signal, said means comprising a rectifier for incoming signal energy, and means for impressing upon the grid of said audion a direct current bias voltage derived from said rectifier, said



rectifier being of the type having an approximately linear relation between direct current output and radio frequency input above a critical input voltage.

1,874,313. LOUD SPEAKER MOUNTING FOR AUTOMOBILE RADIOS. RALPH H. LANGLEY, Cincinnati, Ohio, assignor to The Crosley Radio Corporation, Cincinnati, Ohio, a Corporation of Ohio. Filed June 25, 1930. Serial No. 463,774. 3 Claims.

1. A device to mount an instrument on an upright support comprising a series of members on the back of the instrument, spaced out therefrom with one end of each member free, leaving an entrance space thereunder, and a series of members on the face of the support, spaced out therefrom and so arranged that each member will enter the

(*Continued on page* 760)

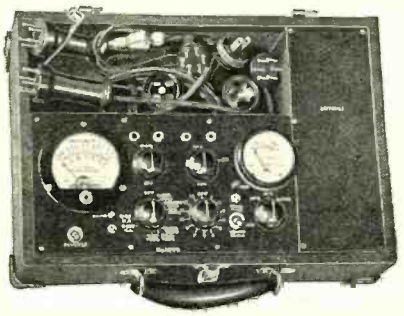
What's New in Radio

A department devoted to the description of the latest developments in radio equipment. Radio servicemen, experimenters, dealers and set builders will find these items of service in conducting their work

By The Technical Staff

Set Analyzer

Description—With the new model No. 1000 resistance, continuity and capacity tester, it is possible to make a complete analysis of a radio receiver without the necessity of removing the chassis from the cabinet. The 0-1 milliammeter reads up to 600 d.c. volts, 300 milliamperes and 3 megohms.



The a.c. meter is calibrated to read directly in microfarads with a capacity range from .008 to 10 mfds. The instrument is enclosed in a leatherette-covered carrying case and it is complete with operating instructions, batteries, cables, cords and the necessary adapters for the new sets.

Maker—Readrite Meter Works, Bluffton, Ohio.

Time Switch

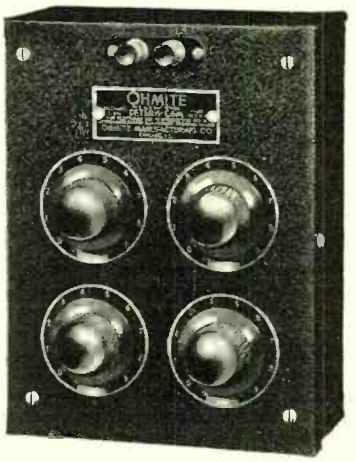
Description—The "Radio Owl" is a time switch for automatically turning off a radio receiver at a predetermined time from a few minutes up to two hours. This unique time-switching device is of course not limited to use with radio sets. For instance, it can be employed for turning off a night light in

the baby's room at a desired time and for many other occasions where a device is required for automatically switching off an electric light or an electrical appliance. It is simple to operate; the line plug is inserted into the light socket and the plug from the radio or appliance inserted into the double connector plug. The hook-up is complete and it is only necessary to push the owl's head down to the indicated time marking. The body of the owl is finished in bronze and it has sparkling red jewelled eyes. The device is 2½ inches in diameter by 4¼ inches high.

Maker—Universal Microphone Co., Ltd., 422 Warren Lane, Inglewood, Calif.

Resistor Measuring Instrument

Description—This new "Determ-ohm" instrument is a resistance measuring device and should prove a valuable service aid to the radio dealer, serviceman or radio experimenter. A set of special wire-wound coated resistance units are mounted in a compact metal box and are connected to four tap-switches in such a way that actual resistance values ranging from 100 ohms up to 1,000,000 ohms can be obtained in 100-ohm steps. The chief use of this instrument is to determine the required value of replacement resistors. Quite frequently a resistor

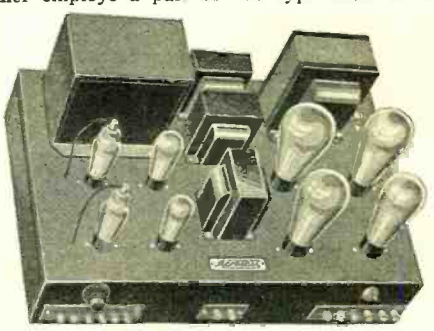


is so completely destroyed as to make it impossible to read the value or measure it. In this case, the "Determ-ohm" instrument can be connected in place of the damaged resistor and the dials adjusted until the proper voltage is obtained. If a voltmeter is not available, the adjustment is made so that the best tone and volume is obtained from the receiver. The "Determ-ohm" can also be used as a meter multiplier and many other equally valuable applications.

Maker—Ohmite Mfg. Co., 636 N. Albany Ave., Chicago, Ill.

Power Amplifier

Description—The Acratone power amplifier employs a pair of –50 type tubes in a



special Class "A" Prime push-pull circuit, designed to provide a power output of 30 watts. Two push-pull stages utilizing –56 and –57 type tubes precede the power stage. The amplifier is equipped with an input matching transformer for phonograph pick-up and microphone connections. The out-

put transformer has tapped windings to provide for multi-speaker installations, using dynamic type speakers and dynamic horn units, and is also equipped with a 500 ohm winding and a high impedance speaker winding. Monitor output connections are available. An amplifier of this kind should find wide application in auditoriums, dance halls, ball parks and sound truck installations or wherever a powerful sound reproducing system is required.

Maker—Federated Purchaser, 23 Park Place, New York City.

Compact A.C.-D.C. Receiver

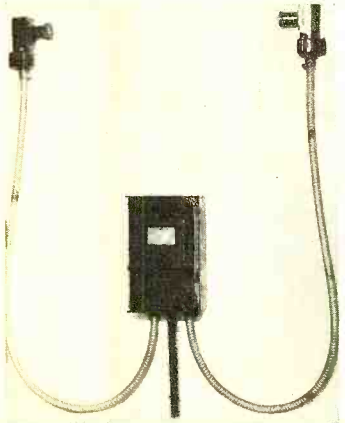
Description—This model 71, portable universal a.c.—d.c. superheterodyne receiver measuring only 10¼ inches by 7 inches by 5½ inches, is designed to operate on 110 or 220 volts a.c. or d.c. line supply. The set features automatic volume control and is

equipped with dynamic type speaker. It utilizes the latest tubes which include: two –6D6 type, one –75 type, one –43 type and one –25Z5 voltage doubler tube. The receiver chassis and the speaker are inclosed in an attractive marquetry inlaid walnut cabinet. The net weight is 8¾ pounds.

Maker—Hetro Electrical Industries, Inc., 506 W. North Ave., Chicago, Ill.

Photo-Electric Device

Description—This company recently introduced a sturdily constructed light sensitive control, termed the "Photo-Troller" which can be actuated by a photo-tube or by delicate contacts carrying only a few micro-



amperes current. The photo-tube or sensitive contact of the controller operates a grid-glow tube directly, which in turn closes a contactor to complete the desired operation. This design eliminates the necessity for delicate intermediate relays. The "Photo-Troller" is adapted to numerous industrial applications such as automatic weighing, counting, door opening, etc. The device is assembled in a sheet metal cabinet and is available for operation on any commercial a.c. voltage and frequency. It incorporates complete power supply for all auxiliaries, including the light source. Auxiliary devices may be had for use with this "Photo-Troller" to adapt it to a large number of

(*Continued on page* 764)

?QRD?

A column devoted to the commercial operator and his activities

Conducted by GY

MILLS have been ruined and miles of paper have been consumed in writeups of the world-wide hook-up of the Presidential Inauguration proceedings, but, up to now, nothing much has been said about the engineers, the monitormen and the apparatus that were put to their greatest test in making the arrangements possible. Microphones were everywhere; in aeroplanes, on coat lapels, in automobiles and on sidewalks to pick up the scene for retransmission by transmitters which were placed in every likely and unlikely spot that can be imagined. Pack transmitters were carried on the backs of men who mingled with the crowds; short-wave 'xmtrs on the top of the Washington Monument; mobile 'xmtrs in automobiles and aeroplanes. All giving their interpretation of the scenes from their vantage points. To gather all these loose ends together in an efficient manner, the monitormen were kept on their toes listening for signals and plugging the right jacks. A vote of thanks is herewith extended to those men who, through their effort, intelligence and ingenuity, perfected, without a single hitch, the most thrilling and unique broadcast the World has ever heard.

The 1933 New England division convention of the ARRL was held in Hartford, Conn., on the 28th and 29th of April. Much of a to-do was made over who was the first to transmit their respective Governor's congratulations. Through the co-operation of the Washington Radio Club, a Ham organization, Amateur transmitters sent their respective State's congratulations to President Franklin Delano Roosevelt upon his taking office. These msgs were handled with speed and despatch and because of their speedy delivery to the White House it was impossible to state which was delivered first. So far all honors remain even.

As a step forward in aiding "ops" to acquire a real knowledge of the types of apparatus they may be called upon to handle and to give them an idea of the strides that have been made in radio-telegraphy since the installation of Telefunkens and sparks, the Editor of this periodical, began a few issues back to present to his host of readers photographs and explanations on the operating of present equipment on some vessels. This should prove of great help to those ops and would-be ops who have the foresight to keep a record of those pages so that in the future if an assignment should come up for one of them they would be familiar with the apparatus before they even land on deck. This column, as spokesman for the brasspounders, sez "tnx" to the Chief for his interest in our behalf.

The Chief has always striven to give his readers the most varied and interesting material since his taking the helm and due to his energy and farsightedness has built this mag up to its present large circulation and a standard that other mags in the field have been vainly trying to equal.

Chief Engineer I. Brimberg of WNYC modestly remarks as how his station is and has been on frequency (only a measly cycle off) so well and so often that Crystal labs and radio set manufacturers in the East have been using his station for checking their frequency. That is a remarkable record of achievement and we hope that the political affairs and economy measures being worked out in the Big Town leave it rest in peace. Much talk had worried the station personnel and until this writing nothing has been done and the outfit is operating as per schedule—so here's a big how that it remains as just plain—talk.

