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RADIO NEWS

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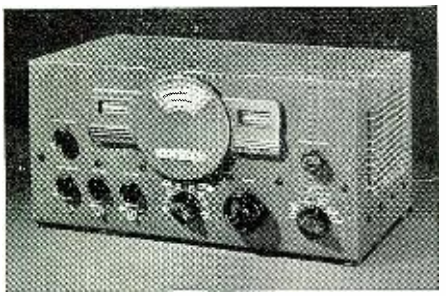

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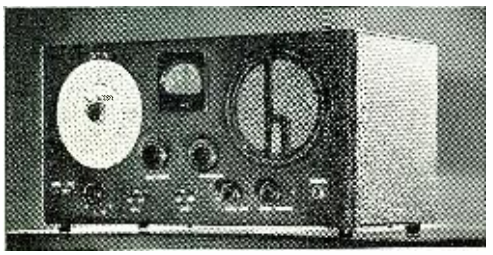

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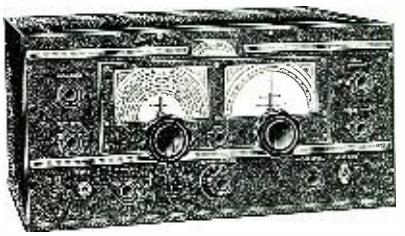

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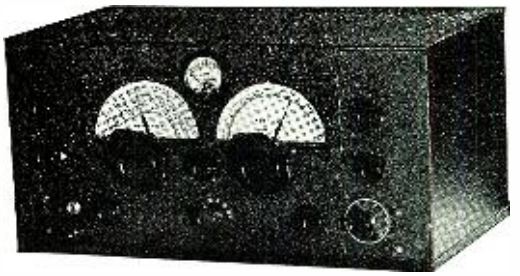

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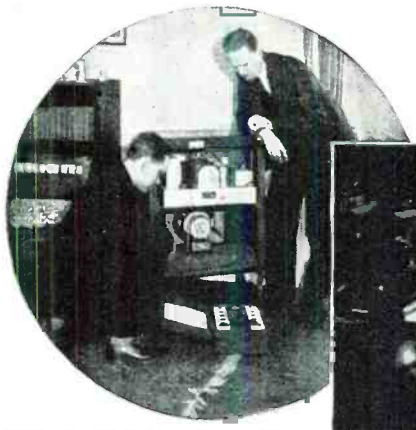
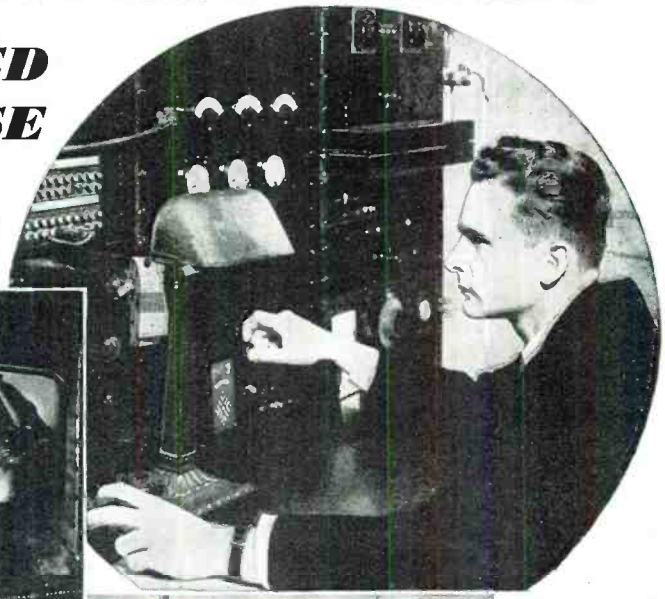


(Above) SET SERVICING pays good money to N.R.I. Graduates—either full time or spare time work.

(Below) AVIATION, Commercial, Marine, Police Radio are other fields that have given good jobs to N.R.I. graduates.



(Above) BROADCAST STATIONS: Many N. R. I. graduates are employed in good-pay jobs as operators, engineers, etc. (Left) LOUDSPEAKER SYSTEMS: Many N.R.I. men make good money in P.A. work.

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Dept. 9FR, NATIONAL RADIO INSTITUTE,
WASHINGTON, D. C.

(Above) YOUR OWN BUSINESS: Many men I trained operate successful Radio sales and service businesses.

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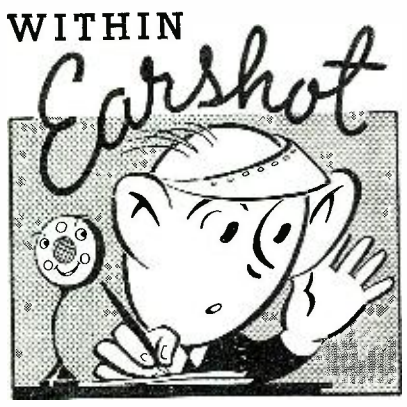

OF THE EDITOR

WE have been receiving quite a few letters complaining that by our continued pushing of television, we are creating an impression that the prospective purchaser of a good radio broadcast receiver should wait until television is here. Nothing could be further from the truth. Television will not replace the present broadcasters, and by the same token the receiver bought today will not become outmoded by virtue of the advance of television. Secretly, we suspect that this statement is just a form of sales resistance on the part of the public to the ever changing models of broadcast receivers, and their ready acceptance of the midgets; nevertheless we wish to make it entirely clear, that television is still too far off to replace the 12,000,000 receivers presently in the hands of the public.

When television comes into general use, so that the rural districts as well as the city folks will have their radio pictures, even then,—unless there is some radical change in the wavelengths and a change in the method of transmitting the television signals,—the modern broadcast receiver will not be able to do much which is satisfactory towards receiving a telecast.

So go ahead and buy that broadcast receiver, and if you must hold off the salesman, do not do it on the basis that the receiver will be outdated by television. That is not true. And in the long run, you will find that a fine musical instrument like one of the bigger receivers, will give far better reception from an aural angle than will the midget. This is so because of the infinitely better sounding board and larger speaker in the big receiver.

* * *

WE are pleased to learn that our magazine has been leading the field with television material, and that in many sources it is considered a text book on the subject. Mr. M. W. Thompson's series has been very popular and it is to be continued leading right up to the home construction of a teleceiver.

Mr. Thompson was in the other day to discuss details of this 1939 RADIO NEWS TELECEIVER, and we can release this much information to you.

(*More Earshot on page* 66)

RADIO NEWS

Including Articles on POPULAR TELEVISION

The Magazine for the radio amateur experimenter, serviceman & dealer

VOL. 21 NO. 6

Contents for June, 1939

FEATURES

DEPARTMENTS

RADIO NEWS is published monthly by the Ziff-Davis Publishing Company at 608 S. Dearborn St., Chicago, Ill. William B. Ziff, Publisher; B. G. Davis, Editor; Karl A. Kopetzky, Managing Editor; Oliver Read, Technical Editor, E. Stanton Brown, Associate Editor; Herman R. Bollin, Art Director; John H. Reardon, Circulation Director; S. L. Cahn, Advertising Manager. New York Office, 381 Fourth Ave. Subscription $2.50 per year; single copies, 25 cents; foreign postage $1.00 per year additional except Canada. Entered as second class matter, March 9, 1938, at the Post Office, Chicago, Illinois, under the Act of March 3, 1879. Contributors should retain a copy of contributions. All submitted material must contain return postage. Contributions will be handled with reasonable care, but this magazine assumes no responsibility for their safety. Accepted material is subject to whatever revisions necessary to meet requirements. Payment will be made at our current rates upon acceptance and, unless otherwise specified by the contributor, all photographs and drawings will be considered as constituting a part of the manuscript in making payment.

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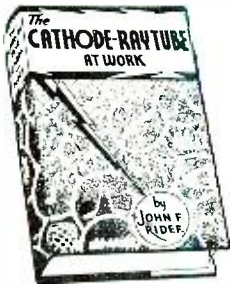

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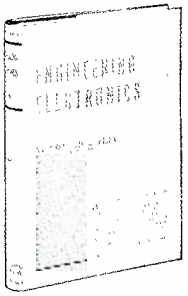

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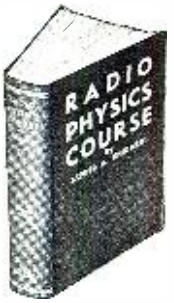

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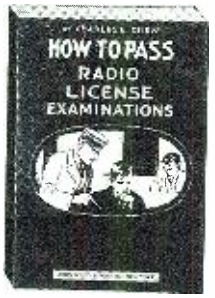

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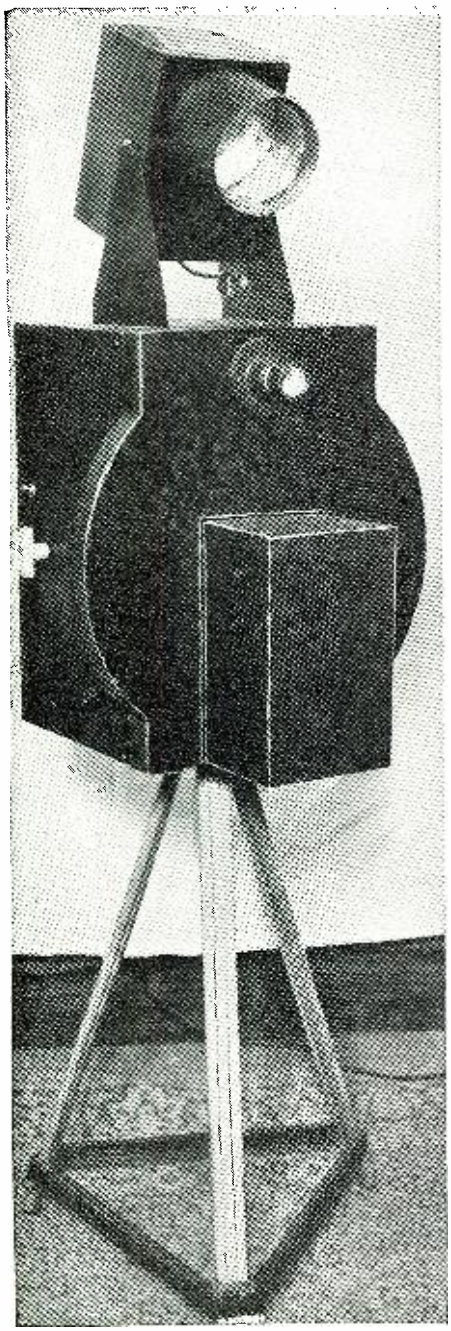


INASMUCH as *high definition* electronic television cameras are not available to most amateurs because of the cost, an effort has been made to design a camera which would have enough detail to be interesting; be not too difficult to construct; and above all be as inexpensive as possible.

At first a 45 line flying-spot camera was built, using a pinhole disc with a 1,000 watt projection lamp and a bank of photo-electric cells. This camera would only pick up scenes about one foot square (close to the camera), such as faces of persons and drawings. Later, a camera was built using a 45 hole lens disc with an automobile headlight bulb and a bank of p. e. cells.

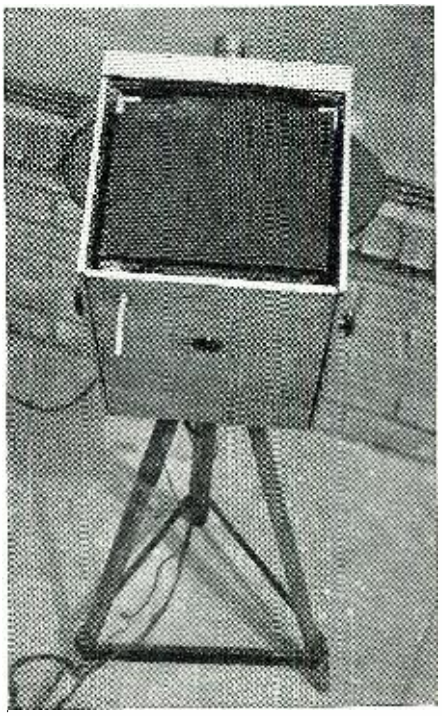
These cameras worked but their range of pickup was limited, the detail was not too good, and they had to be operated in a dark room. So it was decided to build a 60 line direct pickup camera which would take scenes either indoors or outdoors. It was thought by some that such a camera using a small scanning disc was impossible. However, several experiments proved it could be done. The difference in detail between a 45 line and a 60 line picture is more noticeable than between a 60 line and a 100 line picture. In fact, the detail of a good 60 line picture is great enough that when showing a car going by on the street such details as the windows, fenders, and spare tire can be seen.

This camera when used with either a scanning disc or c. r. tube receiver offers the technician an opportunity to profit by his experience in television at once by giving demonstrations at stores, theatres, and fairs. It would also be good advertising for a service shop. Admission may be charged or the store may pay the technician for his time as operator and the use of the equipment. As examples of this are the demonstrations given at the Chicago World's Fair and the Dallas Centennial. Following is a description of the camera and method of construction:

The camera box is made of plywood covered with sheet aluminum. The edges of the aluminum are bent over the edges of the plywood to hold them together. A 1,000 watt, 110 v. spotlight is mounted on top the camera to provide light for indoor or studio scenes. This spotlight is in an aluminum box which can be tilted up or down. When the camera is turned to shift from one scene to another the spotlight will follow the camera. For outdoor shots in daylight the spotlight is not used.

A 5″ lens mounted in the lamphouse is used to focus the light on the subject. The inside back wall of the lamphouse is left unpainted to act as a reflector behind the light.

Projection spotlight bulbs of the type



Left, the completed television camera with its spot-light. Right shows how the camera box is constructed.

used have a concentrated filament and must be well ventilated to have a normal life. Spotlight bulbs with the filament in a half circle evidently have a longer life than the regular projection lamps. Large holes in the top and bottom of the lamphouse provide sufficient circulation of air.

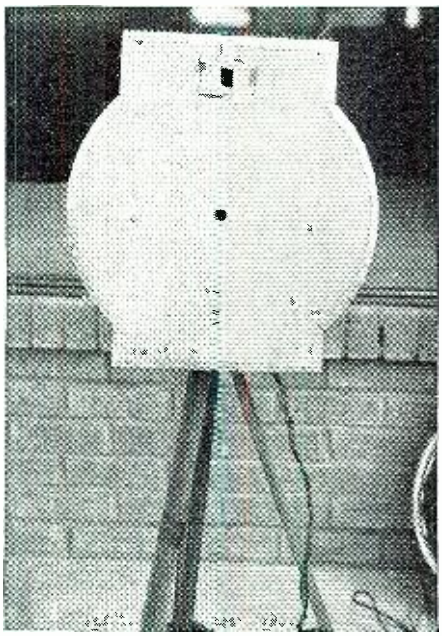
Four small 45 v. "B" batteries and five No. 6 dry cells in the bottom of the camera box supply power for the two preamplifier stages and the p.e. cell, all of which are mounted in the camera.

The p.e. cell and preamplifier tubes are in a tin box which is "light tight" except for the window in front of the p.e. cell. A piece of screen wire must be soldered over this window to shield the p.e. cell.

The preamplifier box (or head amplifier) *floats* on an inch of sponge rubber, and has a narrow strip of sponge rubber around the p.e. cell window, which is pressed against the wall at the back of the disc, to keep out stray light. Due to the high sensitivity of the amplifiers any sharp vibrations of the preamplifier box coming from the motor will cause hum in the amplifier.

One source of hum was located as coming from vibration of the top of the amplifier box. A thin aluminum cover with a heavy coat of paint removed the hum. All of the tubes in the amplifier are mounted horizontally by means of metal brackets on the tube sockets. The camera is so mounted on the tripod that it can be tilted or turned in any direction.

After trying several types of p.e. cells, some of which were not sensitive enough to work at all, the Cetron type C. E. 7 was found to be the most efficient. This is a gas-filled cell (manufactured by the Continental Electric Company of Geneva, Illinois) which has a drop in sensitivity of about 2 d.b. at 10,000 cycles. With the added capacity of the circuits and tubes the output of the amplifiers at 40,000 cycles would be very low, if ordinary resistance-capacity coupled amplifiers were used, resulting in a serious loss of detail in the picture. However with *compensated amplifiers* a reasonably *flat frequency response* can be obtained.



The scanning disc is enclosed in a light-proof case. Note the aperture. The lens is mounted over aperture.

For ordinary demonstration purposes with the 60 line camera, the simplest way of sending the picture is by shielded cable to the receiver. The cable is a low-capacity type single shielded wire, with the shield grounded to the head amplifier and the camera box. It may be up to 50 feet in length.