As a member of the Tall Story Club, Big Time O'mara stands out with his tale of when he was on a "spitkit" (those rickety destroyers) during the late upheaval. He was assigned to the forward searchlight platform. One morning about 3 A. M., he was ordered to stand-by his station as "subs" were expected in that vicinity. The sea was kicking up pretty bad and Tim had a tough time hanging onto the light with one hand and bracing himself on the rail with the other. All of a sudden the bow dove into a huge comber and as she came out of it she turned over about 30 degrees with such force as to tear the rail loose and with it, Big Tim. Just as he hit the water his outflung arms touched something that felt like a rope and he grabbed onto it. Clambering up the line to the deck, he beat it back to the searchlight platform and to this day, he sez, the officers did not know that he had left his post without being properly relieved. Believe this or not, eh.

Frank Keegan wants to make a comeback after being out of the game for the past fifteen years. Having been one of the old standbys during the big fracas and pounding brass on the choochoos since then the fist should be in pretty good condition. But you will have to do some brushing up on the new equipment and apparatus that is now installed on the average wolf-hounds. A good idea would be to dig yourself out of the snow up thar in hills of Vermont and take a course in one of the schools on that subject. Although the old saying is that one can't teach an old dog new tricks, it is always possible to make the old dog do the tricks it once knew, what?

Bridge, being one of the major indoor sports of the gang waiting to be called from the Buzzer Room of the RMCA in New York, has produced some remarkably able players amongst the ops and, with a little publicity, there is the possibility of notice by Culbertson, Lenz and the rest of the pasteboard pitchers. We, therefore, suggest contests be held between the various buzzer rooms and the winnahs to challenge the elite of the art. For the present we will discard all the fine rules, only relying on the honesty of the players to bring forth the two best players in each place and these in turn to be eliminated by a series of games in any place the players will agree upon. All entries will ship their names in for proper positions. It is understood, of course, that entries are all seeded, whatever that means.

From the batch of mail that came over the rolltop desk this month, space must be spared for V. N. Falk who writes in from Oregon with 73s and growling about the promiscuous use of the bug in the hands of the inexperienced ops on the West Coast. He sez, ". . . the air is cluttered up with a lot of brrrrrrrrs and after four or five transmissions they have to go back to their fists anyhow. Just a waste of time. Wonder if they know what it is to get a hot-point

on the galena—copy sigs like they were in '14 off Mexico with each letter four times and your mouth open to get 'em better?" Oowah, what a peeve the boy's got. Ah well, let's pass the joe and reminisce.

How many of the gang have their new licenses? "Stand up, you in the rear row."

"Like it?"

"Mmmm—well, yes. Nice paper, though, eh? All right, stop that tittering there. I'll do all the thinking around here?"

It looks like the Uncle is doing some economizing, and as we're always up in front in headlines, we are the first to be under the hammer. S'funny thing that mate tickets are still the former beautifully embossed certificates which they are proud to hang up in the cabin. Leaving the snappy appearance out of the question, there is the disadvantage of the darn thing breaking up in the pocket book if it is opened too often. Oh, well, we're martyrs to the cause, what?

The only time a brass pounder is thought of in a kindly way is when the World Series or a big fight are on. Just imagine not copying the returns?

But still there is the consolation that we won't have to go for another ticket until three years have elapsed instead of the old system of two years.

Yowza, how we laugh when we look back to the old days. Yea, verily and forsooth, brethren, but if it wasn't for the old days and the efforts put out by its developers, we would not be having these new days, what ho! . . . And to continue to read further out of this old log, it goes into lengthy detail about the speed contest that was won by T. R. McElroy by breaking the tape at 55.1 wpm.

The contest raged for days. Signals flew around loosely. Some caught them and deciphered them, while others just grabbed what they could. The cheering squads were there, the contentants' relatives were there and the press was sitting on the edge of benches thrown around the room. All the contestants stood or sat near their mills, nonchalantly puffing on their smoke-makers. The word was relayed to "stand by." Tense muscles twitched with nervousness. Every hand, with fingers extended lovingly over the keyboards, was ready to do or die for their owner's Alma Mata. Bang! went the starting gun. Mills began to rattle. Waterboys stood by with buckets of water, ready, at an instant's notice, to pour it upon the steaming mills.

Suddenly there was a crack. The tape, in the transmitting machine, which had been sealed, broke its seal. One man fell forward, exhausted, from the nervous strain of the situation. A consultation was called between the referees and the press and it was decided to repair the tape. A great sigh of relief went up to the rafters. The situation was again well in hand, although no Marines were there.

Continued tries were made to end the contest. After two or three more efforts, after much paper and typewriter ribbon were thrown away, after many packages of tobacco had been consumed, not to forget the matches used to light the furnaces, the contest ended amidst great applause, smoke and arguments plus the rejoicing of Mr. T. R. McElroy, the winnah, with an official speed of 55.1 wpm, absolutely free from errors. "A mark to shoot at, Brassers, eh."

What does not the airy waves bring us? There it brings some female's heartbeats, then photos are rushed through the ozone and now an automobile crash is recorded. Engineers at the NBC studios heard one of

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Radio and Acoustics

(*Continued from page 743*)

the set-backs, where a reflection would be dangerous, are absorbed. It is here that the most important addition to modern acoustical engineering has been made: in the use of sound absorbing material in properly shaped auditoriums.

The construction of sound absorbing material is a problem in itself, to which brief discussion shall be given now. Sound absorption, physically speaking, takes place mostly by gradually deadening the energy of the elastic air-wave called sound, e.g., by small air cells or pores in the sound-absorbing material which are intercommunicating. Sound entering these pores is absorbed by friction, the sound being converted into lower forms of energy, mainly heat. In building this material and placing it on the walls care must be taken not to create resonating spaces.

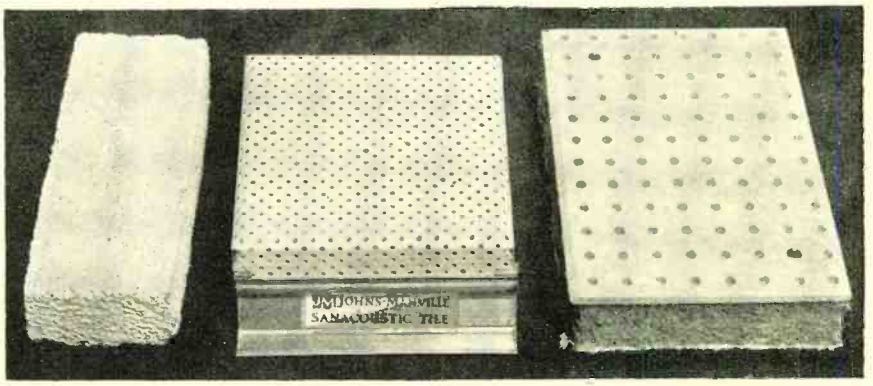
The ideal form of sound absorbing and non-inflammable material is snow. The question therefore arises how to develop a material which has similar sound-absorbing qualities without impairing the hygienic construction of large walls or increasing the fire hazard. Excellent work in developing such a material has been done by the Johns-Manville Laboratories under the guidance of Mr. R. V. Parsons, Fellow of the American Acoustical Society.

Figure 7 shows a diagram of the process of manufacture. Material similar to limestone is heated up in a blast furnace so that it is in practically a liquid state. In dropping out at the lower part of the furnace it meets a blast of steam of 200 pound pressure, which breaks up the flow and creates something like a synthetic red-hot snowstorm. In a chimney of fifteen feet in height the flakes are given a chance to cool. They fall down slowly and settle on a traveling belt, and are carried out, in the form of porous plates or sheets, by the conveyor.

Figure 8 shows a photograph of this so-called expanded transite acoustical tile. This material has marvelous sound absorbing properties, averaging an absorption at various frequencies of almost 90%. This material can be painted and is washable and light and can be easily attached to walls.

Other materials, like rock wool, have different acoustic properties. Originally organic materials like hair felt were used. They are now discarded more and more, both from the standpoint of fire hazard and also because they absorb less sound than the inorganic materials mentioned above. In addition, they can not be painted or cleaned readily and are difficult to attach to walls, particularly if no disturbance of the original acoustical design is to occur. This holds particularly true for the sound treatment of old churches or historical halls.

This problem is solved in a simple way by another material, the sound acoustic tiles of the Johns-Manville Corporation, as also shown in Figure 8. The tile consists of a sound absorbing material, for instance, rock wool with a sound transparent cover, which can be painted in any way so as to meet the architectural requirements of the building. This latter material has become widely used, not only from the standpoint of the sound treatment of big halls, but also for the purpose of rendering noiseless office buildings, factories or other places where humans work. (See for instance the strained face of the executive pictured in the Frontispiece.) How many times has this condition occurred to you—to carry on a telephone conversation but unable to hear on account of the noise surrounding you. The clicking of typewriters in an office, the running of various types of machines in a factory, etc., is detrimental to efficient office routine. From the construction of



SAMPLES OF ACOUSTIC MATERIALS

Figure 8. At left is the photograph of the expanded Transite acoustical tile. Centered is a sample of Sanacoustic tile. At right is a sample of Transite acoustical tile

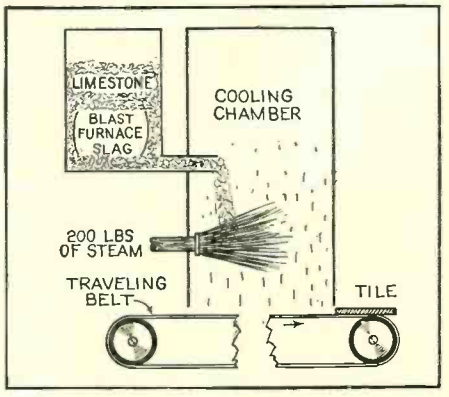


FIGURE 7

auditoriums the acoustic engineer now turns to the silencing of office buildings, vehicular tunnels, subways and railroad terminals as an important step. Figure 9 shows the Chicago office of Montgomery-Ward Company, after treating with this sound absorbing tile.

Numerous acoustical materials of this type are being used for improving the acoustical properties of the reception rooms of the newest radio broadcasting stations. The new broadcasting studios and talking-motion-picture studios, have their walls covered with this type of sound absorbing material.

(*Continued on page 759*)

Code Practice

(*Continued from page 719*)

the operators who send out the Code Guild practice transmissions. Replying to a letter of inquiry he writes: "I brushed the dust off my old short-wave receiver, when the Code Guild transmissions were called to my attention, and at 7:30 p. m., C. S. T., W9HML came through splendidly with perfect signals. Since then I have been listening in on the various Guild programs every night. ——I would have known, had I happened on to one of these programs accidently, that the operators are Candler trained. One can never mistake those perfectly formed signals. They are music to my ears. So far I have copied the programs from six Guild stations and find little to differentiate between them, so far as perfection of operating ability is concerned."

It is an interesting commentary that Mr. McElroy is himself Candler trained.

The Candler System Code Guild is made up of graduates and undergraduates of the Candler System. It was started for the dual purpose of providing practice for its members and to improve the standards of transmission in general by enabling anyone interested to listen in on the transmissions, thus obtaining good practice and at the same time learning to appreciate good key operation and its advantages. Incidentally, there is no charge or obligation of any kind to those who wish to listen in. The programs are sent out over certain "ham" stations, operating in the regular amateur bands.

RADIO NEWS readers who desire to take advantage of these transmissions can obtain a copy of the transmission schedule in effect by addressing a request to "DX Corner," RADIO NEWS, and inclosing a self-addressed, stamped envelope. This schedule gives the hours, station call, frequency and type and speed of transmission for each scheduled program. Due to the use of short waves it is possible for a fan living anywhere in the United States to bring in a sufficient number of these programs to provide daily practice.

A copy of the current schedule is not published with this article because the schedules change somewhat from month to month and by the time this article appears in print the chances are the present schedule would be partially out of date. It is for this reason that arrangements have been made to furnish up-to-date schedules direct to readers who write for them. An activity such as this is one of the type which RADIO NEWS takes pleasure in encouraging and furthering because it is one which we feel sure will be not only of interest but of real utility to many readers.

Another type of transmission which provides good code practice material is found in the "press" copy sent out regularly by numerous short-wave commercial stations. A schedule covering the transmissions of approximately 50 of these stations has been compiled and will also be supplied without charge to those sending a stamped addressed envelope to the DX Corner. These "press" transmissions are keyed at various speeds and the schedule includes stations all over the world, the great majority of which could be picked up readily from any point in the United States by anyone equipped with a suitable short-wave receiver. Some of these transmissions are continuous wave and can be heard on receivers which include provision for c.w. reception. Others are modulated notes which can be received on a short-wave broadcast receiver.

Radio Acoustics

(*Continued from page 758*)

References: *Architectural Acoustics, by Verue O. Knudsen, (John Wiley, Publisher); Acoustics and Architecture, by Dr. Paul E. Sabine, (McGraw-Hill, Publisher); City Noise, Noise Abatement Commission, Dept. of Health, City of New York, 1930.*

Burned Out Meters

(*Continued from page 728*)

before the switch was thrown. Figure 1B, 1C and 1D are photographs taken respectively 1/64, 2/64 and 3/64 second later. Figure 1E was taken 5/64 of a second later. These five views show the progressive action of the fused meter under this load. At Figure A2, that is, 1/64 of a second after the application of the high voltage, the needle had swung approximately ½ way across the dial. A 64th of a second more elapsed (A3) before the meter reached full scale deflection. At the end of 3/64 second (A4) the fuse had blown and the needle was on its way back to normal. At the end of 5/64 second (A5) the needle reached its normal position with the meter in perfect condition and requiring only replacement of the burned out fuse. This study was made using a ⅛ ampere "Littlefuse" and shows a most striking example of the effectiveness of this type of meter protection.

I.F. Transformers

(*Continued from page 741*)

selectivity is relatively poor, due to the use of broadly tuned i.f. circuits. In such receivers the effect of humidity, temperature, etc., would of course be less than in the case of the sharply tuned circuits illustrated here. In some factory-built receivers, for instance, the response characteristic may be as much as 20 kc. wide (per i.f. stage) at 50% gain. In such circuits, even though they use mica-compression condensers changes due to vibration would be relatively small. But even in such cases, the effect of humidity would be sufficiently great to be troublesome, the trouble taking the form primarily of decreased sensitivity.

The recent tendency in receiver development has been toward sharply tuned i.f. amplifiers, partly with the idea of improving overall selectivity and partly to reduce the number of tuned circuits required ahead of the first detector (with their attendant problems of gang tuning, etc.). In the view of this tendency, the material presented in this article is of particular interest and importance.

To the DX fan or "ham" who is building his own receiver, selectivity and high gain in the i.f. amplifier are imperative, and for such receivers it is obvious from the material presented herewith that the air-dielectric condensers offer outstanding advantages which the builder cannot afford to overlook. Certainly the writer has found this to be the case in his own experimental work and that, after all, is only typical of the requirements of other DX fans or "hams".

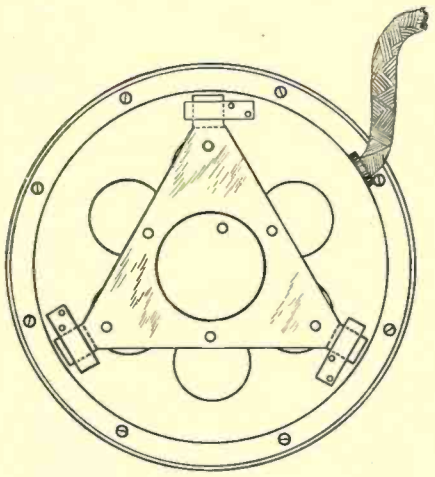
Relay Installation in Bologna

MILAN, ITALY—A company has been formed in Bologna which will build a relay apparatus designed to supply its subscribers with the most important broadcast programs on the air. The technical installation of "Radio-Araldo" is already in progress and is expected to open in the summer.

Latest Radio Patents

(*Continued from page 753*)

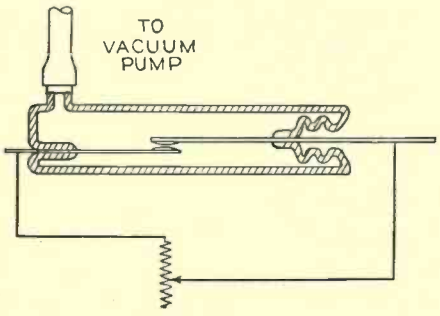
space under a respective member on the instrument through the entrance space thereunder, the members on the instrument being so spaced therefrom as to hold the support members snugly to the instrument back,



and the support members being so spaced from the support as to hold the instrument with its back a required material distance from the support.

1,879,131. METHOD OF DEGASSING VACUUM APPARATUS. GUNTHER DOBKE, Reinickendorf, Germany, assignor to General Electric Company, a Corporation of New York. Filed Dec. 17, 1931. Serial No. 581,558, and in Germany Dec. 24, 1930. 4 Claims.

1. A method of degassing the contact structure of a vacuum switch including an envelope, a pair of contacts mounted therein and means resiliently supporting one of said contacts, which comprises separating said contacts a predetermined distance, applying



an electric potential across said contacts of such magnitude that the electro-static forces between the same overcome the bias of said resilient support resulting in rapid vibratory engagement of said contacts and heating thereof by arcing, and evacuating the evolved gases from said envelope.

Four New Tubes

(*Continued from page 721*)

not need any by-pass condenser. Transformer or impedance coupling is recommended. If resistance coupling is employed, the grid resistance should not exceed 250,000 ohms when the tube is self-biased. It should not exceed 100,000 ohms when a fixed bias is employed.

Console Receiver

(*Continued from page 744*)

ing. When turned to the right, the loudspeaker is in the output circuit of the audio frequency amplifier and when turned to the left the recording head is in this circuit. This switch also connects in the meter at the left and headphone jacks for controlling or monitoring the material being recorded. This jack, which is located to the right of the output meter, is also useful in listening in on headphones to DX late at night as the loudspeaker is then out of the circuit.

The turn table and record changer is a complete unit. The turn table may be run at 33 r.p.m. or 78 r.p.m. to play records of both varieties. This feature is also applicable to the making of records at either speed. The record changing apparatus holds ten 10-inch records and is automatic in operation. A control lever at the right side of the turn table can be set so that these ten records, including one placed directly on the turn-table, may be played continuously making eleven records in all. This system automatically starts a new record by lowering the pickup into the record groove and lifting it out automatically at the end of each record. Then a new record is placed on the turn table and the process is repeated. The volume control for phonograph reproduction is the same as that used for controlling radio signals. This control is on the front panel at the lower right. The record playing apparatus is extremely satisfactory from a reproduction and volume viewpoint and this reproduction would be very difficult to differentiate from the radio reproduction obtained through the receiver. The control lever of the turn-table unit can also be set in three other positions, one of which is to play 12-inch records and stop, the other position is to repeat these records and the third position is a universal one for playing any single record and stopping. The speed control lever is located in front of the turn-table control and can be seen clearly in Figure 2. Another lever directly in back of the turn-table control is for rejecting a record after it starts to play. By merely pulling this lever forward the automatic record changer begins to function immediately and any record not desired is thus rejected.