The lens system of the camera is composed of two small magnifying glasses 1¼ inches in diameter mounted together. These lenses may be obtained at variety stores for about 25 cents each. When mounted together the lenses should have a focal length of about 2 or 2½ inches. This is easily found by focusing a spot from the sun on a piece of paper. The distance from the lens to the paper is the focal length.

The lens barrel was made of two pieces of brass threaded together, and turned out on a lathe. Strips of paper and water-proof cement were used to fix the lenses in the barrel. The lenses must be set straight in the barrel to prevent blurring of the picture.

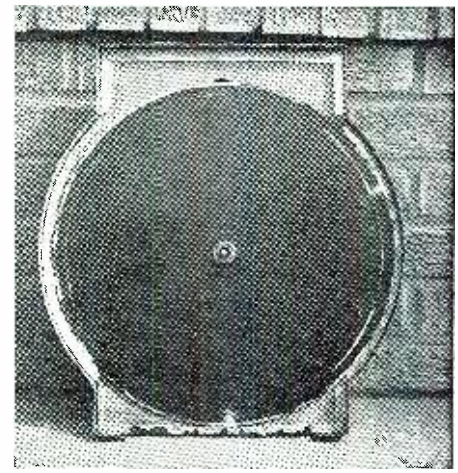
The lens barrel and motor are mounted on the front wall or side of the camera. A strip of aluminum running all the way around the camera holds the front side to the wall behind the disc.

Two toggle switches are mounted on the sides of the camera for the "A" and "B" batteries.

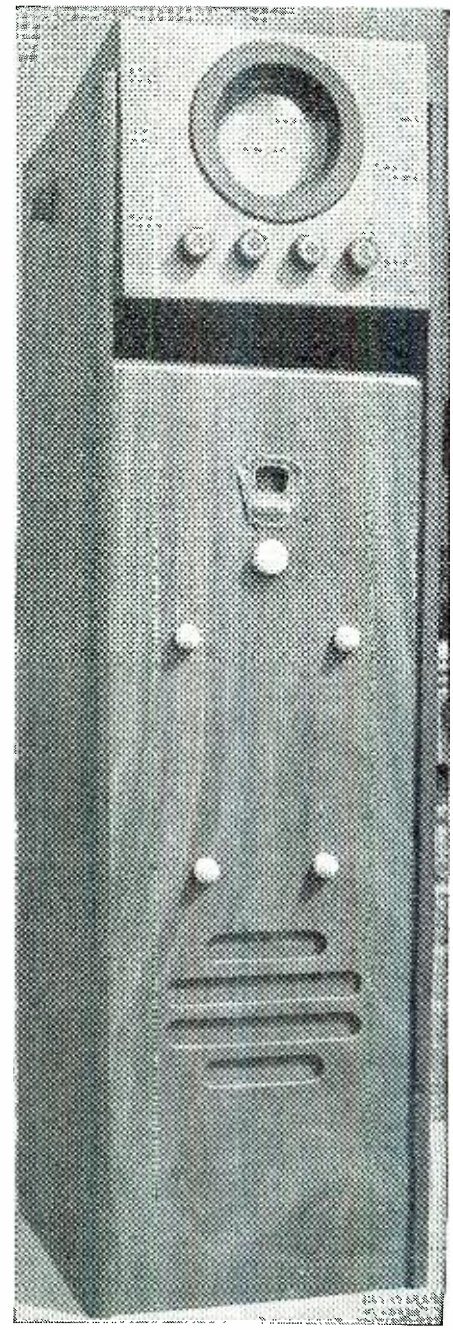
The motor (manufactured by A. H. Pohl, 2123 Hubbard, Detroit, Michigan) is a special combination sync and brush type with two switches. The lower switch turns the motor *on* and connects the armature winding in *series* with the two field windings. When the motor is at the approximate running speed the upper switch is turned, which shorts the brushes to cut out the armature winding, and also pushes the brushes away from the commutator. The motor will then be running as a truly sync motor. As any sync motor approaches correct speed it will "hum or grunt rapidly," the "grunting" slowing down and finally stopping at synchronism. When such a motor hunts, a slow grunting will be heard.

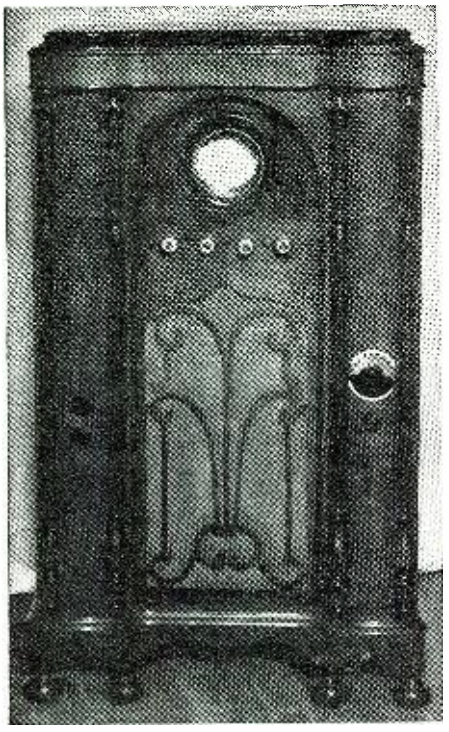
In this camera, a 14 inch disc (made by A. H. Pohl, Detroit) with square holes is used. Until recently the amount of light coming through the small holes in this size disc was not sufficient to work the p.e. cell. But with late types of cells the camera is sensitive enough to take any size scene in daylight. The only limiting factor being the comparative loss of detail when too large a scene is being taken.

The spotlight on the camera gives enough light for studio work with objects about one foot square. With this, close-ups of faces, cartoon work and



Above, the scanning disc exposed for examination. Below, the latest type receiver developed by the author.





This first tele-ceiver was used by the author for direct wire pick-up.

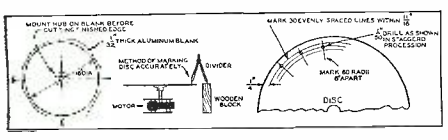
pictures taken from magazines can be taken. Retouched pictures from magazines provide excellent program material. The retouching should be done with a dull black crayon or black india ink, not with a pencil.

A potentiometer on the back of the camera controls the voltage on the p.e. cell and thus the gain. Another gain control is used on the input of the main amplifier chassis. If the latter control is full on, noise coming from the first tube of the head-amplifier and the p.e. cell will show up in the picture as tiny black specks. The limit of usable amplification is reached when this noise begins to appear in the picture.

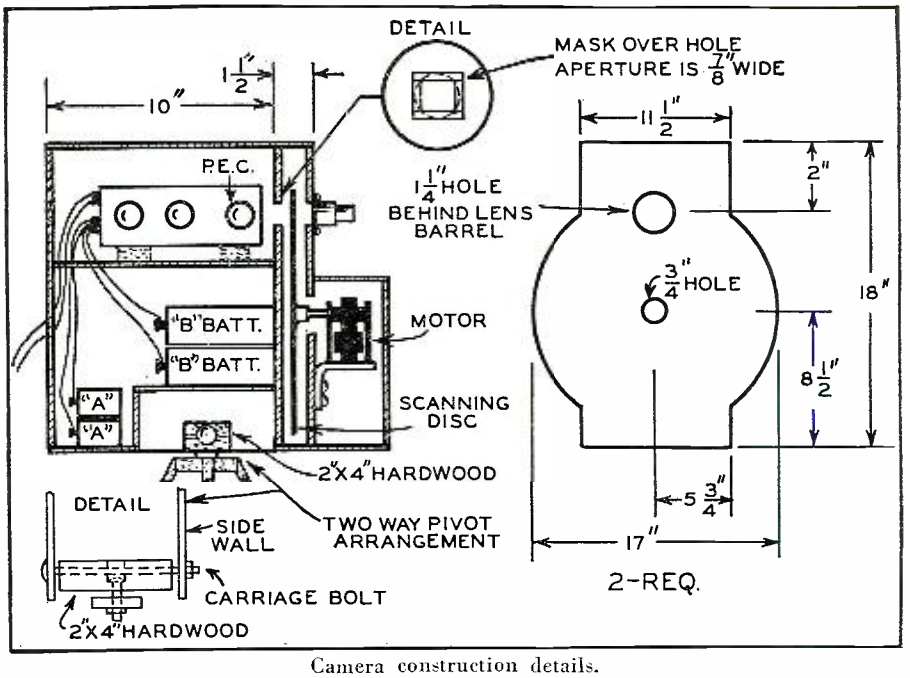
The electron emission of a tube is not entirely smooth and constant, rather the electrons leave the cathode in small bunches (especially with large plate current), giving rise to the *shot effect*. This together with *thermal agitation* in the wiring produces the undesired *noise level* of sensitive video amplifiers.

Late researches indicate that the noise level of a gas-filled p.e. cell is much higher than that of a vacuum cell, possibly due to thermal agitation of the gas. This noise level is higher than that of the wiring and even the internal noise of the first tube.

A sensitive vacuum cell was tried and proved to be just as sensitive for this application. Slight adjustments in the amplifiers were necessary to lower the high frequency response.



How the holes in the disc are made.



Camera construction details.

Sixty Line C.-R. Tube Receiver

As yet only a few sections of the country are able to receive the 441 line stations which are all on the ultra short wavelengths. This receiver can be used to pick up W9XG, Lafayette, Indiana, on 2050 K.C. which can be received in all parts of the country under favorable conditions, or it can be used with the 60 line camera. W9XG broadcasts from motion picture film on Tuesday nights at 7:30 and Thursday nights at 8:00 o'clock, for about 40 minutes. Those who have seen their pictures are always surprised at the amount of detail and the steadiness of the image due to the automatic synchronizing impulses sent with the picture.

When making the 60 line receiver, four decks are used in the receiver cabinet. The chassis for the c.r. tube and sweep tubes is on the top deck. The next deck holds the chassis for the r.f. and det. stages with their power supply. The second deck holds the video amplifiers. Two power supplies and the speaker are mounted on the bottom deck.

The top chassis has four volume control potentiometers on the front and four on the back. Two on the front control the frequency of the sweep circuits (number of lines and frames); one controls the intensity of the spot by varying the grid bias on the c.r. tube; and the other one the focus (first anode voltage) of the spot. Best detail is obtained when the lines are focused as small as possible, so that a thin black line appears between each two bright lines.

When using a comparatively low

(*Televise further on page* 54)

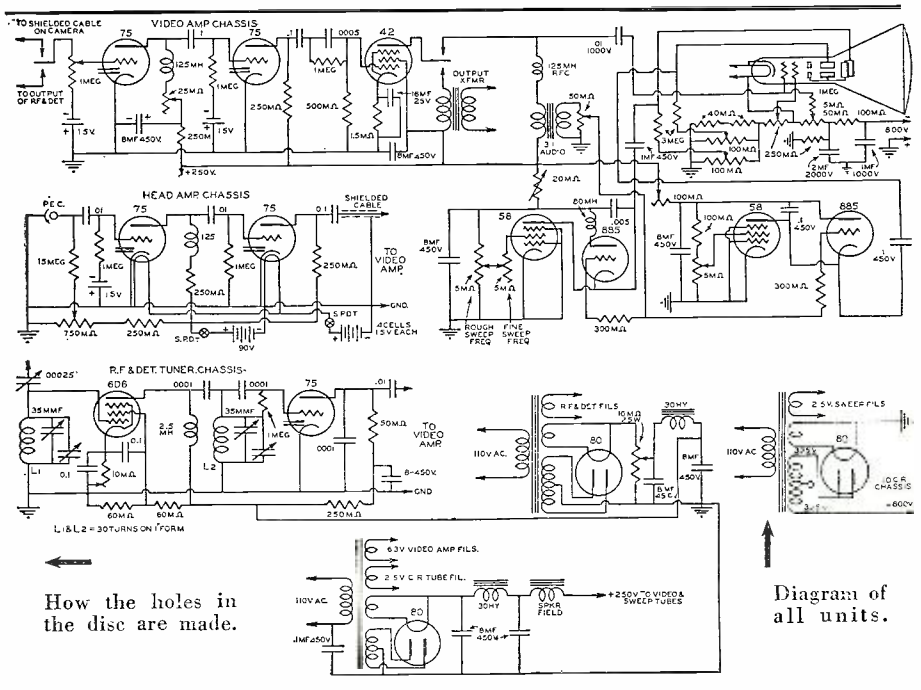


Diagram of all units.

Serviceman's Universal P.A. System

by M. N. BEITMAN
Engineer, Allied Radio Corp.
Chicago, Illinois

Just what the serviceman can use during the summer, a system for 6 v. battery or 110 v. A.C.

A complete portable unit for records or microphones.

TO have a truly universal sound system, suitable for any requirement, is the dream of every radio serviceman. With the objective to satisfy this need in a practical and economical way, this new 30 watt universal amplifier was designed. While in majority of installations, 110 volt a.c. is available, there are places and times where one cannot get the "juice" from a wall receptacle.

Since sound equipment is at times needed for mobile work in automobiles and trucks, the same amplifier should be able to operate from a 6 volt d.c. source with no circuit alternations. The storage battery serves also as an excellent means of power in non-electrified areas or in emergency installations.

By incorporating two primary windings on the power transformer, the changing from 110 volts a.c. to 6 volts d.c. is accomplished by simply replacing the connecting cable and plug. The power supply section of the amplifier is perhaps more interesting and is more ingeniously designed than the other sections of this modern unit.

In using the d.c. source of power, a special heavy-duty, multi-contact vibrator is employed to interrupt the current into pulses to enable the transformer to step up the voltage to the required values. The full-wave, non-synchronous vibrator and center-tapped primary are connected in a familiar circuit and on first examination it may seem that about 6 volts appear on each side of the primary during the corresponding alternations. However, in terms of effective a.c. voltage only about 3.2 volts appear.

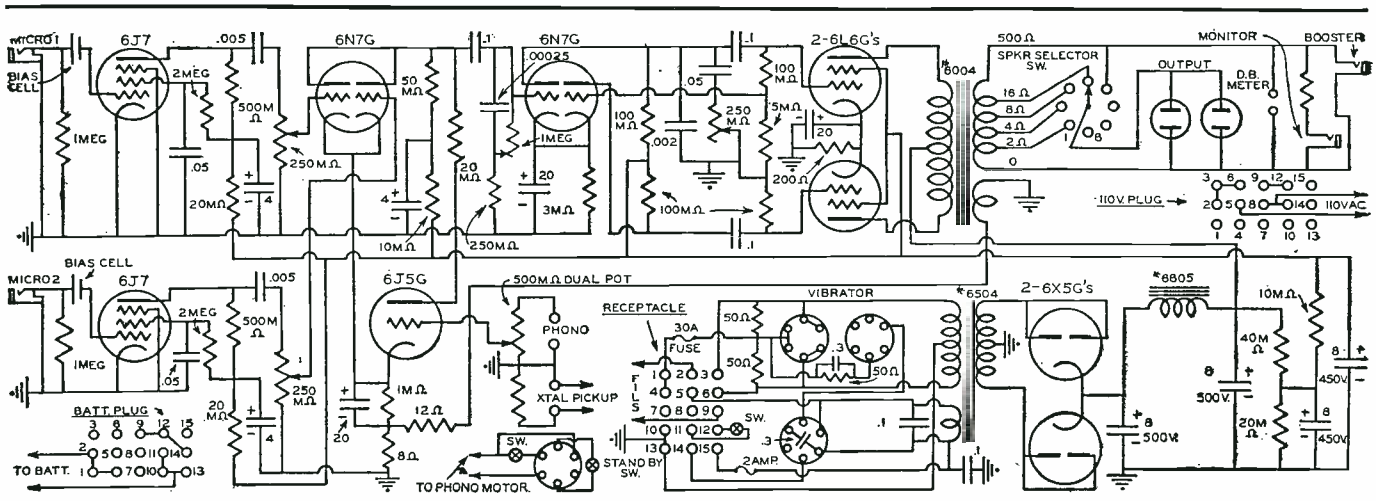
There is a definite IR drop in the connecting cable and transformer winding, and since the wave form is far from the ideal sine curve shape, the effective R.M.S. voltage is reduced considerably. This voltage reduction, as will be explained, works out ideally for the use of the same transformer on 110 volts a.c. power.