In recording received programs all that is necessary is to place a pre-grooved aluminum or wax record on the turn table and press over the turn-table axle the special fitting that holds the record firm. The turn-table control should be set at "universal." A recording needle is then placed in the pick-up and the pickup is placed in the first groove of the record. On the pickup is set an adjustable weight for recording. The control switch is set at "radio." A pair of 'phones may be plugged into the jack and the particular station turned in. For recording on aluminum records it has been found best to get a signal that moves the output meter about ½ scale as a maximum. When using the wax records a little more volume is required and the best records are made with the output meter reading somewhere between ¾ to full-scale deflection as a maximum. When recording an exceptionally long program more than twice as much material may be recorded if the recording is done at 33 r.p.m. And also the needle scratch is considerably reduced at this speed. The low speed recording does not, however, get quite as large a percentage of high tones as the higher speed.

This idea of recording foreign programs, which can be easily done, is an excellent one for accurate station verification and we have used this method, sending the record and a needle to the foreign station asking

them to play it at the proper speed and verify. This method of verification has met with exceedingly cordial results from the stations to whom sent. It very proudly has given them the first real information on their station's reception in foreign countries.

For home recording of local talent the control switch is turned to "microphone" which places the microphone in circuit. The microphone should have a three-cabled lead of at least 15 feet long to reach to another part of the room or possibly to another room near a piano. Such a set-up is shown, where a child's voice is being recorded with piano accompaniment. For this purpose the volume control on the set should be turned full on in order to get the proper volume and the spoken word or music should be directed close to the microphone. Very satisfactory records have been made in aluminum and wax by this system. We have also tried the system out in making a few records to accompany a home-made moving picture film with appropriate remarks although not synchronized. The circuit of the complete phonograph and recording apparatus is shown in Figure 3. Three microphone binding posts are connected to the primary winding of the transformer directly in center of the diagram. The console can be obtained, also, equipped for a condenser microphone in which case a pre-amplifier is used as well.

For ordinary recording purposes, we have found the aluminum records satisfactory and have produced a little more volume than the wax records although they have considerably more scratch. Aluminum records are played back with a fibre needle and the records are made with a special steel recording needle. If a very fine quality of reproduction is desired, however, the wax records seem to be desirable. There is on this type practically no scratch although the volume is somewhat reduced. In our tests we used the Victor pre-grooved waxed records and recording and reproducing was accomplished with the same special Victor needles.

DX Receiver Design

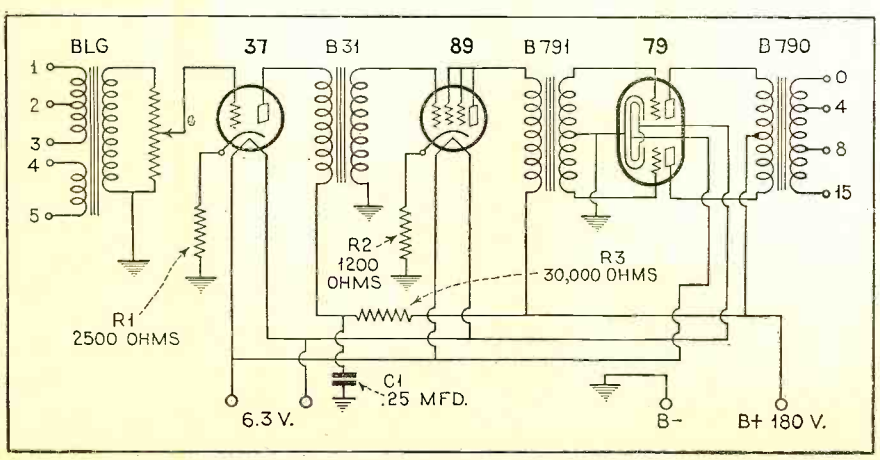
(*Continued from page 718*)

C30—Hammarlund .00035 mfd. regeneration condenser, Type ML-17
C31—Hammarlund .0005 mfd. dual regeneration condenser, Type MLD-23 (Single unit may be used)
C34, C35—Potter .25 mfd. bypass condensers, 200 volts d.c.
C36, C37, C38, C39, C40, C41, C42, C43, C44, C45, C46—Flechtheim .1 mfd. bypass condensers, 250 volts d.c.
C47, C48, C49, C50, C51, C52, C53, C54, C55, C56, C57, C58, C59—Potter .5 mfd. bypass condensers, 400 volts d.c.
C61—Sangamo .005 mfd. mica condenser
CH1, CH2—Hammarlund polarized r.f. chokes, Type SPC
CH3, CH4, CH5, CH6, CH7—Hammarlund 250 millihenry chokes, Type RFC-250
L1—Hammarlund antenna coupler, Type AC-23
L2, L3, L4—Hammarlund shield-grid coils, Type SGT-23
L5—Oscillator coupler (See Figure 3)
L6, L7, L8, L9, L10, L11, L12—Intermediate Transformers (See Figure 4)
R1, R2, R20—Frost 25,000 ohm roller type potentiometers
R3—Bradleyohm 10,000 — 100,000 ohms. (This resistance is adjusted until the full resistance of R2 is useful in controlling volume.)
R4, R6, R8, R9, R11, R13, R15, R17—Adjustable resistors of following respective values: 20, 20, 75, 75, 40, 40, 40, 75 ohms
R5, R7, R10, R12, R14, R16, R18—Fixed resistors of following respective values: 50, 40, 10, 30, 30, 30, 20 ohms
R19—fixed resistor, 40 ohms
R21, R22, R23, R24, R25, R26, R27, R29, R30—Lynch-Durham metallized resistors of following respective values: 5000; 500; 1000; 10,000; 10,000; 10,000 ohms, 1 megohm; 10,000 ohms; .5 megohms
R28, R31—Clarostat ohm potentiometers
SW1—Yaxley D.P.D.T. jack switch
SW2—Yaxley S.P.D.T. jack switch with neutral position
SW3—Toggle switch
SW4—Yaxley 4 pole, double throw jack switch
SW5—Yaxley SPST jack switch
SW6—Yaxley special double throw switch with neutral position (If SW6 is not desired, substitute one double pole-single throw switch SW9.)
SW7—Yaxley four-point inductance switch
SW8—Yaxley S.P.D.T. jack switch
SW9—Yaxley D.P.S.T. jack switch.
T—Thordarson transformer, type R-100
VR—variometer
9—Benjamin 4-prong cushioned sockets
2—Hammarlund drum dials, Type SDW1
5—Hammarlund flexible shaft couplings, Type FC
1—Frost double circuit jack
4—Hammarlund walnut knobs for center panel, Type SDWK
1—Bakelite (walnut finish) 3/16 inch center panel cut to order 12 inches by 20 inches
2—3-ply wood 1/8 inch side panels 12 inches by 14 inches
2—18-oz. copper sheets 30 inches by 98 inches. (About 1⅔ sheets are actually required)

(*Continued on page 762*)

A Correction

A corrected diagram for Figure 1 on page 598 of the April issue is shown herewith. The diagram appeared in the article by Mr. I. A. Mitchell on "Using the New -79 Tube in a D.C. Push-Pull Amplifier.



DX Receiver Design

(*Continued from page* 761)

11—pieces of Bakelite tubing as follows: 3 pieces 1½ inches O.D. by 2 inches long (for L2, L3, and L4), 2 pieces 1½ inches O.D. by 4 inches long (for L6 and L8), 6 pieces 2 inches O.D. by 4 inches long (for L5, L7, L9, L10, L11, L12)
Brass mounting brackets for L4, L5, L6, L7, L8, L9, L10, L11, L12 (made by builder)
Material for chassis
6—CX330 tubes
3—CX332 tubes

QRD?

(*Continued from page* 757)

their short-wave trucks lose a fender this afternoon. The collision occured about three miles away from where the engineers were conducting the testing of the new NBC ultra-short-wave mobile transmitter.

The mobile unit, with Division Engineer George Milne and his crew, had set out for a tour of Manhattan, meanwhile carrying on a two-way conversation with Wm. Miller, director of special broadcasts, who was seated in the control room of the studios. Suddenly a crash was heard.

"What was that?" said Miller, barking into a microphone.

"Our fender was just ripped off," Milne answered.

"How?"

"Just a bakery truck," said Milne.

Then the driver of the bakery truck was heard to give his address, etc. (The report doesn't state whether the driver of the truck insisted that it was the fault of George Milne. It gives us room for imagination, eh?) The NBC truck continued its tour, reporting its progress, while Miller directed the crew to drive to other parts of the city.

There's no limit to what some people call adventure. First, somebody takes one skip-and-a-hop across the Atlantic. Then, another anti-prohibitionist shoots around the world. Next, a chappie flies over the North Pole and under the South Pole, and another goes up so high it took two weeks for a telegram to reach him.

Now, Mr. William Beebe, the noted scientist, broadcast his experience from a depth of 2200 feet, almost one-half mile beneath the bounding waves. Over the NBC network his remarks were heard all over the country. And the first crack out of the box, when he pulled himself out of the Barton "bathysphere," was—"My dive today has given me an entirely new conception of what is down there."

Of course, you and I could have thought of a lot more appropriate remarks anent the sun, the weather, etc., but there's no accounting for some fellows, what?

And whilst on the subject of broadcasting, this one is the whole last volume.

The broadcast of a noted orchestra was being arranged to feed through a station some distance away, and the Op on the monitor was cautioned to be attentive to the three buzzes, meaning "stand by," and one buzz, to "go ahead."

The poor headphone muzzler had a heavy cold, so while he told the Chief, "O.K., tell the bozo to shoot," it was all foggy to him.

Quiet reigned in the "shack" when suddenly it was shattered by the orchestra leader's voice coming through the speaker, "All right, you damn fools. You guys don't know the difference between a dime and a hole in the ground!"

And, to add insult to injury, the operator was fired. He still can't remember having pushed in the plug.

As I have remarked before, one never knows where the ending will be when you start in radio. Joe Greco (GE), an old-time Op, and now assistant engineer of broadcast station WHN, is broadcasting every Sunday morning from the Calvary Baptist Church in New York City. As the studio is right next to the pastor's study, Joe has been studying up on the Bible in between broadcasts. He has learned so much about the Log Book that it wouldn't be surprising to hear next that he will be making preparations for sky pilot's ticket.

The battle raged fast and furious up in the studio room of the RMCA. The question before the house was, "Did you or did you not ever hear about dah dah dit dit dah dah being used as a laugh signal?" It all started over an item in one of the magazines—"Oftentimes when a ship's wireless operator makes a mistake or has an argument with another operator, many others who happen to be listening in give vent to their amusement by jamming the air with the famous radio laugh, two dashes, two dots, and two dashes."

Some said they had heard it and had used it and others were equally emphatic about not ever having heard it or ever having used it. Personally, it was the recognized method to laugh by the usual "hi," or if one wanted to break in, one used the break signal. The two dashes, two dots and two dashes signal was always used for high power.

If there is any one who has authentic information about the sources of these two signals, how's to send the dope here before blood gets spilled on the deck?

One of the snappy mill-pounding, collich-grad calumnyists of a local Blah saved up enough money to make his first trip across the big pond and upon his return all he could do was to knock the daily news bulletins put out by the Radio Shack aboard. Just a chappie who expects a steam-heating plant in an Eskimo igloo! He bleated about the sandwiching in of an article about fallen arches between a Geneva Conference and the latest statistics on the number of union suits worn by the male population. Perhaps he isn't wised-up to the fact that we copy (try to copy?) that which is transmitted. Also, we are not editorialists, but only hard-working sidewinders strutting our stuff under a handicap.

We hear that P. J. Amsterdam, the Vibroplex Vitality Vizard, has cleared quarantine out of Frisco for Manila, P. I. . . . S. Crabtree writes in from the foothills to enquire how's the situation back east. Stay West, young man, stay West. . . . Jack Schauffler sends 73s with the "info" that he has been transferred from the Airway station in Maushton, Wis., to the station in Chi, the land of gun-girls, Chewing gum and the Exposition. What a break, sez we. . . . To be continued because of space but before we do so we craves to put in our two cents with the remarks that better times are already here and, although we don't like to be one of those "I-told-you-so" guys, we were blatting that around when Hector wore knee breeches. That strange word relative to that period A.B., after the Boom-boom, known as depression seems to have disappeared (around that corner maybe) with a decided revival of shipping and a spreading out of radio activities in the larger organizations. So don't worry, gang, keep the old smile working on all eight cylinders and remember that we are always here as before with 73s and ge. . . . GY.

With the Experimenters

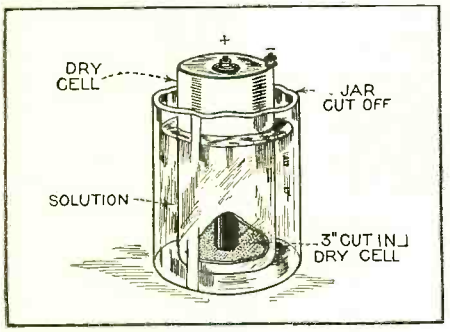
(*Continued from page 727*)

parts can then be soldered easily if a clean iron is used. When not in use, this solution should be kept in a closed jar to prevent evaporation. As the solution is used up, more alcohol should be added, so that a saturated solution is maintained.

CHARLES FELSTEAD,
Los Angeles, Calif.

Wet Cell "Dry" Battery

I have found that by cutting a notch in a dry cell and immersing it in a solution of sal ammoniac it is given a new lease on life. The solution and dry cell are placed in an old fruit jar, or large bottle, which has been prepared for the occasion by cutting off the top, as shown in the drawing.



To remove the top of the jar, I wrapped a bit of string, soaked in kerosene, around it at the place to be cut and touched a match to the knot of the string, gradually turning the jar so the string burned evenly. A drop of water on the string is usually sufficient to break the jar; or it may be plunged into cold water.

CHAS. M. GARDISKY,
Antigo, Wisconsin.

Care of Air Cell Battery

After a careful analysis of the relatively few premature failures of the new Eveready Air Cell A Battery it has found that practically all of them are due to low solution level in the battery.

Despite the fact that the new "breathing battery" requires less attention throughout its life than any other similar source of "A" current, users of the Air Cell occasionally neglect to follow the simple precautions printed on the label of each unit.

For installation and service the following instructions accompanying each battery must be followed:

"In preparing an Eveready Air Cell "A" Battery for service, *it must be filled with water twice*—the *second time* four hours after the first filling.

"On the *first filling*, the battery should be given all the water it will hold—clear up to the bottoms of the filter holes.

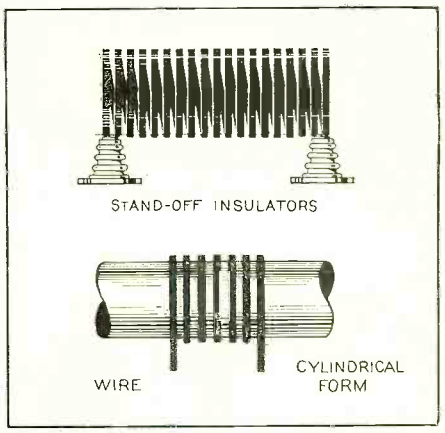
"On the *second filling*, four hours later, add enough water to just cover the indicator wires.

"The user must be cautioned to look into the battery about once a month and to add enough water to each of its two compartments to just cover the indicator wires."

The most important point is that pertaining to the second filling of the chambers with water four hours after the battery is first filled—necessary because the solid chemicals absorb much of the water put in the first time.

Transmitter Coils

A very good substitute for the copper tubing used in transmitting inductances can be obtained from a starter motor of an old car. The field of these motors are wound



with heavy copper band, about ⅜ of an inch wide and about $\frac{1}{16}$" thick. This can be wound in the usual manner, making a very efficient inductance, by merely winding it around a Number 6 dry cell or some other cylindrical form; 12 turns for the 80 meter band, 5 turns for the 40, and 3 turns for 20 meters.

Old starters can be obtained at any garage or auto junk yard.

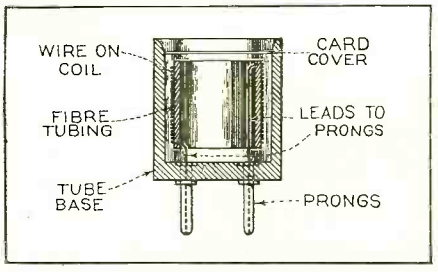
ALLEN D. RICKERT, JR.,
Souderton, Pa.

Accurate Wavemeter Coils

This method of making accurate coils for wavemeters, oscillators, etc., is simple, and yet I have never seen an example or description of it. Coils similar to the one described, in use in a wavemeter at W2DUP, have proved extremely satisfactory.

Materials required are: an old tube base, short length of fibre tubing, magnet wire for the coil, wax or paraffin. The coil is wound on the fibre tubing, which is of such a diameter that the completed coil will just fit snugly within the tube base. The coil might preferably be wound with a few turns more than required and then cut to the desired range by lopping off a turn or so at a time as needed. The coil should be adjusted while in the base, otherwise it may change somewhat when placed in position. When properly adjusted, the leads are permanently soldered to the prongs of the tube base. I have made it a practice, when only one winding is employed, to solder each lead to two prongs to insure perfect contact.

A thin layer of wax is poured over the



top of the tubing, on the leads from the coil, and into the cracks to make everything rigid and moisture-proof, and a piece of card is fitted into the tube base as shown so that it closes the opening on top and another thin layer of wax poured over this to keep it in place. If paraffin is used, this last coating will be translucent and the card may be

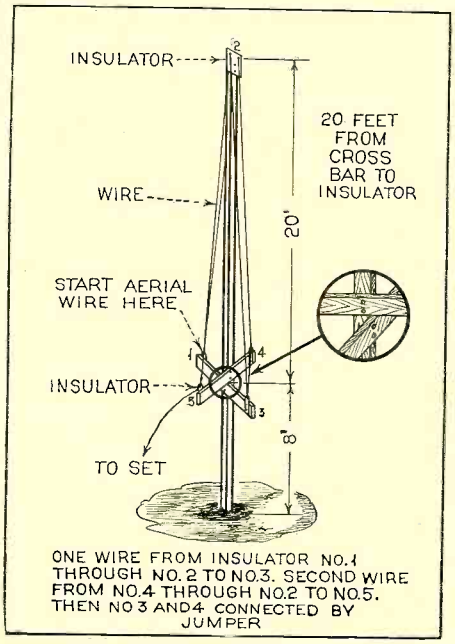
utilized for marking the coil by writing a number or letter or other identification on the card beforehand.

If shielded coils are desired, the construction may be varied slightly by gluing a layer of tinfoil around the inside of the base and using a piece of tubing for the coil of only half the diameter. Care, of course, should be taken not to short the leads with the tinfoil.

LEONARD NACHEMOV,
New York City.

One-Pole Antenna System

Due to the very limited space which I have for the erection of an antenna, I have found considerable difficulty in obtaining adequate signal pickup. After much experimentation I finally arrived at a scheme which is proving highly effective. It requires only a single pole and is constructed

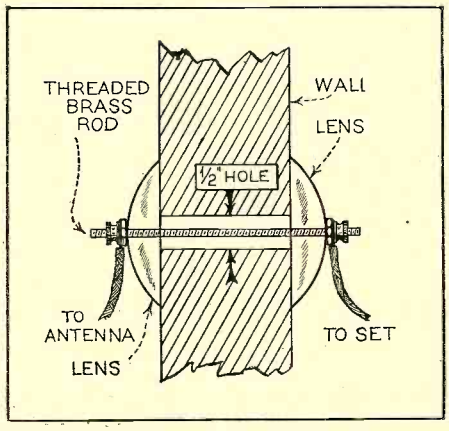


as shown in the drawing herewith. Where possible it is desirable to install guy wires to support this mast. To be most effective, these guy wires should be attached to the mast midway between the cross arms and the top. In order that they will in no way reduce the effectiveness of the antenna it would be well to break the guy wires with insulators every six or eight feet.

O RONDESTVEDT, II.
Glaslyn, Sask., Canada.