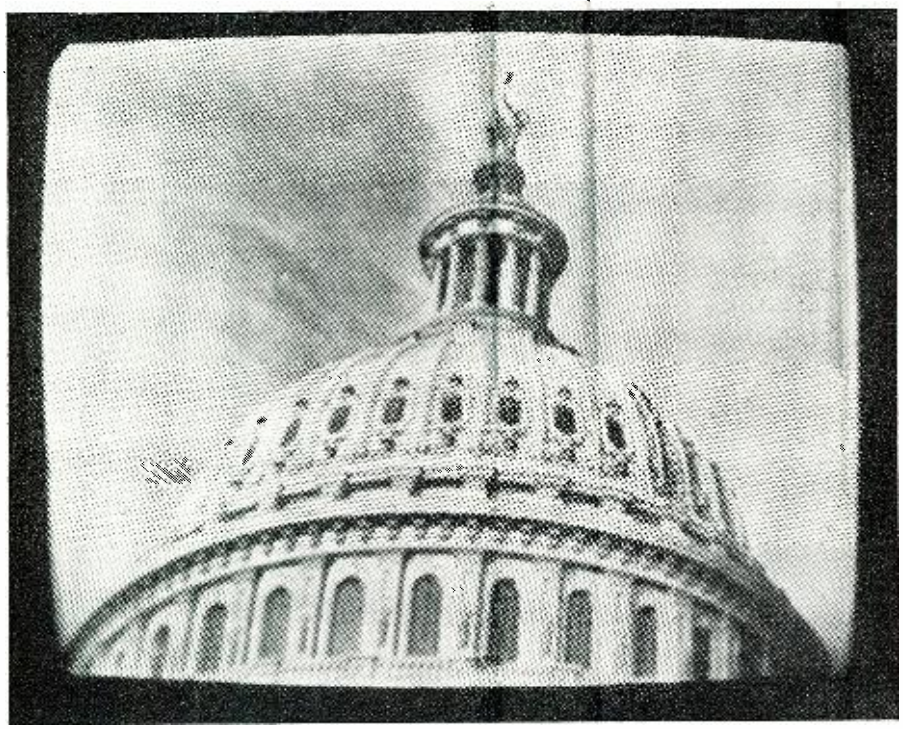
The high voltage secondary winding is connected to two 6X5G tubes in a full wave rectifier circuit and proper filters follow. Actually a single rectifier tube would serve, but under peaks it would be loaded to its maximum capacity and the working life would be shortened.

The remaining winding, as you can see, is used as the 110 volts primary when the a.c. plug is inserted. This plug serves also as an automatic switch. But when the 6 volts d.c. power supply is used, this winding produces 110 volts, 60 cycles, and is used to operate a regular a.c., 78 r.p.m. synchronous record turn-table. The tubes, with this mode of operation, are connected directly to the 6 volt d.c. power supply.

Now when the a.c. plug is inserted, the amplifier is ready for 110 volts operation. The phono motor runs directly from the power supply, and since the turns ratio of the high voltage to the 110 volt winding remains the same, correct voltage results for the plate power supply winding.

(*More information on page* 62)





An example of perfect frequency separation—a perfect tele-picture.

FREQUENCY SEPARATOR

by M. W. THOMPSON
Television Engineer, Chicago, Illinois

A television signal is complex, containing many things besides the actual picture. Separating these components gives us the tele-picture.

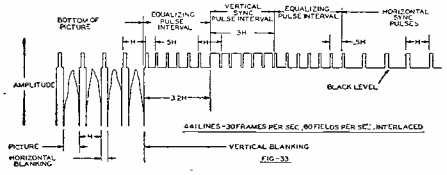
Lesson 5 of the Television Series.

As previous articles have carried our discussion of television reception through transmission standards and channels (February issue), the Iconoscope and its amplifiers (March), antennas and u-h-f circuits (April), then intermediate amplifiers and second detectors (May), it seems desirable at this point to present a block diagram that will show the operations still to be performed.

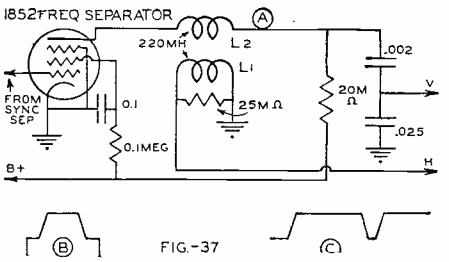
The video amplifier, in effect, replaces the audio amplifier of a sound receiver, the C-R tube is substituted for a speaker, and the A. G. C. is similar in operation to an A. V. C. The items Sync Separator, Frequency (sweep) Separator, and Vertical or Horizontal Sweep Oscillator are definitely new and different. It is the duty of the Sync Separator to take a combination of video and complex synchronizing signals, and eliminate the former, then pass on pulses which can be further separated and then used to control the line and field frequency oscillators.

The section designated as Frequency Separator then takes the three types of pulses—Horizontal, Vertical and Equalizing—separates the first from the other two, and so provides the timing which keeps the scanning of our picture tube synchronized with that of the Iconoscope (camera tube) at the transmitter.

Since it is necessary to move the electron beam in the Kinescope in two directions, vertically and horizontally, an electronic-scanning receiver must have *two* sets of sweep or scanning circuits. Each consists, essentially, of an oscillator (relaxation, blocking or multi-vibrator) whose frequency can be held under control by the pulses from the Frequency Separator, and an amplifier which may be either "pull" only, or push-pull. If the Kinescope contains two pairs of parallel plates, these amplifiers are connected to them and electrostatic deflection of the



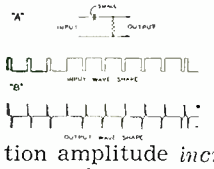
beam is employed. Some types of cathode-ray tubes do not include these plates but are designed for a "yoke" to be slipped over the neck of the tube and moved forward close to the point where the conical shape begins. This yoke contains two coils, to which the sweep amplifiers are connected, and electromagnetic scanning is said to be in use.



Having thus mapped the courses to be taken by the video and synchronizing components of the television transmission, we can go back to where we left our composite signal last month—at the second detector. Due to space limitations, it was impossible to go into the subject of "polarity of shading" in which the detector plays a very important part.

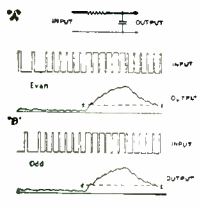
Television stations use movie technique in making titles and fade-ins.

A most confusing point in television is to find that one writer states that a receiver *must* have one or three video amplifier stages, while another says, with equal positiveness, that you either feed the Kinescope's grid directly from the video detector or two stages must be employed.

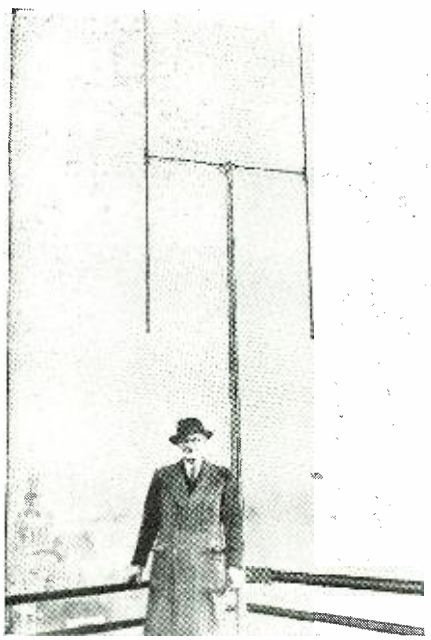


This all goes back to the fact that, with present RMA standards, modulation amplitude *increases in black* portions of the picture and *decreases in white* areas, and is said to have *negative* transmission polarity. It is essential, therefore, that video signals reach the Kinescope grid with correct polarity of shading, otherwise (1) the image will resemble a photographic negative (blacks are white and vice versa), and (2) the "blanking pedestals" will not be at full black amplitude and may bias off the Kinescope during the return trace of the beam.

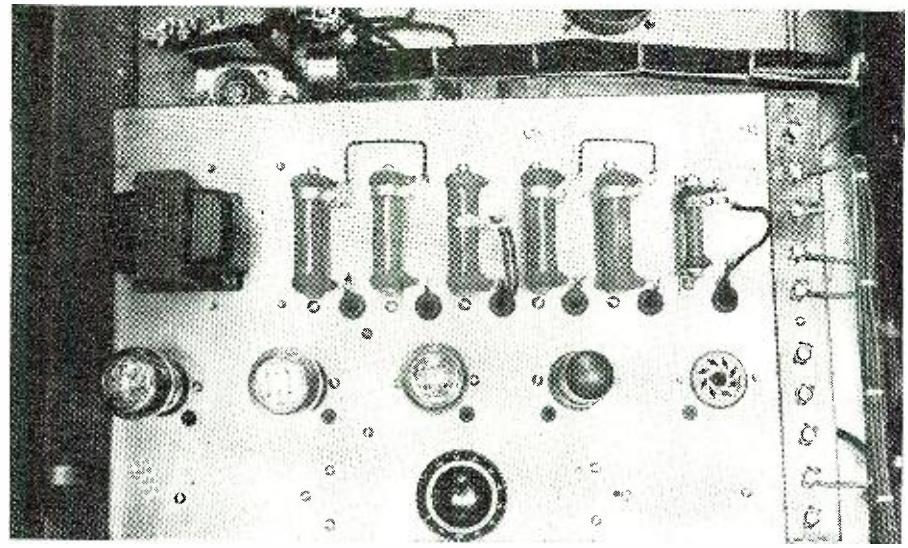
Each video amplifier stage produces a complete reversal of polarity of shading and the last stage must feed the picture tube grid with video signal and blanking periods at *negative* polarity. Now, strange to say, the proponents of *both* odd and even numbers of video stages can be right if each would only add—and this is important —"with my detector hook-up."



Three methods of inserting a 6H6 diode are shown in Figure 32. When the "high" end of the input circuit is connected to the plate of the diode, as in 32a, and the output filter network is connected to the cathode, the output polarity of shading is "positive"



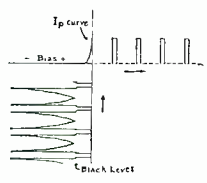
The British Televisors use this type of antenna for receiving.



The scanning source for live "pick-up" used and built by Don Lee. of W6XAO.

and must be reversed by either one or three video stages. If, as in 32b, the "high" input terminal goes to the cathode, and our output network connects to the diode's plate, we get "negative" polarity of shading and this output can be fed (if strong enough) directly to the grid of the Kinescope or put through a 2-stage amplifier. The circuit of Fig. 32c, seldom used, also requires 2 stages.

This matter of polarity of shading must be watched carefully when feeding other circuits from the detector output filter. There may be as many as three circuits to be attached —the first video amplifier, a sync pulse amplifier and an automatic gain control (A.G.C.). The total of the tube and wiring capacities of these circuits may be somewhat large and it would be unwise to attach them all to the point "Z" which would be regarded as the logical output terminal.



The filter will be less upset, for example, if we tap it at "Y" for the video grid lead, and hook-on the sync separator or amplifier at "Z." If an A.G.C. amplifier is also to be operated from this filter, add it at "Y." However, do not think it unusual if, on examining the many circuits coming out, you find only the video amplifier connected to the detector's output. Many set and kit designers believe it preferable to take Sync Separator and A.G.C. current from the output of either the first or second video amplifiers, which provides much stronger components and for some designs, a more advantageous polarity of shading.

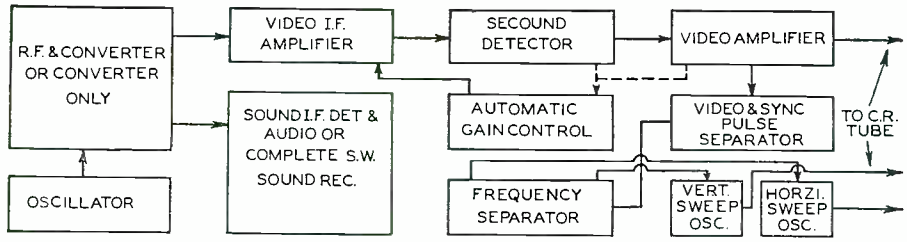


FIG.-31

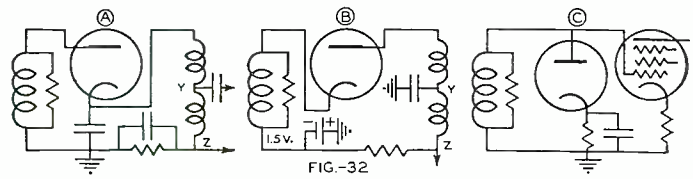


FIG.-32

Before going into separation of the

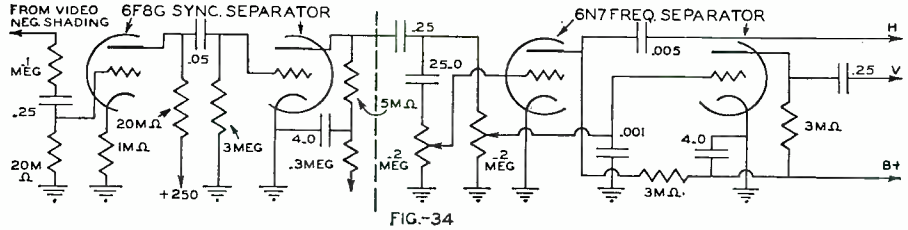


FIG.-34

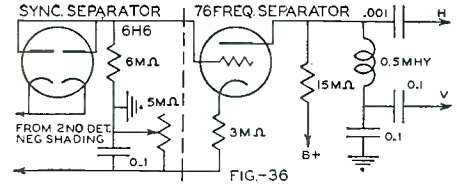


FIG.-36

synchronizing signals from the video current, let's refresh our memory of the complete television signal that has been brought in on the carrier and which appears as shown in Figure 33. The time interval chosen is at the end of one field and includes four picture

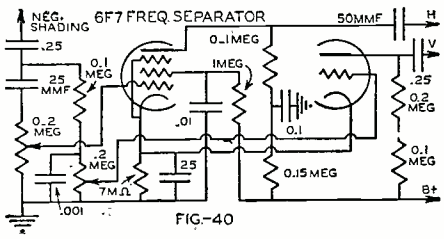


FIG.-40

lines, equalizing pulses, a vertical pulse and horizontal pulses. What we must do is split this television signal into that portion above the "Black Level" and that part below, which means elimination of the video current.

One of the most frequently used methods is that shown in Figure 34, and which uses a type 6F8G double-triode. A few moments' study of this diagram will show that the first triode of the 6F8G is a straight resistance-coupled amplifier. It serves two purposes—first to amplify, which makes separation easier, and second, to reverse the shading polarity so that signals reach the second triode with "positive" polarity. This "separation" triode is grid-leak-biased much like an audio second detector. If you overload such a detector, bias reaches the cut-off point, the tube blocks, and no plate current flows.

In this case we deliberately bias the tube so that cut-off occurs (see Figure 35) just about at the "black level." The video signals and pedestals are insufficiently positive to reduce the bias below cut-off and no plate cur-

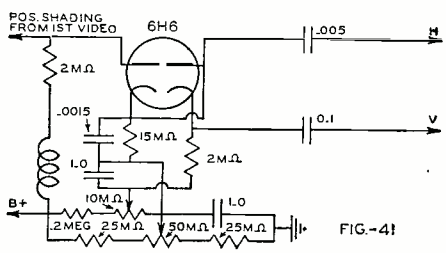


FIG.-41

rent flows; the sync pulses are, however, and, as each reaches the sync separating triode's grid, the negative bias drops and a pulse occurs in the plate circuit. The amplitude of these output pulses will remain constant, regardless of variations of the video signal, if the incoming pulses not only swing the bias below cut-off but also to zero. While only a series of horizontal sync pulses are shown in Figure 35, the equalizing and serrated vertical pulses go through in the same way, since all are above the "black level" and of the same amplitude.

Another method of separating the sync and video signals that you will encounter, although less frequently, is that shown in Figure 36, and here a 6H6 diode is set-up to pass the former and reject the latter. It is essential here that the plates be biased very slightly negative with respect to the cathode, and this bias is obtained from the current flowing in the cathode circuit of the following tube, the Frequency Separator. Current cannot flow in the 6H6 under these conditions. This bias is so adjusted that the amplitude of the sync pulses above the "black level" is sufficient to swing the plates positive, and current will flow; the amplitude of the video current is insufficient to do this and no current is passed to the Frequency Separator during the picture trace periods.

There are several methods of Frequency Separation, of which the four you are most likely to meet are here presented. One thing they all have in common—they make use of the *difference in pulse length.* If you will glance at Figure 33, you will note that

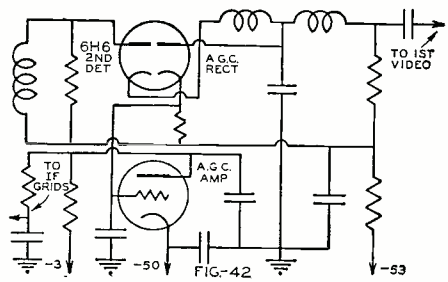


FIG.-42

horizontal pulses are short, equalizing pulses are even shorter, while the six pulses in the vertical pulse interval are, comparatively, very long indeed. A factor, also, in this separation operation is the narrowness of the serrations between vertical pulses.