Spot-Light Lens Makes Good Lead-In Insulator

The lead-in insulator is the weak spot in many antenna systems. A good insulator for this purpose can be made, as shown in



the sketch from two lenses taken from automobile spot-lights or cowl lights. Two holes are drilled, one at the center of each lens, large enough to accommodate a threaded brass rod ⅛ of an inch in diameter. The method of mounting is as follows: First drill a ½ inch hole through the wall then place the lenses over the hole, thread the rod through and tighten the nuts to hold the assembly together.

What's New in Radio

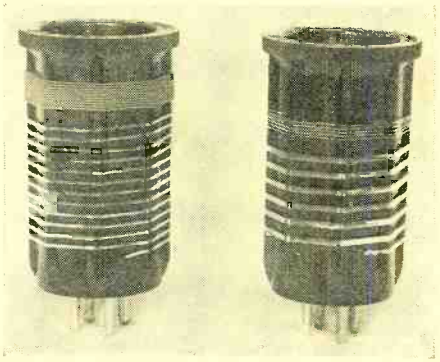
(*Continued from page* 755)

unusual machine and process applications.

Maker—Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

Short-Wave Coils

Description—This company announces a new plug-in short-wave coil, wound with flat silver wire. The moulded bakelite form has eight ribs over which the inductance is wound. The primary is closed wound and the secondary coil is space wound. This type of coil design and the use of silver ribbon result in unusually low radio-frequency resistance and minimum distributed capacity.

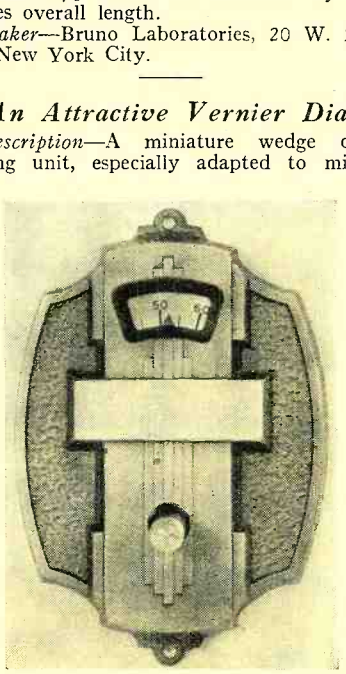


These short-wave inductances are said to have considerably greater efficiency than coils wound with No. 12 wire. There are four coils to a set and using a tuning condenser of .00015 mfd. capacity they have a tuning range from 15 to 230 meters. The coils fit a standard four-prong socket and measure 1⅜ inches in diameter by 3½ inches overall length.

Maker—Bruno Laboratories, 20 W. 22nd St., New York City.

An Attractive Vernier Dial

Description—A miniature wedge drive tuning unit, especially adapted to midget



(*Continued on page* 765)

The Service Bench

(*Continued from page* 749)

caution in the selection of the i.f. tubes to prevent oscillation. The 6000-ohm resistor is colored yellow, and will be found at one end of the bias-resistor strip, attached to the chassis. Clip it from its connections and enjoy increased power."

Our personal preference would be for the substitution of a slightly higher value rather than the removal in an effort to pep up the set—except as a cheap expedient for getting a little longer life out of old tubes.

Steinite Models 70 and 80

In servicing a receiver for the first time it is an excellent idea to determine, if possible, what repairs have been made previously on the set by another serviceman. This will occasionally give you a clue as to the present difficulty. The value of such an inquiry is demonstrated in the following case contributed by George Jehle, Newark, N. J.:

"An unusual instance of a dead receiver was repaired recently, after the owner had installed a new dial cable. In fitting the new cable he had found it necessary to remove the shield-can about the first r.f. coil to provide access to the dial mechanism. The trouble was finally traced to this coil, and upon removing the cover it was found that a slip of the screw driver had broken the winding."

Mr. Jehle also sends along the following dope on the Steinite models 70 and 80:

"A complaint of a loud, scratchy noise when tuning will usually be found due to poor contact between the rotors and the wiping arms. The trouble can be overcome by cleaning and then bending the arm to provide more forceful wiping." (A permanent cure can be effected by drilling the shafts, tapping and installing pigtails.—Ed.)

"A frequent source of trouble on these Steinite models has been due to short-circuited .5-mfd. by-pass condensers connecting from the r.f. plate supply to ground. The short-circuited condenser, of course, results in practically no plate voltage at the sockets. An open condenser in the same position was found to be responsible for oscillation and general instability."

Controlling Shielding Effect

F. J. Faulkner, of Brigham City, Utah, comments upon the loss of volume occasioned by conventional lead-in shielding (not to be confused with transmission lines or transposition), and observes that this is a needless waste during periods of low noise level. He suggests connecting a variable resistor (zero to about 5000 ohms) betwen the shield and ground—rather than grounding directly. The variable resistor should be, preferably, bakelite housed, such as the Centralab, in order to reduce the electrostatic capacity.

Adjustment of the resistor (which, to an extent, functions as a volume control) makes possible the selection of the optimum shielding effect at all times. When open, or at the high-resistance adjustment, full sensitivity will be secured, and no shielding. During periods of slight noise an intermediate adjustment will be desirable, and during bad noise the resistor is turned down until the shielding is directly grounded, giving full noise-reduction effect but with low sensitivity.

Soldering to Driven Grounds

Antennas of the transmission-line variety will often require grounds at the antenna end of the line, where water pipes or similar conveniences are not on hand. A "driven ground," consisting of from 6 to 8 feet of pipe, pile-driven into the earth, is the usual solution. However, as the connection to such pipes is generally in the open and subject to the corrosive action of the elements, the usual ground-clamp contact may not be satisfactory for any length of time. A soldered connection is the solution to the problem. Ronald McNeill, authorized Silver-Marshall service station at Atwater, Sask., Canada, remarks that sandpapering or filing the pipe is a laborious and not always successful undertaking. He facilitates such connections by hack-sawing a "V" about ⅛ inch deep and soldering the wire into this clean groove, the walls of which contribute to the mechanical strength of the joint. He points out that a blow torch *must* be used, as even a large iron is inadequate to heat the pipe sufficiently for a permanent, non-crystalized joint.

Servicing Speakers

"Some of the smaller dynamic speakers omit the leather floating ring holding the outer edge of the cone to the frame. Instead, the cone itself is corrugated, turned outward, and mounted directly on the support. The low tones on such speakers may be to some extent suppressed and in general lack the full rounded quality associated with high-class reproduction.

"With a little effort and care, the tone of these speakers can be considerably improved. Procure a piece of soft leather, such as chamois, big enough to make a circle slightly larger than the edge of the cone. With a sharp knife or a razor blade, cut off the turned-up edge or flange of the cone and remove this piece from the cone support.

"Measure the distance from the cone to the support and cut a leather ring of the proper diameter, making it as wide as the piece that was cut out, plus enough allowance for cementing to the cone. Care should be observed in mounting so that the cone is kept perfectly even, otherwise the voice coil will rub against the pole-piece. Needless to say, the cement should be permitted to dry thoroughly before putting the speaker into operation.

"Arnold G. Hansen, Manistee, Mich."

James R. Dibben, of Prince George, B.C., Canada, recommends as an excellent cement for loudspeaker repairs, collodion and banana oil, fifty-fifty. Robert Freeman, Adel, Iowa, uses the commercial celluloid cement (usually sold for splicing motion-picture films and available in almost any photo supply store). He finds his greatest use for this cement in servicing Majestic cones when a rattle becomes evident, due to a loosening seam.

Many dynamic speakers develop a peculiar rattle or blasting effect after they have been in service for some time. When careful inspection discloses no obvious mechanical fault, the distortion is generally being caused by an imperceptible buckle in the cone, resulting in an area of the diaphragm vibrating independently at harmonic frequencies. The Service Editor has found a simple cure for

What's New in Radio

(*Continued from page* 764)

and portable type radio sets. It provides a 4 to 1 ration and 180 degree rotation. The complete tuning dial may be attached to the face of any panel or cabinet. The bronze metal dial cover in oxidized finish, measures 2⅜ inches wide by 3¼ inches high.

Maker—Crowe Name Plate & Mfg. Co., 1749 Grace St., Chicago, Ill.

this form of overload in the repeated coating of the cone with rubber cement. Five or six coats may be applied, over the entire cone, allowing about one hour between applications for thorough drying.

Testing Each Plate on "–80's"

Joseph C. Hanhauser, of Lansdowne, Pa., used his head when he found it desirable to check the individual plate currents of an –80 type rectifier tube suspected of being the cause of hum. His system is applicable to any tube tester, such as the Readrite No. 245, not equipped for individual readings. Merely plug in the tube backward—the filament prongs in the correct holes, but with the plate connections overhanging, outside of the socket. Connection may then be made to either plate prong by means of a test prod with a lead to the milliammeter.

Long Live the Kink!

Simplicity and common sense being the keynote of the day, Isidore Salzman (our old acquaintance with the Globe Radio Co., Jamaica, N. Y.), carries on with the following question and answer:

"What does the average serviceman do with the dial knobs, nuts, bolts, washers, etc., when he removes a chassis from the cabinet for transportation to the shop? The chances are he leaves them in the cabinet, at the mercy of the first dust rag, and finds half of them missing when he returns. I provide myself with a supply of small paper bags, deposit miscellaneous small parts therein, and find them again without getting down on my hands and knees!

"A simple device for peering into remote corners of a radio cabinet or chassis (where even the pencil flashlight won't reach) can be made with a couple of feet of flexible cord, a 4.5-volt "C" battery and a flashlight bulb. Put two test prods in the circuit and you have a double utility!"

Using Philco Dry A Battery 2-Volt Battery Radios

"The new Philco dry A battery shipped with the model 36 battery receiver can be used with Philco model 35, 35B and 30 and with other 2-volt battery operated radio receivers consuming not over .67 ampere filament current for the complete drain.