The first method to be considered is that shown in Figure 37a. The successful functioning of this circuit relies on the fact that the sides of pulses (37b) and serrations (37c) are *not straight up and down,* but have a slight and very definite slope. When a current is passing through an inductance which is coupled to a second inductance, any *changes* in that current will be reflected in the second inductance (transformer action). When current such as that produced by pulses and serrations (37b and 37c) is present in the plate circuit of 37a, each slope represents a *variation* of current in coil L1 and a voltage pulse will appear in L2. The front edges of the horizontal, equalizing and six vertical pulses cause positive voltage pulses, and all back edges cause negative voltage pulses (see Figure 38B). It is the *positive* pulses which are utilized for horizontal timing and a little study will show you that this timing is constantly maintained — right through vertical pulse intervals and equalizing pulse intervals. It is true the off-beat equalizing pulses show up also, but they may be disregarded because the oscillator to which they go is not susceptible to pulses which occur that far "out of step" with it.

Because of the length of the vertical pulses and the short time interval between them, we can insert a pulse-collector or "integrator" which will build up a higher voltage and hold it there during the entire vertical pulse interval. This consists of the 20,000-ohm resistor and the .002 mfd. conden-

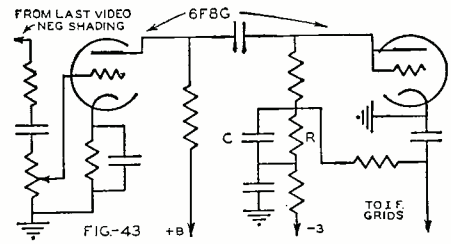


FIG.-43

ser, and the action is indicated in Figure 39B. It will be noticed that the insertion of equalizing pulses causes a much finer saw tooth formation than would be the case were they not there —both just preceding the vertical pulse and throughout its rise and fall. It is this smoothing action which makes the vertical pulses of alternate fields so alike that there is no difficulty securing proper interlace.

Only the front face of the first saw tooth in the vertical pulse (below line t-t) is utilized. Either the tube fed from the integrator is arranged to clip the pulse at "t-t" or the timing of the vertical oscillator is adjusted to respond to this pulse only on the first small saw tooth.

The type of Frequency Separator which will probably be the most utilized is that shown in Figure 40. What it really provides is a pair of *selective input* filters; and a pentode line frequency amplifier and a triode field frequency amplifier. Figure 38A presents a "high pass" resistance-capacity filter and 38B gives the action. In Figure 40, this R-C combination is the 25 mmfd. condenser and the 200,000-ohm variable resistance, from which a lead goes to the pentode grid. In Figure 39A we have a "low pass" filter, together with the integrating action (39B), and its counterpart in Figure 40 is composed of the .001 mfd. condenser, a 100,000-ohm fixed resistor and the 200,000-ohm variable from which a wire connects to the triode grid. Referring back to Figure 34, you will see that a type 6N7 double-triode is used in the same way, and similar selective filters show up in the input circuits to the two grids.

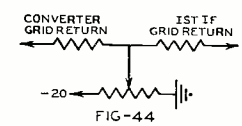


FIG-44

While Figure 36 illustrates a type of sync separator, it has also been drawn to illustrate a method of Frequency Separation. Here a type 76 triode functions (1) as an amplifier, (2) as a polarity-changer, so that positive pulses will be delivered to the sweep generators, and (3) as a frequency separator, with selective circuits in the output. The 13,230 brief line-pulses-per-second find an easy road through the small .001 mfd. con-

(*Televise further on page* 51)

AS I SEE IT!

By JOHN F. RIDER
Dean of the Servicemen

Why worry about that $1 factory service charge on the small midgets, you'll get the business anyway!

John F. Rider

(The opinions expressed herein are solely those of the author, and do not necessarily represent those of the Publisher nor Editors of RADIO NEWS.)

Identify Please

DID you ever run up against a radio receiver in which a serviceman had incorporated some of his own ideas? . . . We have, and it most certainly was no pleasure. Not that we are condemning the change, but it should have been *identified.* Very often some of the old radio receivers, being called upon to operate under more difficult local conditions, are improved by some minor change—or in some instances a serviceman not so thoroughly versed in radio incorporates a change to effect some remedy, wrong though it may be. These changes should be identified.

Remember you may be the other guy in the next job. Give the other bird a break so that he'll do as much for you. Not that we are starting a chain letter series, but such little effort is required to record the change, that there is no justification for not recording the data upon a sheet of paper and attaching the envelope to one of the walls of the cabinet so that it will be found by the next man. As a matter of fact you yourself may be called in to repair the receiver and, knowing the change you made, it will prove of inestimable value.

Of course we can speak about a number of ridiculous changes which have been made by servicemen, but that is not the question. Whether or not the change can be condoned is not of importance at the present moment. Servicing is tough enough as it is without complicating matters more by making changes in a receiver without letting the next man know about them. Once more, give the next fellow a break, you may need one yourself.

Shatterproof Glass

HERE is a suggestion for what it is worth. It should be of interest to the manufacturers of television receivers and is founded upon a very narrow escape. Make the window in front of the cathode-ray oscillograph tube of shatterproof glass. The average maid or housewife handling a vacuum cleaner or a broom can very easily without much thought bang the modern receiver cabinet and all that happens is a scratch or a dent. However, some of the television receivers shown in picture form have an open window. If this window is of the conventional glass, it can be easily broken and there is no doubt about the fact that it will be broken in more than one case. Shatterproof glass will protect the oscillograph tube.

A Lot of Juice

SPEAKING about television receivers, it is never too early to speak about the danger of high voltages. The receivers we have at hand operate with several thousand volts applied to the cathode-ray tube. As a matter of fact, there are numerous places where the voltage is from 1,000 to 4,500. To play blindly with such voltages is ridiculous and no doubt some organization will offer insulated gloves to the service trade. They'll need them when servicing time comes around and it is not as far distant as you think.

Several television kits will be offered for sale during the next few months. These kits will be built and as can be expected will not work well the first time assembled. Not that the basic design is incorrect, but that the man who assembles the unit will not do a perfect job the very first time. No doubt, a serviceman will be called in and he will find it necessary to measure the various operating voltages.

When he does, it will be a good idea to work with one hand in his pocket. No, not nonchalance—*just safety.* As a matter of fact it will be a grand idea to learn not to be wise. Remember, you can't duck an electric shock, and it sure can throw you a long way, if not for a total loss.

$1.00 Factory Service Charge

A NUMBER of servicemen have been stirred up by the $1.00 factory service policy established for these $6.95 to $9.95 receivers. It's not as bad as it looks and dollars to doughnuts, many thousands of these receivers will be serviced by the regular run of servicemen, that is, if their service routine and their service equipment is modern enough to enable them to work rapidly and efficiently. Some servicemen feel that the receiver manufacturers have bent backwards just to take business away from the established service group. Such is not the case. Plants must be kept going and one way to help keep these plants running is to make a secondary market and it is these cheap jobs. It is our guess that the factories will not receive many of these receivers back for service. Let's see why.

Suppose that we consider you as the customer. You buy one of these receivers and as is to be expected, the service problem is not of great moment when you buy the receiver, so you do the natural thing and throw the shipping carton away. After all, there is no place for an empty shipping carton in the average home. The receiver is guaranteed for one year, but the tubes are guaranteed for only 90 days. Furthermore, the year's guarantee applies only if the receiver has not been tampered with, etc. So, some time passes and the receiver goes bad. It is past the tube warranty period, so that while the $1.00 charge still applies the tubes represent an extra expense.

Well, you have decided to return the receiver. It must be packed and packed securely because the warranty does not apply if the unit is damaged in transit. There is nothing difficult about such packing, but after all you're not a shipping clerk and you must have the carton and you're worried about it becoming damaged in transit. While you're hunting for the carton, which you threw away, you give some thought to the actual shipping. You do not have a scale, so can-

(Please turn the page)

C. R. Hutchcroft & Son at the shop!

not weigh the package and determine the amount of postage, which means that you will have to take the package to the post-office. Oh, if this were only a letter, which you could conveniently drop into a mail box. But it is not, and it must be shipped. Of course, during all this time, you hope that the dollar bill, you will put into the box will not go astray and will be found, when the package is opened.

Well, you decide that the carton is not available. You must seek corrugated or some kind of heavy paper wrapping, something in which you can pack the receiver securely. Just then you begin wondering. How long will it take to get the receiver back after service? Will it arrive in perfect shape after having been serviced? What will the mailing charge be? Maybe the local serviceman can repair the receiver. After all, you can afford to pay at least $1.50 because the factory charge is $1.00 and it will cost at least 25 cents each way for mailing. Maybe, it might be best to pay the local serviceman $2.00 and have the receiver back in a day or two. Oh, what's the use of packing and taking the thing to the post-office, gambling on your ability as a packer? If you're a poor packer, the service charge might be more than you would have to pay to the local serviceman. Maybe you should not pack the job at all; instead, talk to the serviceman tomorrow.

And that's just what you do. You don't pack the set and you go see the serviceman. If he is a salesman, he'll sell you the idea of bringing the set to his shop. Pay him $2.00 or possibly more, and you're content. Basically you're a lazy individual. You like your comfort and you're not a shipping clerk. And it's a nuisance to pack after a day's work. And the post-office is closed anyway. These are the reasons why tens of thousands of these midgets will get into the hands of the independent serviceman. These are the reasons why hundreds of thousands of books are sold by mail—you know, the ten-day free trial—send it back if you don't like it. Well, you seldom send it back. You pay the price because you're lazy.

Facsimile Notes

WE have played around quite a bit with facsimile lately and with the interest growing, it might be well to state some salient items of interest, points which might prove of value to those servicemen located in areas served by facsimile systems.

Excellent pictures can be received when conditions are correct, but very poor pictures will be received if conditions are not correct. This is in contrast to normal radio reception at the very high frequencies. Many of us marvel at the ease with which we can pick up domestic and foreign short-wave broadcasts with practically no antenna, poor locations, etc.

However, in the case of short-wave

(*Please turn to page* 48)

by SAMUEL B. KAUFMAN

STUDIO 3H at Radio City has been a chamber of mystery these past two years. Orders to keep out were posted on front and back entrances and all for a good reason. The studio was the television program testing grounds all through the preliminary experimental period that paved the way for the regular transmissions now being maintained.

Recently, the RADIO NEWS *Video Reporter* was permitted access to the sanctum sanctorum to see just how complicated the task of putting a television show on the air really is. We anticipated that it was a ticklish job calling for an unusual blend of showmanship and engineering. Still we were amazed at the precision and efficiency of the staff in maintaining a smooth, swift production pace in the small third floor studio.

Six settings were required for the half-hour program we observed through rehearsal and actual transmission stages. Each setting was so shallow that it was virtually two-dimensional, the backdrops providing the main atmosphere. However, the few foreground props—chairs, tables, etc.—were ample to give the illusion of a greater depth than actually employed.

The settings were arranged in cycloramic fashion around the walls of the studio, with the three iconoscope cameras and microphone boom in the center. The cast, directors, camera men and engineers had to do some nimble stepping to get out of one setting and into another in time without walking in front of a "live" camera. Costume changes are made on the run. Action must be continuous. In the movies, there's a big wait between "takes," but in television all shots must be made in direct succession and the smooth manner in which the show is seen on a television receiver is remarkable in view of the breathless tasks of the cast and producers in the studio.

The half-hour production I witnessed in the making had a brush-up rehearsal—and it wasn't the first—of more than two hours. Here, the director, Warren Wade, ironed out rough spots and eliminated implausibilities in the script or settings.

"Throw away that ice!" he yelled to a property man. "Did you ever see an Englishman take ice in his whiskey-and-soda?"

It is apparent that the movies don't go in for more realistic details than television. Genuine atmosphere in foreign settings is provided even down to such a detail as using a British-type telephone in the scene representing a British hotel.

The day after I witnessed the rehearsal, I watched the actual program over a receiver in the studio control room, dashing out to the studio proper occasionally to compare reception with the pick-up. Everything went smoothly and, despite the studio hubbub and the dashing about of the cast, directors and engineers, the performance as viewed over the television receiver was well-knit and definitely superior to Hollywood's Grade B products.

CBS has completed its Chrysler Building television transmitter installation as we write these lines and the chances are that test transmissions will be on the air when this issue reaches you. Dr. Peter Goldmark, the chain's technical television chief, revealed that the equipment and installation represent an investment of $600,000. That's a lot of money to spend before a single image went out over the facilities but Dr. Goldmark thinks it's worth every cent of it because anticipated results will bring many benefits.

For one thing, Dr. Goldmark remarked at a press inspection of the installation, the CBS station will provide a better signal than the NBC transmitter due to the design of the antenna atop the Chrysler Building. An NBC spokesman promptly challenged this claim by pointing out that Columbia won't know how good its video signal is until it gets it on the air.

Major Edward Bowes officiated at the inspection tour and threw switches for a photographer even though there wasn't any current behind them.

CBS proved that it was definitely "in the picture" in more ways than one insofar as video matters are concerned. Gilbert Seldes, television program director, was reported to be working on advanced program technique long before the transmitter was completed. The technical set-up in the Chrysler Building, accomplished after considerable difficulty in getting the bulky equipment more than seventy stories in the air, is one of the best in the world and, along with NBC's splendid Empire State Building unit, should do much towards creating a mass demand for television receivers in the huge New York service area.

ORDINARILY, television signals don't carry beyond the horizon. Or, so video engineers would have us believe. However, television signals from London have been received in the United States at intervals and RCA has recorded the images, as received at Riverhead, Long Island, on movie film. The results are surprisingly good, taking into consideration that some detail is lost in photography.

RCA experts attribute successful trans-oceanic video reception to higher-value ionization density in the upper layers of the ionosphere during the winter months.

Reception was accomplished on a special set utilizing two stages of radio-frequency gain and other refinements including a Rhombic antenna 800 feet long and 150 feet wide with adjustment provisions. After considerable experimentation, a camera recorded the images.

THE Wald Television Laboratories, have announced a television attachment which would convert any radio set into an image receiver. This seems to be the type of unit very popular in England right now and referred to there as an "add-on" unit.

The chief advantage of the "add-on" instruments in England is confined to boosting the sales of ordinary sound receivers in areas not yet serviced with television. The sales story is "Buy any good radio set now and it won't be out-of-date when television arrives; just attach an 'add-on' unit and you'll have a perfect television receiver."

EVEN though elaborate television displays are featured by RCA in the Hall of Television at the New York World's Fair, the permanent television tour in Radio City is expected to draw 400,000 visitors during 1939, this estimate being based on past attendance plus the huge throngs due to come to the city. While there is no competition between the Radio City and Fair Ground displays of RCA, considerable "sales" effort is being placed on the former.

At 55 cents a head, a total of 400,000 television tourists represents quite an income for RCA. But even more important than this revenue is the promotional value of having such a great number of potential look-and-listeners *pay to see a television display*. True, many of the visitors come from cities and towns not yet in video service areas. But a great percentage does come from areas where stations are planned, if not already built.

CBS will not have any television tie-in with the Fair, but there is a possibility that visitors will be permitted at the Grand Central Terminal studios.

THE marvels of television are thus far confined to novelty. But the day isn't far off when people will accept the idea of receiving images through the air in a matter-of-fact manner. That's when program material will have to prove suitable enough to carry on the following built on just the sheer magic of the new medium.

The networks are looking ahead to that day and are building up the program production end while selling the public on the technical end.

NBC recently engaged Max Gordon, the noted Broadway stage producer, to assist its television and radio drama efforts. This acquisition was loudly proclaimed by the network in an elaborate promotional mailing piece in which Mr. Gordon states his stand in the following words:

"By furthering and developing Television right from the start, I hope to prove to theatrical people that Television is the greatest supplementary medium for their activities.

"Television provides a new field for the showman to apply his knowledge of the public's likes and dislikes. It will be my task to bring more of this knowledge and experience to sound and sight broadcasting. The future of Television is enormous and I feel honored by this call from NBC."

Incidentally, the capital "T" in Television in the above quotes was used in the NBC broadside. Maybe that psychologically emphasizes the importance Mr. Gordon and the network both place in the video art.

CBS, too, is getting some television help from the outside. Donald Hunter Munro, television

(*Televise further on page* 46)

BENCH NOTES

by LEE WARD
Service Manager, San Francisco, California

Some excellent money-making tips for the serviceman as well as a suggestion for the improvement of the trade.

Lock the Cells!

ONE of my customers—who had bought one of the new portables from me—turned in an unusual complaint: he had checked the set in a night club, and, when he called for it about four hours later, one of the check-room girls was using it to listen to *Kay Kyser*. He was so angry he left only a nickel—which, in most night spots, represents plenty of mad. Wanted me to install a coin slot on the set, so he could use the money to buy new batteries.

No, I am not the business genius who ran over to sell the check-room girls a receiver; I simply wondered why some manufacturer hadn't made a portable with a lock on the switch. Back in the heavy-current auto-radio days, when fifteen minutes' use by an attendant in a public garage would run down the car battery, I remember set owners appreciated a lock. A key would make the portables *personal* receivers; why not—since battery expense is an important sales factor—lock them?

Start at the Top

QUOTING the *New York Sun*, reporting on an interview with O. B. Hanson, Vice-President and Chief Engineer of NBC:

"The arrival of sight programs must end antenna neglect because the most costly video set can't be expected to perform unless the installation is accomplished with as much care and precision as the designing of the set itself.

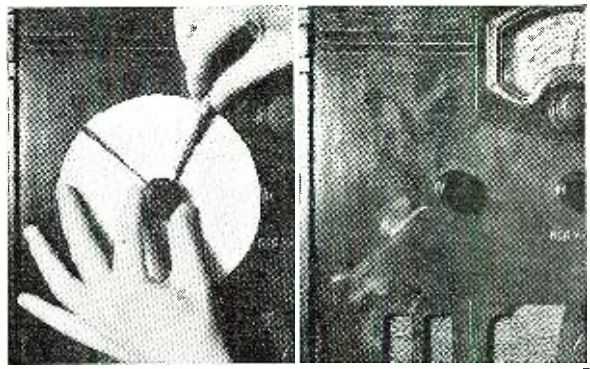
"Radio listeners have neglected their sound receiving aerials and often wondered why they don't get all the stations satisfactorily just by tossing a wire out of the window. They can't attempt that with television. If they think it's that simple, they might as well throw the set out of the window, too."

Come television, an antenna will no longer be a hole in an apartment-house wall. The serviceman-installer is going to follow the work of the design engineers very closely, so that the wide frequency band which television requires will not bottle-neck at the receiving antenna.

How *are* you on antenna theory and construction? Neither am I—but I'm learning!

Cabinet Shield

THERE is no answer to a scratched console. Until rubber-tipped screwdrivers are marketed, the pictured expedient will serve. Cut a tapered segment out of a press-board disc about six or seven inches in diameter. Slip it over each shaft that is to carry a screw knob. If the tool slips, the finish is protected.



Might seem like an elaborate precaution—but it isn't. While the customer probably won't be able to *see* a scratch after you patch it up with a portable finishing kit, he will never forget your carelessness, and will wonder if your shop methods are equally clumsy.

Prospect Rouser

MANY customers, after buying a set, retire into profitless hibernation. They wave when passing the store—but never drop in for service as long as the set plays. Very discouraging, for there is nothing as worthless as dormant good-will. Here's a way to cash in on some of it. Send out cards or letters, expressing these ideas:

RIGHTOVER RADIO SERVICE
Glendale

June 15, 1939

Dear Customer:

Whenever I go through my old files, I remember how well-pleased you were with your Colonial when you bought it. No doubt you are satisfied with the set (which happens to be an unusually good model), but have you neglected it during these past seven years?

Many things have happened in radio since then. Tube prices, for instance, have dropped to surprisingly low levels—especially for your tube types, which have been used in models of sustained popularity. I list them for illustration:

Your Set Uses	Previous Cost	Present Cost
1 type 27 tube.....	$ 2.20	$0.80
1 type 80 tube.....	2.00	1.00
4 type 24 tube.....	13.20	5.00
2 type 45 tube.....	5.00	2.00
	$22.40	$8.80

You would have jumped at such a bargain when you bought your set—and today, it's more of a bargain because of late improvements in design and manufacture.

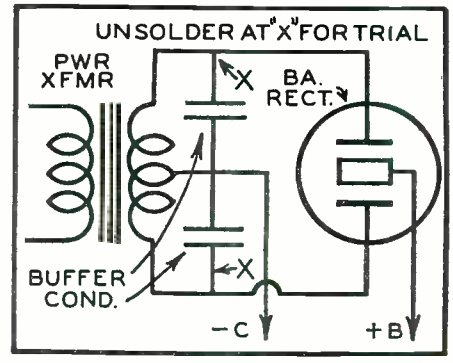
Broadcasters give their stations a break every half hour—why not give your receiver one in seven years?

Sincerely,
Cole Leftover
Manager.

P. S.: This price—if the order is placed within a week—includes delivery and installation. Call Sheldrake 0000.

Noise Source

NEARLY muffed a repair job last week. Here's how it happened: answered a call on one of those huge cabinets containing a *Federal E* chassis, with the loop in the swinging door. Noisy, apartment-house location. I remembered gain usually was at a premium in this model, so replaced all r.f. and audio tubes in an effort to increase the signal-noise ratio as much as pos-



(*More Bench Notes on page* 55)

THE Third Annual get together of the *Federation of Long Island Radio Clubs* - - held at Casino Hall Friday, March 24, broke all records for attendance with over 300 of the gang on hand. One of the very interesting phenomena observed was the number of old timers; namely, two letter men, who were present. If this is an indication of forthcoming events, you can expect to see many of the old gang back on the air soon. A slight bit of confusion at the beginning, due to W2BKZ arriving late (he was the cashier) was quickly straightened out and matters got rapidly under way.

W2JDG was appointed a committee of 3 to get ready all gadgets for the contests, such as balloons, relay races, athletic contests, putting nipples on beer bottles (hi!!), etc. These gimmicks certainly make monkeys out of he-men.

To Rudy Ballner, W2BAA (commonly known as the sheep herder of Long Island) goes much of the credit for these most successful gatherings, as his is a tremendous job and the responsibility of getting the six clubs together, plus door prizes, announcements, being master of ceremonies, and whatnot, rests entirely upon his shoulders. We congratulate him for doing a most successful job.

The racket started with a balloon blowing contest; i.e., everyone was given balloons and the boys who blew them up the most without breaking them, were allowed to participate in a run-off. Nine were chosen as having "the most wind," and the successful contestant was the winner of an 809.

The next brain teaser was a string chewing contest in which four teams of two each participated. A string about 8 ft. long was given each team and the boy who got to the middle first by rapidly chewing, was declared the winner. W2HPB took the honors, much to his surprise.

Probably one of the funniest events of the evening was a balloon carrying contest in which small balloons about the size of a large pickle were placed on paper spoons and the contestant had to carry these balloons from one end of the room to the other and return. The winner—W2FHR.

Next in order was a Hammer Throwing Contest. In lieu of hammers, paper bags with a 3 ft. piece of string attached, were used. These were swung in an arc, very much in the manner of David and his slingshot. The winner, with a throw of 4 ft. 8 in., was W2IUN.

The old pin-the-tail-on-the-donkey game was slightly changed around so that in lieu of a donkey, a circuit of a crystal oscillator was pinned on the wall and taking the place of a tail was a schematic of a radio tube. Frank Jacobs of Transceiver fame got one on a table leg, and Marty, a SWL, succeeded in getting in the privy. Anyway, the winner, W2FXB, hit a bulls-eye.

W2EUI, W2JIL, and W2HKY successfully demonstrated a complicated transmitter which rang bells, squealed, hollered, and did everything transmitters aren't supposed to do.

A real side-splitter was the nursing contest. Nine participants accompanied by their "nurses" endeavored to see who could drink a bottle of beer via the nipple method. It was a remarkable thing to see what a memory some of these boys had. W2FRG, accompanied by nurse W2IDJ went back to his early childhood the fastest and walked off with a nice prize.

The "Eat the Cracker and Whistle Contest" gave the boys a lot of laughs—winner —unknown.

Mr. Robert Wiman of *Bell Labs* gave an interesting talk on the "Voder." This is one of these monstrosities that actually demonstrate the human voice by electrical means. Everything was going fine until we discovered a hidden microphone in one of the spare rooms with 2DXO acting as the "phantom."

Arthur Lynch, 2DKJ, explained amateur radio at the New York World's Fair. Volunteer operators were asked for, with promises of a season's pass if their qualifications made them acceptable. A most successful time was had by all and even better plans are being made for the Fourth Annual.

DX has been rolling in on the high end of the 20 meter band, such as hasn't been heard in these here parts for years. Some interesting contacts turned in by W2APT include: XU2AW, 14325; J5CC, 14420; JS6AF, 14396; KA1RP, 14396; KA1SP, 14350; JSCC, 14310; and XU8ZT, 14430.

In the early evening, around 5 p.m. Eastern Standard Time, the VKs are putting S5 to 9 signals through to the Eastern Coast.

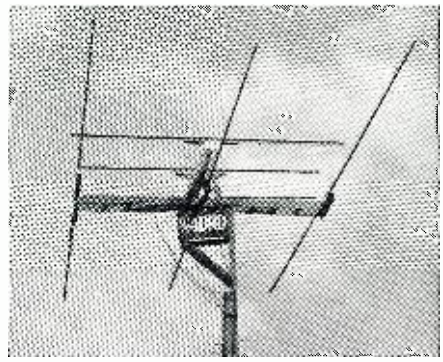
A WACCW round table has been planned with XU2AW, VK4CA, VP5PZ, W2APT and G80A.

W2DTY is rebuilding his rig and plans to be on the air soon with an 801 in the final.

W2FRR has been doing a mighty job on 7 megacycles with PP801s.

GLEANED from the interesting mag of *The Mike & Key of the Asheville Amateur Radio Club:* In the CW Contest, XE2N repeated his performance of last year, making over 1,500 contacts on 3 bands. Other high scorers outside the States will probably be: YS2LR, ZS6DW, K6PSB, LU5AN, and VK4ADE. High score locally was W4TO with 35,000. But don't crow yet, wait for W4AH, W4BPD, and W4CEN. Some of the old timers heard during the contest were, G6WY, D4BFT, XE2N, CT3AB, CT1ZA, etc. etc. ZS6DW junked his mike for a week and was probably the high man from Africa if FA8BG did not pass him. And watch for a foto finish in the mikemen's contest between W4CYU, W3EOZ, W6GRL, and W2UK.

W4DRD has put up a swell beam for ten-twent and mailed us a pix which we show



above. The beam is made of *General's* parts. Looks swell, too . . . but how is the DX wid it?

W9ETI is building hisself a fb mobile rig. Has been running around Chi wid "W9ETI mobile unit" plastered on the back window of his Chevvy, but so far no rig inside. Now he will make the sign tell the truth.

The law of the State of Illinois prohibits anyone including the amateurs from having a radio receiver in their cars which can pick up police frequencies. With the first ultra-high police band set at 31.1 mc. it is hard to see how they will avoid it when using the ten meter band. Someone from the *ARRL* ought to look into this.

W9QEA is rebuilding. Something special that will probably never work. *(Oh, yeah??? Ed.)*

The battle of the 40 meter band is on for fair. A station, "Paris Mobile" is heard nightly on 7280. It beats the gun of September 1st, and is incurring the displeasure of over 50,000 hams. Is that a nice way to treat the "Lafayette we're here boys"?

England is preparing a few stations of her own to occupy the 40 meter band. Yea, verily it is the twilight of the American Ham . . . or is it?

Meanwhile, our own *FCC* has sliced 2,000 kc. off our 112 mc.-118 mc. bands making them to reach only to 116 mc. It won't be long now, fellers!

New ruling for the *Asheville Amateur Radio Club* is that all new members MUST be members of the *ARRL*. Seems sorta high-handed, but then maybe we're wrong.

With over 120 hams presently employed by NBC, it seems a pity that they would try to make us believe that this lovely lady would broadcast into a mike with no connections at all.

THAT ham yl with whom *Smilin Jack* (of the daily funnies) is carrying on romance, must be a fugitive from the RI. In her transmission with Jack in his plane, she never once signed her call letters, (violation of sec. 152.10); she QRM'd an airline station, (violation of sec. 152.42); she was outside ham frequency, (violation of sec. 152.25) and her communication was for compensation since she aided the author of *Smilin Jack* sell his comic strip, (violation of sec. 152.15).

Another peculiarity of the same strip is that Smilin Jack now has a license, W4ZTM, with which he operates on ham frequencies from his plane. He first contacted his Big Romance on some frequency near those of itinerant flyers, 3105,3120 or 6210KC. Now he has been able to find her out of all the usual air hodge-podge on 30MC or 56MC the only band in which mobile work is permitted. Very . . . very . . . funnyeh!

With apologies to Walt Winchell, scads of orchids to Walt Winchell for taking up the ham's fight on smearing the 40 meter foreign BC QRM! He broadcast an appeal for all Hams to get on the frequencies of the furriners who put their BC rigs in our 7MC band and hit the key long, and loud to drown them out. That was swelligant of you, Walter!

There are now no less than 467,893 different "Ferdinand the Bull" on the air. Haven't you hams any originality at all? Oh, for a Spanish bullfighter or at least a lovely contented bovine creature of the weaker sex. That would be one way of ridding the ether of this epidemic.

W6PCO, a talented and pretty YL op, has organized an Amateur Radio Club on the campus of the University of California. QSO's with various colleges all over the country are requested. Ask for her pic-

ture fellers, and don't tell us we did not warn you that she has lotsa umph!

The Mid-American and Dakota Div. ARRL Convention will be held in the West Hotel at Minneapolis, May 12 through 14th. A fb turnout of the exhibitors has been promised and a really swell time can be had by all who will attend. Numerous speakers and a grand program is in readiness. BCNU at *The Mid-American & Dakota Div. ARRL Convention.* Don't miss it!

A meeting house for 26,000 (count 'em) hams of the N.Y. World's Fair will be provided in the Westinghouse Bldg. there. A display of "how and why a radio" has been built by the ARRL featuring 6400 flashing bulbs in varied colors. When at the NYWF see your fellow hams at the Westinghouse Bldg.

Incidentally, W2HXQ has been appointed "official greeter of hams" at the Fair. Contact her for arrangements and she will do everything to make the trip interesting for you.

FOLLOWING is the list of hams with NBC *outside* of Chicago. (Whatsa matter CBS, haven't you any hams?) W2-AK, EP, IP, JJ, KP, LV, SJ, VI, VY, ZA, ABD, ADL, AEB, AID, AKQ, ALB, AMG, AMQ, AMS, ARB, AUR, AWU, BIH, BNL, BRR, BWT, BXY, CEF, CHG, CRA, CSX, CUZ, XEJ, XER, DCB, DEL, DHA, DIT, DWS, DZR, EGD, FED, GSY, HAT, HEJ, HIO, HZO, IHI, INB, IPG, IOX, IUU, JDZ, JRY, KDF, KBA, LPK, LXR,

W3-HN, ANJ, AOH, DST, CEJ, CKH, ESL, HAP, HIH, QEC,

W6-BH, DO, IY, IX, JD, JJ, KM, KO, MY, SO, VH, ACX, ADI, CFZ, CFQ, CRO, DOB, DZP, GIS, GVE, HSC, KIP, KLM, KLU, LXS, NAD, OSH, PHS, PKA, QED,

W8-FP, RU, DBC, DHF, GLX, GTG, LEX, LJM, LLG,

W9-FA, PI, CZR, DSD, EYN, FKQ, QKW, and UXZ.

NBC has over 120 hams working for it. Who says that ham radio doesn't lead somewheres?

W2ALB can be heard nightly on 3570KC.

W6PHS made headlines with his final of 813's. RCA lika verra mooch!

Chicago Notes: W9KQS will be on 20 soon. W9WC has installed a bandswitching exciter. W9BU QSO's South Africa with distressing regularity these spring evenings.

W9EYN has a 70 ft. tower that can be clum, and plans one 90 ft. tall. The 70 footer has withstood 60mph gales with ease.

Taken by W9LBV of the 7th Brigade, our only mechanized cavalry. This outfit uses entire radio control.

W6QUT (Amos of A & A) has a 12 watt 28mc rig in his car.

Since W9MR sashayed fm Chgo to Hllywd he has not yet been given a "6" call. Will be on soon, though.

W6USA is being very badly QRM'd these nights by W6ITH. At least that is the story in the middle west. Howsabout movin' a coupla cycles, ITH?

W3ANJ got hisself a Premax (no advt) rotary and squirts a mean sig almost everywheres.

W3CEJ is back on 7MC. Look fer that oldtimer.