"When using this battery with the radio sets mentioned above, it is necessary to use the new Philco type 6 ballast lamp so as to provide the correct voltage throughout the life of the battery. This ballast lamp is designed for operation with sets consuming not over .67 ampere. When using the battery with the Philco models 30 and 35B, which consume .62 ampere filament current, it is necessary to increase this current drain to .67 ampere in order to avoid high voltage on the tube filaments. This increase can be effected either by the addition of a Philco pilot light or by connecting a 30-ohm resistor across the filament circuit in the chassis —the equivalent of adding one more tube. The same changes will be necessary when the battery is used with other makes of radio sets consuming .62 ampere.

"If the battery is to be used with a set containing a resistor for air-cell battery operation, this resistor must be shorted out of the circuit. On some sets the resistor is connected in the filament circuit inside the chassis and on other sets it is connected externally.

"The Transitone speaker receptacle part 4539 can be used as a socket for the Philco type 6 ballast lamp. A wire from either terminal of the Philco dry A battery should be soldered to the small hole terminal in the receptacle. The A battery lead of the cable should next be soldered to the receptacle terminal diagonally opposite the small hole. The ballast lamp, which has but two terminals, can now be inserted in these two holes of the socket."

Sounds Like a Bad Ground to Us

"Here is a service note on an unusual trouble. The complaint was a tunable a.c. hum in a Sheridan type –760. The usual tests showed the circuits and voltages okay. Balancing and neutralizing merely shifted the hum to a different portion of the dial. New tubes had no effect whatever. A thorough test of condensers and resistors suggested no solution to the difficulty. I noticed that changing the location of the set had a pronounced effect on the hum, which was entirely missing when the receiver was operated in a neighboring home. The final cure was a 1 mfd. condenser between one

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side of the a.c. line and the chassis.

"HARRY SCHMIDT,
"Richmond Hill, N. Y."

A Tight Corner Kink

Writes C. A. Goditus, of the Paramount Radio Service, Wilkes-Barre, Pa.:

"Like many other servicemen, I possess a very good screw-holding screw-driver designed to facilitate the insertion of screws in tight places. But there are still many corners where even this device will not do the trick. Put a little sealing pitch in the groove of the screw-head, and then force the tip of an ordinary screw-driver into the groove. Lock washers and nuts can be similarly handled by applying the pitch to the flat-side of the screw-driver tip."

(Chewing-gum is an excellent and readily available substitute for pitch.—*Ed.*)

From a Service Note-Book

Frank J. Faulkner, of Brigham City, Utah, keeps as close a record of his service calls as the old Mormons did of their wives, and the following notes are from his case book:

"More than the usual amount of hum in Crosley radios can generally be traced to defective Mershon condensers. Evaporation takes place, resulting in reduced capacity.

"When a Crosley tunes dead over a considerable portion of the dial, suspect a loose set of plates on the tuning condenser shorting over to the stator.

"Steinite—No signal. Shorted bypass condenser, usually in the screen-grid circuits. Sometimes a power transformer comes in heating badly. Shorted turns.

"Atwater Kent—40 series: Low volume and poor quality. Probably open or defective resistors under the terminal strip in the power-pack.

"R.C.A. 17's and 18's with no pep. Low emission from the 26's or a poor antenna.

"Silver 30's, etc.—no signal. Check the voltages and, if incorrect, suspect the resistors.

"Noise in the Brunswick model 15: Look for a riveted lug not making good contact to the chassis due to rosin flux having run under it. Same model Brunswick came in with low sensitivity. Also distortion, when the volume control was turned down on loud

Radio News Technical Information Service

The Technical Information Service has been carried on for many years by the technical staff of RADIO NEWS. Its primary purpose is to give helpful information to those readers who ran across technical problems in their work or hobby which they are not able to solve without assistance. The service has grown to such large proportions that it is now advisable to outline and regulate activities so that information desired may come to our readers accurately, adequately and promptly.

Long, rambling letters containing requests that are vague or on a subject that is unanswerable, take up so large a protion of the staff's working time that legitimate questions may pile up in such quantities as to cause a delay that seriously hinders the promptness of reply. To eliminate this waste of time and the period of waiting, that sometimes occurs to our readers as a consequence, the following list of simple rules *must* be observed in making requests for information. Readers will help themselves by abiding by these rules.

Preparation of Requests

1. Limit each request for information to a single subject.
2. In a request for information, include any data that will aid us in assisting in answering. If the request relates to apparatus described in RADIO NEWS, state the issue, page number, title of article and the name of the device or apparatus.
3. Write only on one side of your paper.
4. Pin the coupon to your request.

The service is directed specifically at the problems of the radio serviceman, engineer, mechanic, experimenter, set builder, student and amateur, but is open to all classes of readers as well.

All questions from subscribers to RADIO NEWS will be answered free of charge, provided they comply with the regulations here set forth. All questions will be answered by mail and not through the editorial columns of the magazine, or by telephone. When possible, requests for information will be answered by referring to articles in past issues of the magazine that contain the desired information. For this reason it is advisable to keep RADIO NEWS as a radio reference.

Complete information about sets described in other publications cannot be given, although readers will be referred to other sources of information whenever possible. The staff cannot undertake to design special circuits, receivers, equipment or installations. The staff cannot service receivers or test any radio apparatus. Wiring diagrams of commercial receivers cannot be supplied, but where we have published them in RADIO NEWS, a reference will be given to past issues. Comparisons between various kinds of receivers or manufactured apparatus cannot be made.

Only those requests will be given consideration that are accompanied by the current month's coupon below, accurately filled out.

JUNE, 1933

Technical Information Coupon
RADIO NEWS Laboratory
222 W. 39th Street
New York, N. Y.

Gentlemen:

Kindly supply me with complete information on the attached question:

☐ I am a regular subscriber to RADIO NEWS, and I understand this information will be sent me free of charge.

☐ I am not yet a subscriber to RADIO NEWS.

☐ I wish to become a subscriber to RADIO NEWS, and enclose $2.50 to receive the magazine regularly for one year, and to receive this valuable technical information service free of charge.

Name.....

Address.....

signals. Cause located as a shorted bypass, screen grid to catnode, on the detector socket.

"Model 9 Knight sets with low volume and poor quality, and yet fair on distant stations. Check the coupling condensers in the resistance-coupled a.f. amplifier. Probably open. All voltages will test okay. (Another symptom in this case would be no low-frequency response.—*Ed.*)

A Tip for the Rural Serviceman

"While servicing a 6-volt battery set using 3 cells of a Delco system for the 'A' supply, the idea of employing the 32 volts for the detector 'B' occurred to the writer. This provides a justifiable economy, as the heaviest drain is on the first 'B' battery, and the difference in volume attributable to the change is very slight.

"'A' minus and 'B' minus have a common terminal in the system. The high voltage side of the plant is connected to the detector 'B' plus and to one side of an electric light bulb. The other side of the socket goes to 'A' plus through a heavy duty rheostat. A voltmeter should be connected across the 'A' battery leads in the set, and the voltage maintained below six volts by means of the rheostat.

"The size of the bulb used will be determined by the number of tubes in the set. For a tix tube receiver, a 50-watt, 28 to 32-volt bulb is used, and for a 5-tube set a 25-watt and a 15-watt bulb in parallel.

"E. H. McNeill, East Haddam, Conn."

A somewhat more simple method is to light the filaments from three cells of the Delco system and supply the detector "B" voltage from the plus 32-volt side. No series lamps or extra rheostats are required.

Stewart Warner 950

Glenn Ellsworth of Vernonia, Oregon, has picked a few prize ones in this model receiver. The first complaint was noise—a cross between a roar and a howl. A bad -45 tube was suspected, but proved guiltless. The pitch of the note rose as the set warmed up, suggesting the possibility of leaky condensers or faulty resistors, and attention was directed to these possibilities. The culprit turned out to be the r.f. by-pass in the plate circuit of the detector tube. While low-voltage tests showed nothing wrong with this capacitor, leakage was apparent at higher potentials. Disembowelment of the defective unit showed a peculiar form of deterioration which suggested the possible creeping inclusion of an acid soldering flux at some previous servicing (by another serviceman!).

Another Stewart-Warner 950 developed hum—an unusual trouble with this receiver. The cure was equally off the beaten path and consisted of connecting a 2 mfd. condenser across the detector grid-bias resistor.

Mr. Ellsworth's final contribution to the science of radio pathology, describes a definite improvement in the selectivity of the same S.-W. 950 by connecting a 2 mfd. condenser from the set side of the a.c. switch to ground. Probably a case where a bit of pick-up was getting in via the power line and gumming up the legitimate input.

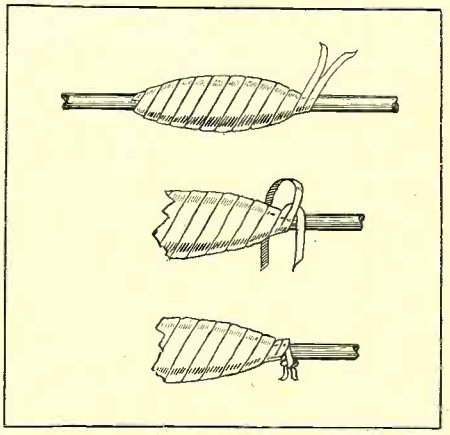
An Old Offender

Mr. M. W. Weld, Radio Service and Repair, of Sanford, Maine, has rediscovered a source of noise just common and baffling enough to justify occasional redescription.

As he tells it—"Anyone walking across the floor of the room in which the set was installed, or a heavy truck passing in the street, would set up an ungodly racket. Naturally the first try was at the receiver itself—but everything checked okay. Next, the electrical wiring was gone over, but still nothing discovered. I was about to call in the power company's service gang to overhaul the entrance and meter, when I happened to bump into one of the pipes in the heating system. This pipe was suspended from the floor beams and passed up into the room in which the radio was located. The ceiling was of the metal lath and plaster type, and the pipe did not not center in the hole, but rested lightly against one side of it. Any vibration caused a microphonic contact with a steel lath well within the antenna field of the receiver. A clearance of ⅛ inch all around cured the trouble."

Permanent Taping

Borrowing an idea from the medical clinics, George Mark, of Los Angeles, California, sends in the sketch shown below. Designed to make taping stay taped when exposed to rain and sun, it is good practice on



any permanent taping job indoor and out. Split and rip the tape lengthwise for two or three inches from the finishing end, wrap the two pieces around the wire in opposite directions, and tie.

Condenser Resistance and Low Sensitivity

Frederick J. Bernardini, of Calais, Maine, has unearthed high-resistance rotor contacts as the cause of many instances of low sensitivity. Direct-current resistance measurements, from grids to ground in tuned circuits, have shown discrepancies as high as 8 ohms which could not be accounted for by differences in the coils.

High-resistance circuits of this nature may be suspected in cases where a consistently insensitive receiver is not amenable to the usual attention to tube conditions and correct voltages. The obvious cure of pig-tailing all rotor connections, or cleaning and stiffening spring contacts may be effected without further checking by means of d.c. resistance measurements. While the positive results of such measurements may be indicative of trouble, negative results are not reliable, as the measured d.c. resistance will often vary with the potential employed, due to polarization effects resulting from the electrolysis of grease and oxide accumulations in the contacts.

In some instances, such contacts will result in instability (due to a more or less floating grid) or increased but inconsistent sensitivity. Such effects are almost invariably accompanied with noisy tuning.

Auto-radio Antenna

We close as we started—with automobile radio. The M. H. Fleron Company, of Trenton, N. J., has developed an under-chassis antenna for autos. The ease of attachment recommends this device for installation in cars not equipped with a built-in roof aerial. It is also an excellent "ounce of prevention" where noise pick-up from the dome-light interferes with reception on the conventional installation.

For Your Enjoyment!

"The Intelligence Gigantic"

by J. R. Fearn

FIVE gleaming trays, upon which reposed food and drink, floated into the huge, guarded chamber and became stationary before each of the captives, held firmly aloft and guided by powerful radio waves.

Just one of the many amazing inventions created by the *Intelligence*.

Three scientists had produced the *Intelligence*—a synthetic being equipped with a brain of superhuman mentality, but without sex or soul!

Its marvelous brain power enables it to rule the world and to advance civilization beyond human conception. Due to its lack of morals, the *Intelligence* is a pitiless intellectual power and a dreadful despot.

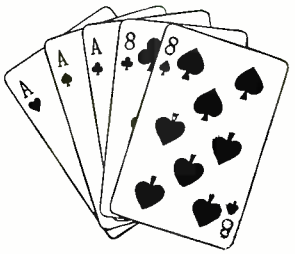
David Elton, the scientist who created the super-intelligent brain, strives to destroy the monster. Will he succeed or will mankind be replaced by synthetic beings? Read *"The Intelligence Gigantic"* in the June issue of *Amazing Stories*.

Also in this issue are "The Crime Crusher" by Bob Olsen and "Tumithak in Shawn" by Charles R. Tanner.

***In the June* Amazing Stories**

"Dead Man's Hand"

by William MacDonald



A FRIENDLY poker game between Vink Thorpe, Brad Wheeler, Matt Everett, Ward Stinson and Gus Oldfield in the general store—the next morning, Thorpe found murdered . . . his last poker hand before him . . . a full house, aces up with a pair of eights . . . superstitiously called "the dead man's hand"!

Events had been moving fast in the small, western town of Morada. First, there had been signs of cattle rustling on the VIT range and a smoldering boundary dispute between Thorpe, owner of the VIT range and Stinson, owner of the Forker-S. Then the receipt of a mysterious letter that caused Thorpe to turn ghostly white—and a sudden resolution to go to Capitol City in the morning to draw up a will. And then the dramatic climax—Thorpe murdered!

Who killed Vink Thorpe, "King of the Crazy River Country"? What were the contents of that mysterious message?

Read *"Dead Man's Hand"*, a full length western novel.

In the June
Wild West Stories and Complete Novel Magazine

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"The Shanghai Bund Murders"

by F. V. Mason

MICHAEL SMITH, German spy, swayed crazily back and forth—wires twisted below his thumb joints, the ends joined and stranded over an iron hook so that his hands were secured high above his head.

Ruby Braunfeld, Austrian adventuress, lay in a wire-topped coffin, perpendicularly divided into four segments. Starved rats gnawed at a piece of bacon between the first and second sections, the hysterical woman's body was wedged into the other three sections.

Lashed to a table, writhed Captain North, U. S. Secret Service ace, a double-edged sword poised precariously above him, spasmodically driving nearer and nearer to his heart.

Three pawns of humanity at the mercies of a raging Chinaman, trapped in an ancient torture chamber. Outside—a doomed city. Captain North alone could save Shanghai from the Chinese bandits—he alone could stop the shipment of munitions! Could he escape—or would the sword reach its goal? Read *"The Shanghai Bund Murders"*, a full length novel.

***In the June* Complete Detective Novel Magazine**

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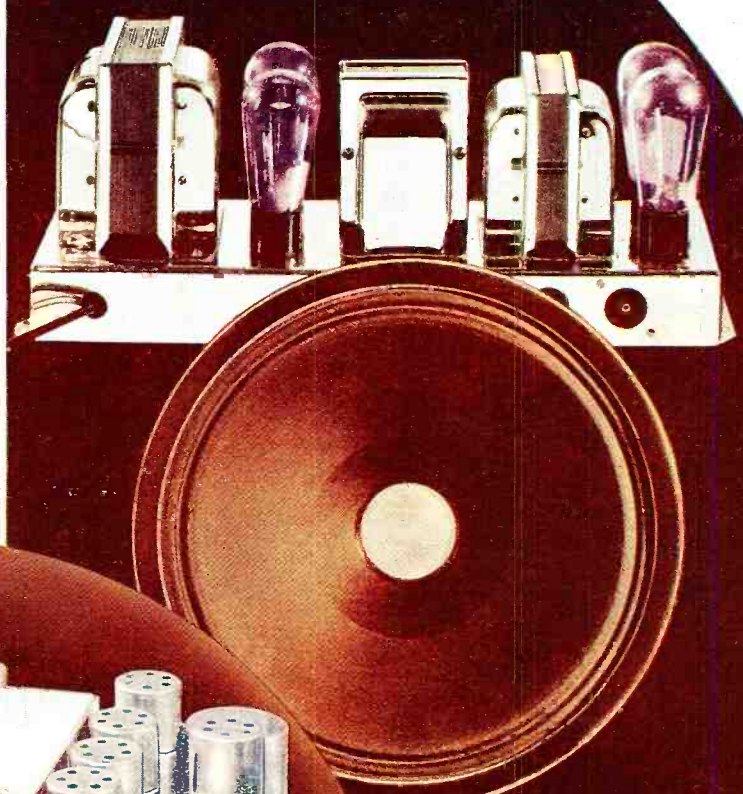
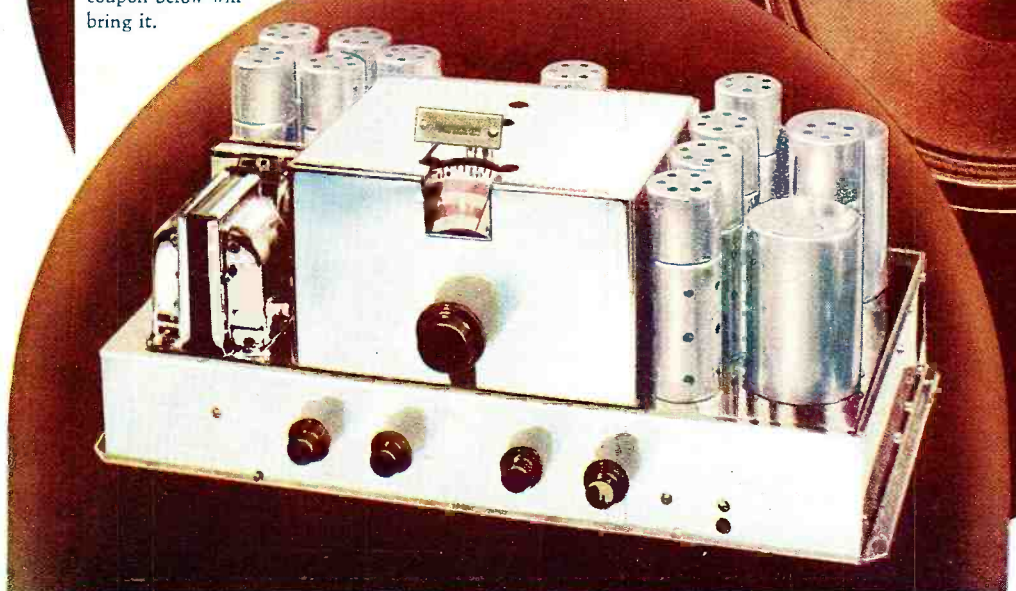
It is comparatively easy for even a mediocre all-wave receiver to register the signals of foreign short wave broadcasters. Consequently it does not take a masterpiece to support the flimsy subterfuge of a guarantee based upon the mere reception of foreign stations.

But it is not mere signals you want to hear. When you tune in London you want every sweet note from the Hotel Mayfair dining room—the shuffle of feet on the dance floor—the tinkling of glasses on the tables . . . you want the complete and thrilling picture of far away London reproduced before you. You want all the romance—all the adventure of your trans-oceanic air journey, whether it be to London, Rabat or a hundred other places equally as fascinating to hear. A *guarantee* won't give you this—but *engineering* will!

The Masterpiece is acknowledged to be the most outstanding achievement in the field of precision engineering. It invites the opportunity to demonstrate its superiority in open competition. It meets all issues squarely—to give you foreign reception just as you want to hear it, or to be immediately returnable for full refund—no questions asked.

Full technical description of The Masterpiece and its many advanced operating and performance features are contained in my new book. Six cents in stamps and the coupon below will bring it.





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