W6KLU wkd W6CJ while the latter was in Utah on location with Paramount Pix making "Union Pacific." CJ was on a moving flat car at the time. Nice goin'! W6BOQ also wkd CJ.

W6KIP is ceeeerecting an 8JK, yessir!

W6ARX is on 112MC and wants to QSO someone.

W6OMN has been on duty with the CCC in New Mexico.

W9BCW has left hamdom giving his all fer a 1930 Chevvy. Watch out you YL's. But he'll be back. You can bet your last KC they always return . . . sadder, Budweiser! (Phew ! ! !)

W9PI built a concentric fed vertical dipole antenny fer 28MC. Wrks most scrumptiously!

W9CZR says nix to super-super-super singlesiggnle supers and uses a regen detec, plus 2 stages of audio. What, no 200A's?

W9FA replaced the 860's wid 150T's. Has an HRO wid voltage regulated power supply. Says it's just the nuts fer stability.

WHATDOYA know? W9UXZ is building a rig ! ! !

W6ACX hassa pr. of 808's, and does r i g h t w e l l wid 'em.

Page the Prevention of Cruelty to Tubes Society or somepin. W6CRO feeds 150 watts to ONE 809! Does it blush? By now he got a KW wid 810's.

W6JJ had to have a special power line run to handle the 810's power input.

W6PHS is looking fer skeds with W2KBA es W2ARB.

Many thanx and a load of beautious QSO's to the ATE Journal fer lotsa dope fer this colyum!

W9BSU, who has been off the air for about eight years, is back with us on 14 mc. fone. Leo has a tiny 16 watt rig. It sounds good and we hope he will stick around this time.

W9AYN is rebuilding and will have about twice as much power when he comes on again. Better watch your step, Jimmy; some bum is using your call on 14 mc., says he is located in Colorado. He doesn't give the name of the town.

W9TMH vacationed in Florida. Some guys have all the luck. We hope Sam had a good time down in the land of flowers.

W9VUY is still having trouble with his class "B" stage. It might help if he would reduce the driver power, those tubes are very easy to swing.

W8SH, the club station at Michigan State College, is being operated by "W8SHI". The similarity of calls is purely coincidence. This station is on 7mc. with plenty of sock.

W5GIK/9 is doing a swell job on 14 mc. from a hotel room. Andy says his XYL doesn't worry as long as he has his rig along but we notice she didn't let him bring his benzine buggy up from Fort Worth, Texas.

What's this about W4BMR "Four Big Mean Rabbits"? We hear that the stork stopped in and left twins.

SOME months ago the story went the rounds about a food shortage on *Pitcairn Island.* It seems that the situation was relieved through the efforts of a certain amateur station and the food shortage was alleviated. Later the good folk on the Island wishing to express their gratitude, forwarded a small gift to the amateur. As the ship bearing this gift docked, a communication was forwarded to the recipient. Uncle Sam's agents got wind of the package and rushed to forestall what appeared to be an attempt at smuggling only to find a small hand made basket.

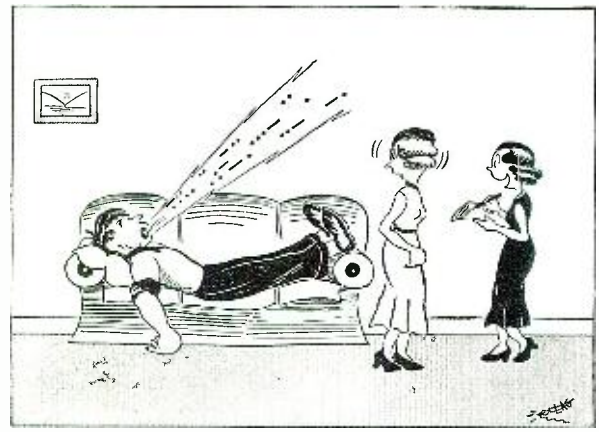
W2GSB is active again on 14 mc. fone and cw. There are several operators and the sigs come in bery fb.

What ham got hisself across 2000 volts and survived. Bet he doesn't let it happen again soon. It doesn't feel any too good.

W9UFU has acquired a new rig. He will have about five times as much power as before (about 200 watts).

W3HZF is working portable 9 while attending college at Angola, Indiana.

W9EMN is back on the air again after an absence of several years. He is on 7 mc. this time, having deserted the 80 meter gang.



I HAD to learn the code, since Joseph has taken to talking that way in his sleep!

One of our pet peeves is to hear two VKs going to town in a long rag chew. It is especially irritating when we can hear both sides about R7 on 7 mc.

Speaking of YLs, one of the boys came near putting his foot in his mouth the other day. He was working a Canadian XYL on 7 mc. QRM was bad on the lady's frequency and he got to copying the wrong signal (don't we all). It seems someone was expecting the immediate arrival of the stork and of all places to mention this fact had to pick this lady's frequency. The brass pounder got confused with the result so he came back like this, "Ve3—de W9—, sorri qrm bd pse rpt abt stork". The fun began and lasted a full fifteen minutes before W9—was in the clear.

Warning to all persons who might be interested. Don't ride tandem with W9VUY on his motorcycle. Bud gets too much fiendish glee out of frightening his passengers out of their wits. Incidentally, we don't think much of the egg who wrote *that anonymous card* and sent it to Bud.

W3CKY worked the bootlegger who has been stealing his call and the *F.C.C.* has some very good evidence if and when they decide to prosecute.

K4FAY was relieved of twenty four bucks under very mysterious circumstances. It seems the money was in his coat pocket, the coat hanging in the operating room and that Jack was in the room all the time. The irony of it all was that the thief left one dollar in the pocket.

SWL's are complaining that the amateurs refuse to send QSL cards even when return postage is enclosed with their request for a card. There are several instances wherein foreign postage certificates received from SWLs were used to send cards to other than the one who supplied the postage. We wonder if poetic justice is sometimes visited

(Plse QSO page 52, now.)

Serviceman's Experiences

by **LEE SHELDON**
Chicago, Illinois

Repair those midgets, and don't think that they won't bring in more business on the big consoles. They are a good get-inner.

"SHADES of Marconi!" Al exclaimed as I walked into the shop, "is that a burn you have on your nose?"

"It is—and it Hertz," I replied sheepishly.

My partner made a noise that corresponds to the human laugh, and said: "Well—don't look so discouraged. That's the first hot tip you've brought into *Salutary Sales & Service* since we went into business together. How did it happen?"

"Gruber, out in Lawndale, 'phoned early this morning. Said he needed a repairman quickly, so he wouldn't miss hearing the *Lew Onderdouk Newsy Items* program. I remembered the big *Sparton* he had the last time I went out there, and expected a juicy repair job—but after I drove the six miles at top throttle, he led me past the big console to one of those yeast-cake midgets in an upstairs room!"

"And the nose?" Al asked.

"I unwrapped the chassis, and while I had it upside down, replacing a sixteenth-watt resistor, my head got so close to the small parts that my nose side-swiped the soldering-iron."

"Next time use your handkerchief," my callous companion said. "And don't think you're a failure just because of a red nose—think of that famous comedian!"

"That's not the point," I rebutted. "What really burns me is the fact that tiny tuneboxes are running the radio business into the ditch. This burned nose is not only a physical blemish, but also a symbol of What's Wrong With Our Profession. Couldn't we start some system of midget repair elimination? We might refuse to work on any set that weighs under ten ounces, and go out after the big sets that pay better."

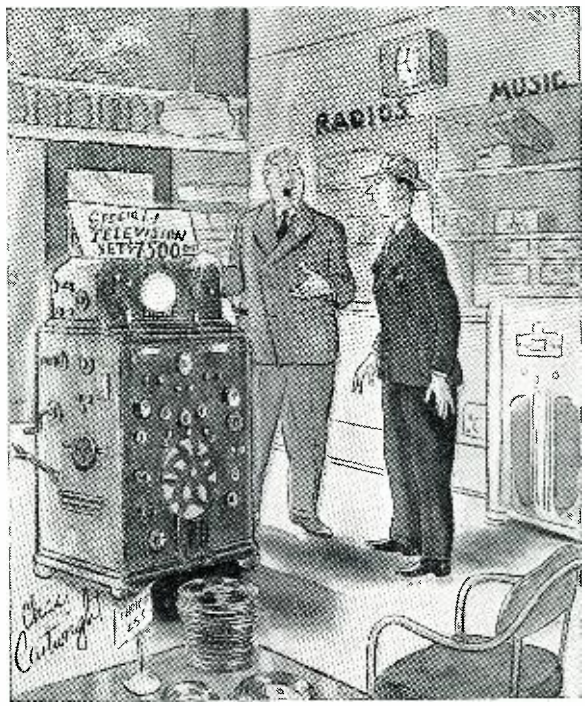
"Nonsense," my partner replied.

"I drove twelve miles on that Gruber job. How far do you think we can go for a midget without losing money?"

"No distance is too far when profit or reputation are at stake." Al bent one knee and threw his arms out. "I'd walk 10^6 miles for your unit smile, Mammon!" Then, when he saw he had frightened me, he added: "Weeding out small chassis would be bad for business—too much risk of customer offense."

"You are mistaken," I insisted. "We could offer to buy all sets measuring under seven inches, instead of repairing them, and then sell the customer a bigger job. Set owners are seldom willing to spend $4 to repair a $6 set. We could offer them $2 for their sets —*as are*—when they came in to have them repaired."

"Wouldn't work," Al replied. "When you offer $2 for a set you have bid $4 on, the prospect says to himself: 'Total, $6. This repairman is overestimating the repair cost; otherwise, how could he plan to sell a second-hand midget at a profit for $6 when anyone can get a *new* one for that price? I'll bet the proper repair charge is only about 75c—he wants to invest $2.75 in my set, and retail it for five!' No, small sets are a part of our business; pleasant or unpleasant, we must cope with them!"



"The price may seem a bit high, but it includes a full year of night school to learn how to run it."

"You are wrong to an unusual extent," I said, sensing the impending conflict, and determining not to falter. "Although it is not my wish to cast asparagus upon your business talent, I must point out that my opinions are more mature."

"How do you spell it?" Al interrupted, revealing his true character in half the length of a telegram.

"During the next five midget calls, I will prove to you that we lose money on them," I continued, "and, since the results of the test will be derived from performed fact, rather than from your thoughtless words, the outcome will not be affected by your tricks of tirade."

"Your nose dazzles me more than your ideas," Al responded, using his more typical coarse manner. *"I'll* prove to *you* that little receivers, with the proper handling, can be used as a source of both profit and good-will!"

I am not one to take the glove meekly. "Here's ten bucks says you're wrong, and that the next five calls will show we should plow midgets under! What do you think of *that?"*

"I think," Al said, cooling off suddenly to disconcert me, "that you are a person of positive beliefs and negative personality."

The next morning a woman came into the shop, carrying a dead set in a small casket. Ours, she volunteered, was the fourth store she had entered, asking for an estimate. The other three store owners had requested—in advance—an examination fee. I was glad our first test was with a "shopper."

"These little trinkets are troublesome, aren't they?" Al remarked, rolling the set from one hand to another. "Here, Lee—take this thing back to the bench and fix it!"

Free service! Al wouldn't prove his point on *this* job! As I took the case off, I heard Al distracting the customer's mind with idle chatter. When the set began to play, they both came back.

"How much?" the owner asked.

"What was the trouble?" my partner asked me.

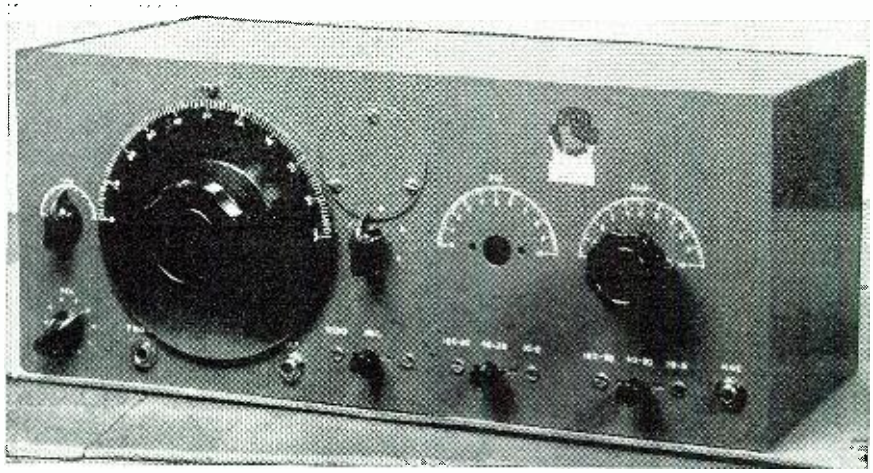
"Antenna lead was pulled off at the lug," I replied, confident the work would be recorded in red.

"No charge," my fool partner announced, wrapping the six foot power cord around the box ten times, and handing it to the former prospect. "We won't charge to make minor adjustments on *any* of your household gadgets, but—if you ever need a *radio* repaired—please call again."

The woman was too well satisfied to take offense. She caught Al's spirit, and asked: "How long do you think it will run?"

"A long time," he replied, "—just

(*More Experiences on page* 57)



The results of one man's desire to help the tyro get started in hamdom.

How to get started in ham radio is a question that has puzzled many. This rig is one of the good answers.

by EDWIN I. DILLON
Chicago, Illinois

A Send-'Ceiver for $30

DURING a late afternoon not so long ago there took place in the RADIO NEWS editorial offices one of those gatherings which in public belief are regular editorial fare. The next issue had just been put to bed, and the managing and technical editors could take a few minutes off to catch their breath. At this moment in walked the writer rapidly followed by The Oldtimer, a well-known amateur. Conversation waxed fast and furious, and soon evolved in reminiscences of each man's early days in radio. Somehow the talk moved around to how each participant had got started in amateur radio—how twenty-seven years ago there was no literature worth the name in the art, how each had had to dig and work to get his first crystal receiver going, and then that thrill that came with hearing the first signal—maybe just another amateur spark-coil across town. Conversational agreement was finally reached on how hard it had been to get started in the amateur field.

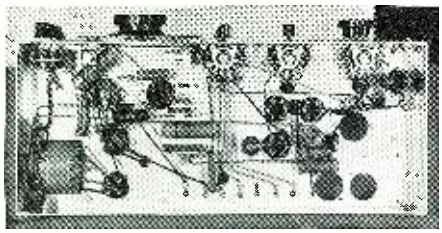
"Today things are very different. Just look at all the radio magazines, and several good hand-books that are literally engineering bibles in themselves," said The Oldtimer. And then the cat was out of the bag as the question was propounded "yes, but how does the beginner—the complete tyro—who wants to get started in amateur radio go about it? Just because the available amateur hand-books are almost engineering text-books, what good *are* they to the beginner who wants to get started without taking their 500-odd page courses in radio engineering?"

This question focused the attention of the group on the fact that amateur radio is the hardest of all hobbies to get started in—that the beginner has been the "forgotten man." Soon vague theorizing as to what to do to make the path into the thrills of amateur radio easy for the beginner began to crystallize into a concrete idea—a simple yet thoroughly efficient transmitter and receiver design which could be built of standard parts without first taking a college course in radio theory. Fortunately, everyone was agreed as to what such an amateur "station" should consist of, but plenty of work remained before this idea could take concrete form. Then up spoke The Oldtimer and said, "This whole thing looks like lots of fun, and a worthwhile and badly needed service to amateur radio. I'll tell you what I'll do. I'll try to design the rig and get it worked into a final form." Then the meeting was adjourned with the consensus of opinion that something would quickly be done for the beginner.

The illustrations herewith show that The Oldtimer was better than his word, for not only is the "Send-'Ceiver," as it was finally named, a complete beginner's amateur sending and receiving station, but it is also an excellent portable "rig" which should appeal to the seasoned amateur, who can use it as an emergency standby station, and for vacation, mobile, portable, as well as that serious life-saving emergency, flood, fire and distress work for which every amateur should be prepared. Yet, with all standard readily available parts costing only around $25.00 for transmitter and receiver, the "Send-'Ceiver" is much more than just a "beginner's" outfit. Its design is so ship-shape and commercial-appearing that the proud possessor can be proud of this little "station" even when he has reached the top ranks of amateur radio. Also, it can be built up into a bigger and bigger outfit without a wasted penny as its owner progresses.

The "Send-'Ceiver" front panel carries all receiver controls at left and all transmitter controls at right. The small knob at the upper left is the receiver tuning condenser, or band-setting knob. In operation, it is set to the edge of any amateur band from 10 through 160 meters (or is used to tune the regular and short-wave broadcast bands which the receiver also covers), after which stations in the desired band are tuned in on the large 5½" "vernier" band-spread dial, on which they pop in, comfortably spread apart—for easy tuning even as low down as 10 meter. The lower left knob is the master on-off switch and receiver regeneration control. Set up to just below oscillation, as evidenced by a hiss in the head-phones (with stations heard as a squeal), it provides for selective long distance voice and broadcast reception. Set just above this point or just beyond critical regeneration, c.w. telegraph stations can be tuned in—with excellent selectivity. To the lower left of the dial is the head-phone jack—with loud-speaker terminals on the rear, for this super-efficient two-tube receiver will provide simple loud-speaker volume on many stations. An audio volume control, not illustrated, has to be added at upper left of panel to prevent blasting phones or speaker on strong signals. At the top center is a hole for a plate milliameter for the transmitter, when it can be afforded. This hole is ordinarily covered by a neat disc. Directly below is the 6-band wave-change switch knob, and below and toward the left, the sending key jack and then the send-receiver switch which shifts power from receiver to transmitter, and shifts antenna connections, too—the acme of modernity.

Starting at the extreme lower right is the microphone jack, not used in the one-tube transmitter illustrated, but included for appearance. To its left is the 3-position oscillator plate circuit wave-change switch, with above



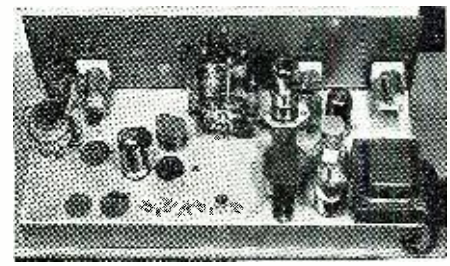
Note simple connections.

it the plate tuning condenser knob and dial scale. Each plate circuit switch position covers two out of six amateur bands, shift from one to the other being accomplished simply by rotating the oscillator plate condenser knob. Just to the left is a blank dial scale (with holes covered by a blank plate until the builder desires to expand the transmitter up to two tube m.o.p.a.) with, below it, the 3-position crystal switch (which will also switch oscillator plate coils when the transmitter grows to two tubes, the right dial and switch then controlling the power amplifier plate circuit.) With it, any one of three crystals set in 10, 20, 40, 80 and 160 meter amateur bands can be instantly selected at will. In one tube form, with three crystals plugged into their sockets, instant choice of three-band operation is had, while two additional bands can be covered simply by swapping crystals. In two tube form, when the amplifier may also double the crystal frequency, six bands can be instantly covered by using one each 160, 40 and 10 meter crystals.

The receiver uses two of the newest tubes. The new 6SJ7 (single ended 6J7) sharp-cut-off r.f. pentode functions as a high-sensitivity regenerative (autodyne) detector, followed by one of the new loctal 7C5 (new all-glass 6V6) beam power tubes. A three circuit low-loss wave-change switch, swl, having six well spaced contacts for low inter-circuit capacity carries six individual coils (all shown as L1 for simplicity) mounted directly on its contacts. Each coil, consisting of antenna primary and separate secondary, is short circuited to prevent absorption losses except for the one coil selected for reception by swl. These coils are tuned by a new positive-single-bearing "band-set" tuning condenser C1 of 165 mmfd. capacity, with "band-spread" provided by an identical but smaller 15 mmfd. condenser, C2. Thus sharp short-wave stations are well spread apart upon the large 5½" finished dial of C2. The 6 bands so provided tune from above 600 meters for ship and distress calls right on down through the 10 meter amateur band without a "dead-spot" anywhere in between.

An old and time-tried method of obtaining regeneration is used. The most obvious method would be to tap the cathode of the 6SJ7 up about one-quarter of total turns on the secondary of L1, and this would work. However, so tapping the cathode up on L1 would impair its "Q", or excellence, and not be conducive to best results in this simple circuit where every bit of efficiency has been zealously guarded. Instead, an r.f. choke, RFC, is inserted in the 6SJ7 plate circuit, with tickler connected in parallel through C4 and shunted by potentiometer, R1, which controls regeneration so smoothly it is almost impossible to tell by ear when the 6SJ7 detector goes into oscillation except through the change in character of signals from voice to voice accompanied by the heterodyne squeal necessary to c.w. telegraph reception. In this circuit screen, plate and cathode voltages may all be set for maximum weak signal sensitivity, while plate detection, rather than usual grid-condenser-and-leak, completely eliminates regeneration hum in a.c. operation.

The audio output of the detector is fed through usual r.f. isolation choke RFC1 and its r.f. by-pass condenser C7, on to the grid of the 7C5 audio power amplifier by usual resistance coupling plate load resistor R4, grid blocking condenser C8 and grid leak R6. R6 is a potentiometer, which serves as the ideal audio volume control. The 7C5 is biased negatively by a 300 ohm, 1 watt resistor, by-passed for good bass tone reproduction by a 5 mfd. electrolytic condenser. For greatest power output, the 7C5 should have a plate load resistance of 5,000 ohms, such as would be provided by the input transformer of a dynamic loud-speaker. For greatest voltage amplification, as for maximum volume on weak signals heard through headphones, the 7C5 plate load should be much higher. So, for headphones plugged into jack J1, and insulated from direct current by ¼ mfd. con-



Lots of finger-room here.

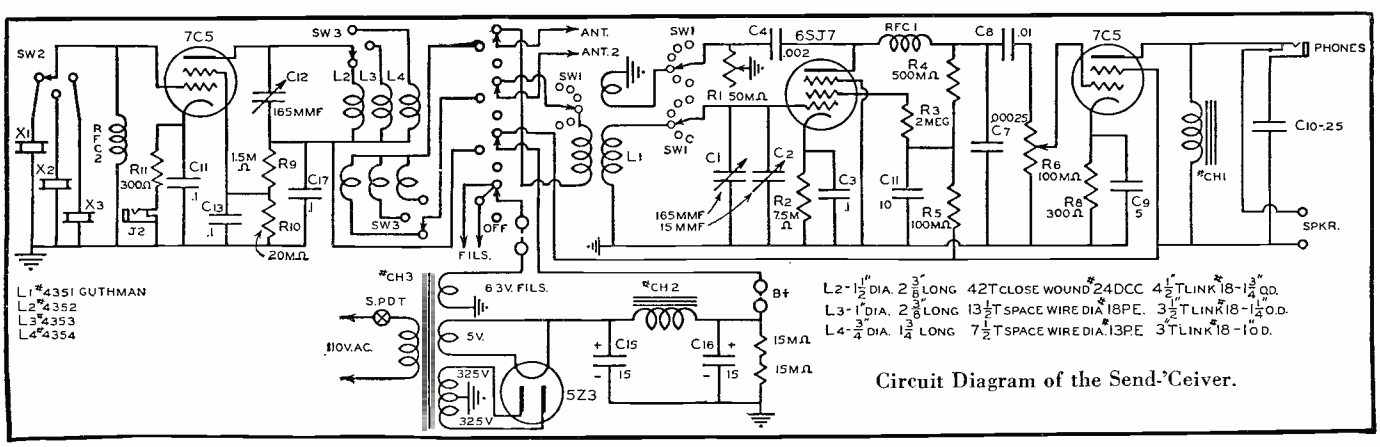
denser C10, the 7C5 "sees" a load CH1 of much higher than 5,000 ohms, thus giving greatest volume. When the phone plug is pulled out, and a 5,000 ohm loud-speaker is connected to the two terminals marked "SPK" in Fig. 2, the 7C5 "sees" 5,000 ohms—CHI being of such high inductance as to give negligible shunting effect—the condition for maximum power output such as is wanted in loud-speaker operation.

For battery operation, using a 6 volt storage or dry "Hot-Shot" battery for tube heaters, only the parts at the upper right of the dotted lines are necessary, with 90 to 250 volts of B battery connected, negative to chassis ground and positive to the wire marked with an arrow and "B +."

At the bottom is the a.c. power supply unit for both transmitter and receiver, with a.c. on-off switch mounted on R1 and operated as its knob is turned to the right at start of rotation. The filament or heater circuit of all tubes is also controlled by the lower section of the send-receive switch on the upper center so that whether power be a.c. or batteries, control of either is complete at the front panel. Provision for battery operation exists in the power unit by virtue of the two groups of terminals marked "B +" and "FIL." Disconnecting each of these terminals from its mate allows batteries to be connected between chassis and each left terminal for portable operation as when a.c. is not available—or with omission of a.c. power supply, for permanent battery operation in unelectrified areas. The power supply consists of power transformer CH3, filter choke CH2, and filter condensers C11, C15, C16 all seen in Fig. 3 in the round can just to the left of T1.

The transmitter occupies the chas-

(*Pse QSY to page* 58)



Circuit Diagram of the Send-'Ceiver.

In building this power supply the leads were all kept above the chassis for greater safety and for servicing.

High Voltage Power Supplies

by LOUIS J. GAMACHE, W9RGL
Development Engineer
Standard Transformer Corp.
Chicago, Illinois

A ripple-free high voltage supply can be built by following the author's article.

THE proper design factors of a high voltage power supply, in the majority of cases, are often sadly neglected. It is common to find that the constructor of a power supply is left to a haphazard guess as to what is needed. Consequently, the entire operation and performance of the transmitter, or associated apparatus, does not always live up to the expectations of the builder.

In this day and age, where economy is of paramount importance, the *bargain price* transformers and chokes appear to be very attractive. However, in the manufacture of transformers and chokes, the copper and iron used cost the various manufacturers approximately the same amount in dollars and cents. Therefore, it stands to reason that the *economical* transformers and chokes are either very skimpy on iron or copper, or both, and these units, although specifications indicate that they will operate satisfactorily on CW, are not recommended for phone, or where the apparatus is left on for any period of time.

Another disadvantage of the above units, is that their regulation and IR drop (that is the resistance of the copper) is such that even on CW, the note may be chirpy. Another thing worth mentioning is that on the *economical* transformers, the voltage is rated as (a.c. voltage), which does not take into account the d.c. resistance of the transformer or the voltage drop of the rectifier and chokes. This would lead one to interpret and expect erroneously higher voltages from such a transformer.

In constructing a power supply, it is advisable to consider that in the future, changes are bound to occur in transmitting tubes and transmitter design and the yearning for higher power must always be satisfied. Therefore, the design of a power supply should be conservative.

The calculation of a power unit to supply energy to only one stage is rather simple. The factors necessary are: the d.c. voltage desired for that stage, the IR drop in the choke, tube, and transformer combination; and the current required for the bleeder to improve regulation. The bleeder serves a two-fold purpose by automatically discharging the condensers when the unit is turned off and preventing high peak voltage to the condenser when the load is removed.

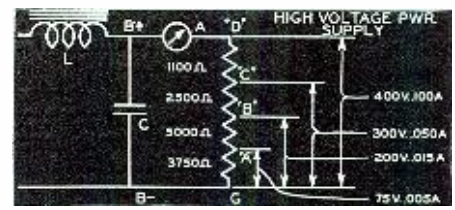
It may also be used in conjunction with a milliameter to indicate the voltage across that circuit (voltmeters are current meters with series resistors; a 0-25 milliameter with a 10,000 ohm resistor becomes a 0-250 volt voltmeter. Other values of current and resistor may be used for different ranges). With the new Ham regulations now in effect, the amateur wants to know the plate voltage to the final stage, which is advisable.

The design of a power pack to supply energy to more than one stage is a little more complicated, but well within the scope of the average amateur, experimenter and serviceman. The first step in calculating such a supply is to find the following: the current which will flow in the bottom part of the voltage divider or "bleeder current," and the current of circuits A, B, C, and D.

Using the following values in a hypothetical case, .020 amperes the bleeder current, .005 amperes the current desired from A, .015 amperes the current desired from B, .050 amperes the current desired from C, and .100 amperes the current desired from D, making a total of .190 amperes. Using the formula $R = \frac{E}{I}$ it is found that the resistance from A to G is 3750 ohms, capable of carrying .020 amperes continuous. The current flowing through the resistor A to B is .020 plus .005, or .025 amperes, and the voltage drop is 125 volts. Therefore, the resistance is 5000 ohms. The current flowing to the resistor C to B is .020 plus .005 plus .015, or .040 amperes, making a total of .090 amperes, and the voltage drop is 100 volts. Therefore, the resistance of this unit is 1100 ohms.

This voltage divider would then be a 15,000 ohm resistor capable of carrying .1 ampere. It will be more economical to use two individual voltage dividers, one of 5000 ohms capable of carrying 100 milliamperes, and the other of 10,000 ohms capable of carrying 50 milliamperes. Other power supplies may be figured by following the above procedure.

(*More data on page* 50)



Voltage divider circuit diagram.

5 Band Switching Mobile

by OLIVER READ, W9ETI
Technical Editor, RADIO NEWS

The 1939 version of the portable rig described by the author a year ago. Self-contained and pre-set on 5 bands, it is a complete ham radio station.

Compact, the rig works from 6v.dc or 110v.ac power.

ANY type of portable radio transmitting equipment should be designed to fulfill as many applications as is possible and yet maintain a high degree of performance with as small an assembly as is practical for the purpose. The writer has built many types of portable and semi-portable rigs with a hope and prayer that one of them would satisfy the desire for a complete station that could be picked up and comfortably carried about for mobile, emergency and portable use.

Early models fell short of our needs in one respect or another, but by taking the best features of each, we finally arrived at a happy conclusion with the rig described in the following paragraphs.

The most reliable source of emergency power is the automobile storage battery which is to be found in any town or hamlet, which is not the case with dry batteries or power lines. Motor generators are available for various input voltages, and while a unit designed for twelve volt input could well be used in a mobile installation, it was felt that a standard of six volts be used in order to reduce total carrying weight when using the rig some distance from the family car.

The total current drawn from the battery is around 15 amperes maximum, and with a fully charged battery, will give several hours of continuous service before it is necessary to recharge.

All amateur bands with the exception of the high-frequencies are available by means of the selector switches on both the transmitter and receiver so quick change is provided for without resorting to plug-in coils or change of antenna. The transmitter puts out a modulated carrier of from 12 to 15 watts on all bands. This amount of power has covered plenty of dx which includes both coasts, Canada, Cuba, and Mexico.

Unlike the early models, this unit follows a rather novel method of construction of the upper chassis and panel. The top chassis is completely drilled and all parts mounted, after which the panel is bolted to the chassis. The speaker is mounted off-center to allow more room for the genemotor, being fastened to the panel where wiring can be completed without using a cable.

The main "Send - Receive" switch is also mounted to the panel above the speaker in order to keep the leads short and direct to the various circuits. The panel is made of ⅛" aluminum, finished in grey wrinkle. The speaker escutcheon is taken from an aircraft dial assembly and has an outside rim diameter 4".

The two chassis measure 9"x6¼"x2" and the panel 10"x12¼". The overall dimensions of the complete unit are 12¼"x10"x6½". Provision must be made for ventilation within the cabinet by including either cane metal inserts or by having a cabinet made up with louvres.

The complete station, as shown on the illustrations, is the result of several previously built experimental models and many months of field tests in order to determine just what type of portable equipment would fulfill the greatest amount of satisfaction and pleasure in operation. The writer's portable station in the June 1938 issue of RADIO NEWS brought hundreds of letters from those who had built the unit and some who expressed the desire of incorporating a more flexible design that would permit complete band-switching on both the transmitter and receiver.

Seven different models have been built since that time and each has approached the problem in a slightly different manner. By far the most efficient and compact of these units will be discussed in the following paragraphs:

The Transmitter Section

Many circuits and layouts were attempted before the final unit was evolved. Each r.f. stage was studied with an eye to compactness, high efficiency, and a minimum of parts. The selection of a two stage assembly using a type 6C5 Pierce oscillator and a 6L6 amplifier offered the closest approach to our wants. Further tests with this combination proved our choice well-founded and the performance was very gratifying. It is always important to consider the choice of tubes in this type of gear from the standpoint of its being accessible from a stock carried by any serviceman, even in a small community or summer resort town. Then, if occasion presents itself, we may obtain a "spare" with little difficulty no matter where we may be operating.

It was also apparent that we should limit the number of controls wherever possible and this was accomplished by using the un-tuned oscillator circuit shown. The tube will operate with all crystals on their fundamental frequency and this includes the ten and twenty meter rocks: A safety device in the form of a 6.3 v. pilot light connected in series with the crystal acts also as an indicator of oscillation in the stage. If the light burns brightly, it indicates that the crystal is being overloaded and steps must be taken to reduce the current passing through the crystal by changing the value of the condenser that is connected across

Mobile Receiver

the grid-leak. Save the crystal!

A jack is wired in series with the cathode return to ground for keying and is by-passed with a mica condenser of .01 mfd. This condenser is important for efficient operation and must not be omitted from the circuit. Keying will be clean with good active crystals.

The amplifier stage operates at twenty watts input on all bands of from 10 to 160 meters. This stage is plate and screen modulated for phone operation. Bandswitching was accomplished by slightly revamping a *Browning 5P* tuner in the following manner. Remove the mounting strap that holds the coil assembly and the tuning condenser together. Remove the rear terminal assembly to gain additional space for the remaining parts. These changes need only be made when the utmost in compactness is wanted. The coils cover the 10-160 meter bands with a 50 mmfd. variable condenser which may be left intact providing a conventional antenna coupler is to be used.

Many coupling arrangements were tried in order to find the one most suited for all-band operation using an 8 ft. vertical rod as the radiator. The final choice was the network shown on the schematic. Two 100 mmfd. variable condensers are connected in series with one another, and the antenna connects to the junction of the two units. Each condenser shaft should be insulated in order that hand capacity will not effect tuning. This may be done by substituting bakelite shafts in place of the originals. Cut two pieces of ¼" bakelite rod to a length of one inch and have a quarter inch of each rod turned down on a lathe to a diameter that will allow a 6-32 thread to be made. These pieces are screwed into the condenser assembly in place of the original metal extension.

The condenser nearest the plate of the 6L6 acts as the tuning condenser, while the other determines the proper loading of the antenna. Always keep the tuning condenser set to resonance, for proper operation. A combination of automatic and grid-leak bias is used in the amplifier to protect the tube should excitation fail.

Care must be taken in laying out the various parts in order that a compact assembly result. Reference to the illustration shows how these are mounted and wired.

Speech and Modulator Section

Some of the early models were designed to use a regular single-button carbon microphone. After the disappointment from the carbon granuals "going west" during one test it was decided that the rugged crystal be used or at least given a try. A new amplifier section was built and disclosed a marked increase in effective speech response and a reduction from the noise level of a carbon mike that results from carbon hiss at high levels. Many crystal microphones are designed to accentuate the voice frequencies and this type was selected for use with the final model.

Twenty watts input to the final amplifier calls for audio power of 10 watts. This is best had from a type 6N7 in class B. This tube is very small and fits well into the compact assembly. Two other 6N7's are used, one for the driver with the grids and plates connected in parallel, and the other as two separate audio stages having a common cathode.

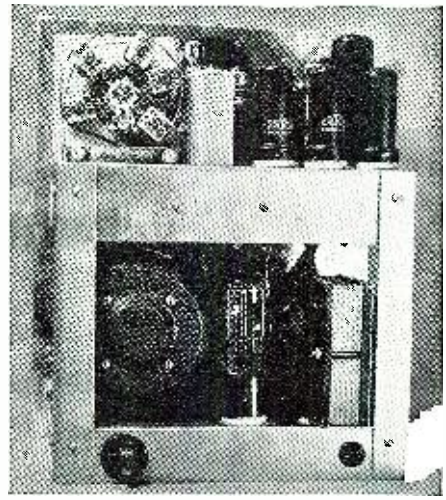
Sufficient gain is had from the above to operate a low-level type of microphone. In fact, more than enough gain is had for close-talking than is needed. After determining the proper audio level, gain riding should be needed and the potentiometer is mounted under the chassis near the tube in a "set" position.

The modulation transformer presented a problem at first, as the overall dimensions were intended to afford complete shielding of the unit. By removing the shells from the assembly, it was possible to mount the open unit as shown. A slot is cut in the chassis so that the lamination stack will pass through, and then the bolts are replaced above the chassis and hold the assembly tight underneath. No trouble was had from the rebuilt transformer as it is operated at low impedance. The input transformer may be seen underneath the chassis next to the output.

The driver and output stages are used both for amplifying the receiver output as well as serving their purpose as modulators. A four-pole-double-throw-switch takes care of the changeover of all necessary circuits for send-receive. When the switch is thrown to the "send" position, the audio from the speech is connected to the modulators, the antenna to the transmitter, the modulation transformer to the r.f. amplifier, and the plate voltage to the proper stages.

When thrown to the "receive" position, the audio from the 6R7 tube in the receiver connects to the input of the driver transformer, the output to the speaker transformer, the antenna to the receiver, and the plate voltage to the proper stages. In this way, the number of tubes can be kept to a minimum and plenty of power may be fed to the speaker on weak signals.

It is important properly to match the impedance of the modulation transformer to both the speaker and the r.f. load. This is done by using a universal output transformer between the modulation transformer and the speaker and by using the same primary impedance that is used as the r.f. load which is 6,500 ohms. The same load to the 6N7 will then result at both switch positions.

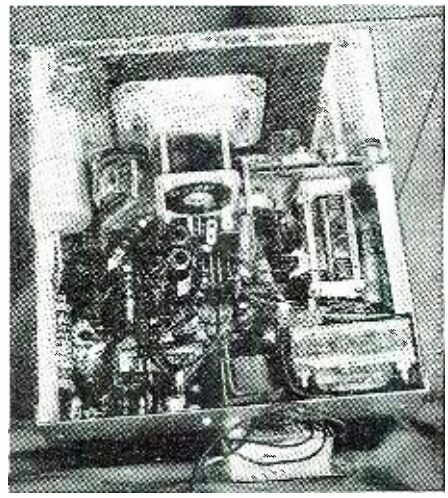


Rear view shows how carefully the parts were placed. No wasted space. Note the generator at the left and the 110v. AC power supply alongside.

The speech section will require the greatest care in wiring as the parts are the most crowded. The by-pass condensers are wired last and mount above the wiring wherever possible. Care in assembly, together with good parts should guarantee that no trouble be had after the job is finished.

The Receiver Section

The final choice of receiver was taken from several models that occupied a greater space than finally used. By studying the best of the lot, it was found that much space could be conserved by using a very small i.f. transformer in place of the usual units sold on the open market. The ones selected are only an inch square and only slightly higher than the metal tubes. The coil assembly was made up to fit in the amount of space at hand. A



Underside the chassis with every part protected against vibration.

four gang-five position switch was obtained and the sections spaced to the length of the coil forms. The individual coils are soldered directly to the switch lugs as shown. Isolantite-mica condensers are soldered across the tuned circuits and are set to tune to the center of each amateur band.

It is not necessary to use series padder condensers in order to track the circuits properly.

Regeneration is used at both the first detector as well as the i.f. stage to add to the overall selectivity of the receiver as well as to bring up the sensitivity on weak signals. The regeneration chokes used in the set must be of the types listed. The primarys of the antenna coils were designed for use on a short vertical rod antenna so that maximum pickup would result when "on location." An aluminum baffle shield is made to fit in-between the coil assemblies to isolate the oscillator and antenna circuits. A large hole is drilled in the center of the baffle to pass over and clear the switch shaft with two additional holes for mounting the baffle to the threaded rods.

The i.f. amplifier uses a type 6K7 in the regenerative circuit shown. Note that the grid return connects to the a.v.c. network where voltage is fed into the triode portion of the type 6R7 diode-triode. This tube serves the purpose for detector, a.v.c. and audio amplifier. It is possible to drive the 6N7 output tube from this triode section, but an additional switch would be needed at the changeover to take care of a push-pull connection.

The output of the 6R7 is coupled to the input of the driver tube through a condenser of .01 mfd. capacity in conjunction with a plate resistor of 10,000 ohms. This places the proper load to the detector for maximum linearity and sensitivity, and provides the best audio response.

C.w. reception is had by advancing the regeneration control to the point of oscillation and change in pitch may be had by advancing and retarding the setting of this control.

Lining up the receiver follows standard practice for super-heterodyne receivers and is best accomplished by using a signal generator to spot the various bands. Upon locating the signal with the band-spread condenser set to the middle of the band, carefully set the trimmers to bring the signal to maximum peak, assuming that the i.f. transformers have been properly set to the frequency of 460 kc.

There will be no interaction between stages if the wiring is done to keep the leads as short as possible. The parts may appear unduly crowded in the illustration but most of the actual wiring is done before adding the condensers, with the result that everything fits in very comfortably.

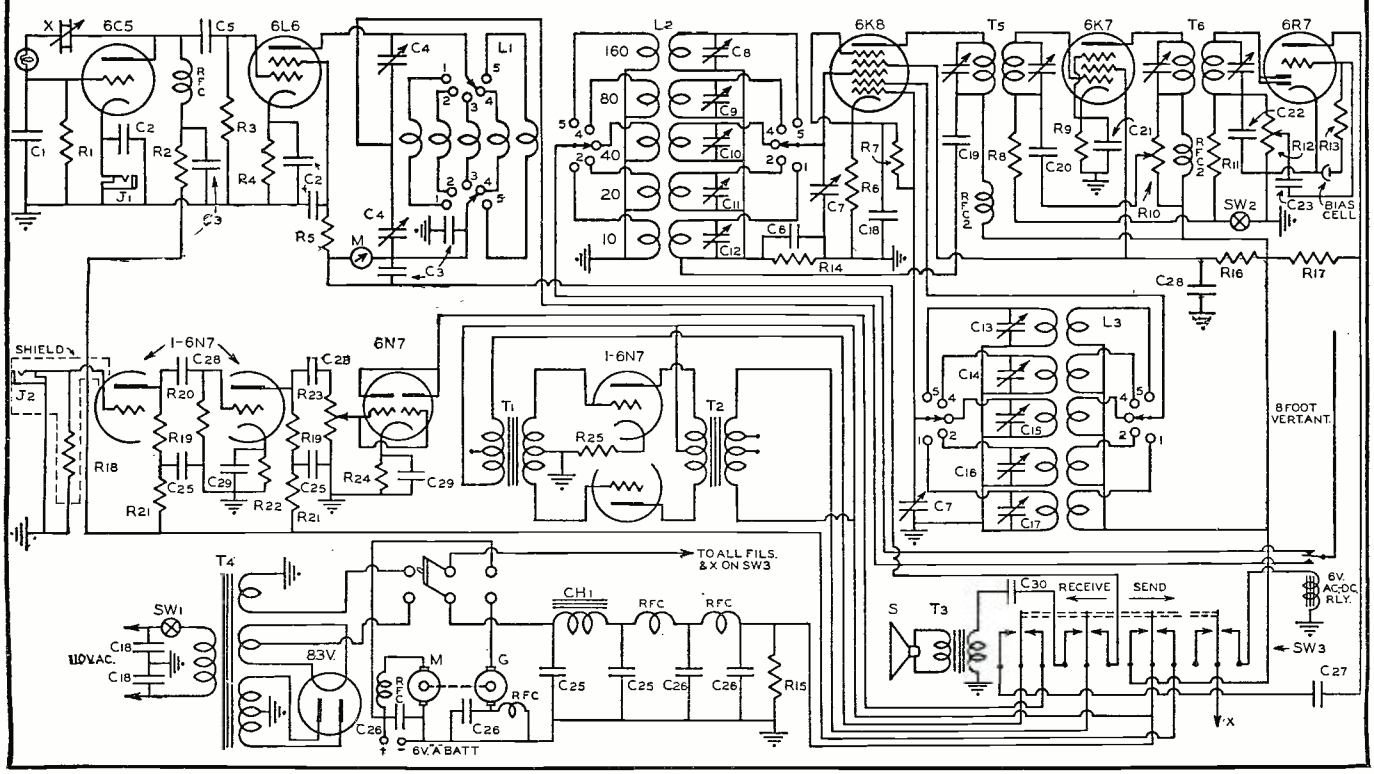
The Dual Power Supply

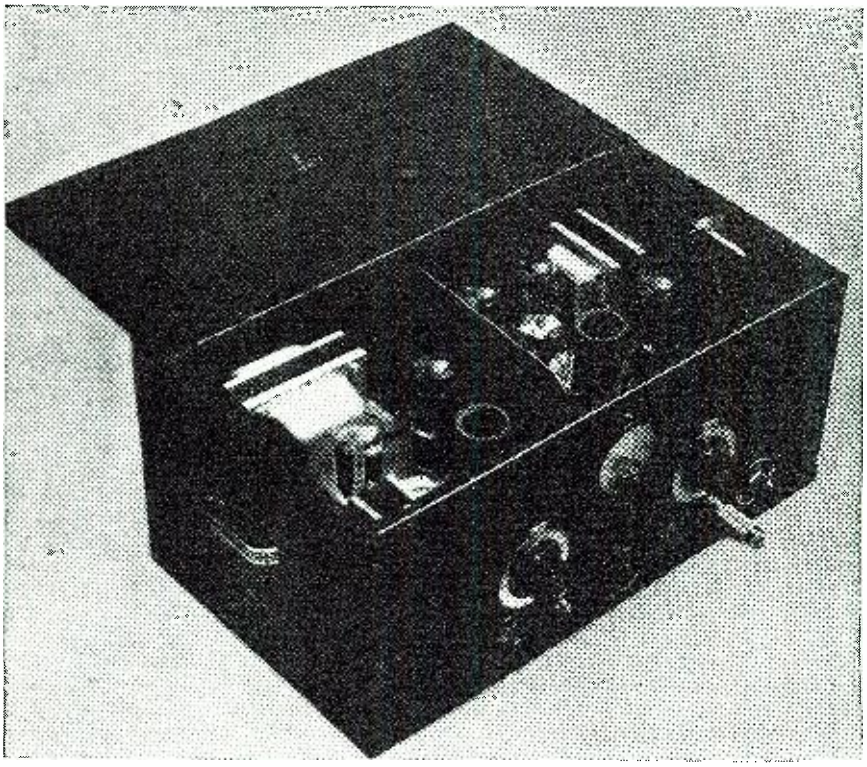
Provision has been made in the design to permit operation from either 110 volt a.c. or from a storage battery. A *Pioneer Genemotor* mounts on one side of the chassis on its shock-mounts to prevent any vibration from effecting the operation of the set when in the receiving position. The *genemotor* furnishes 300 volts at 150 ma. d.c. and is designed to furnish continuous output at these values.

Heavy leads must be used between

(*Build further on page* 47)

C_1—.00025 mica Aerovox 1467
C_2—.01 mica Aerovox 1450
C_3—.0025 mica Aerovox 1467
C_4—100 mmf. var. Cardwell ZU100AS
C_5—.0001 mica Aerovox 1467
C_6—.05, 400 v. paper Aerovox 484
C_7—dual 35 mmf. Cardwell ER35AD
C_8—Guthman padder. Set to 48 mmf.
C_9—Guthman padder. Set to 65 mmf.
C_{10}—Guthman padder. Set to 185 mmf.
C_{11}—Guthman padder. Set to 225 mmf.
C_{12}—Guthman padder. Set to 55 mmf.
C_{13}—Guthman padder. Set to 65 mmf.
C_{14}—Guthman padder. Set to 75 mmf.
C_{15}—Guthman padder. Set to 190 mmf.
C_{16}—Guthman padder. Set to 205 mmf.
C_{17}—Guthman padder. Set to 55 mmf.
C_{18}—.1 mfd., 400 v. paper Aerovox 484
C_{19}—.1 mfd., 400 v. paper Aerovox 484
C_{20}—.1 mfd., 400 v. paper Aerovox 484
C_{21}—.1 mfd., 400 v. paper Aerovox 484
C_{22}—.0001 mica Aerovox 1467
C_{23}—.02 mfd., 200 v. paper 284
C_{24}—4 mfd. 450 v. electro. Aerovox 2GLS450
C_{25}—8 mfd. 450 v. electro. Aerovox 2GLS450
C_{26}—.5 mfd. 600 v. paper Aerovox 684
C_{27}—.05 mfd. 400 v. paper Aerovox 484
C_{28}—.1 mfd. 400 v. paper Aerovox 484
C_{29}—10 mf. 25 v. electro. Aerovox PR25
C_{30}—.1 mf. 600 v. paper Aerovox 684
L_1—Browning Labs. 5 P tuner. See text
L_2, L_3—5 band coil and switch assembly. Guthman 4355
CH_1—20 hy. 150 ma. choke. Utah 4509
RFC—2½ mhy. chokes
RFC_2—Special regeneration chokes. Guthman 4272
R_1—30,000 ohm 1 w. Aerovox 1098
R_2—5,000 ohm 10 w. Utah CC5M
R_3—100,000 ohm 1 w. Aerovox 1098
R_4—250 ohm 10 w. Aerovox 1098
R_5—15,000 ohm 10 w. Utah CC15M
R_6—200 ohm ½ w. Aerovox 1097
R_7—50,000 ohm ½ w. Aerovox 1097
R_8—100,000 ohm ½ w. Aerovox 1097
R_9—250 ohm ½ w. Aerovox 1097
R_{10}—5,000 ohm pot. Utah RC5M
R_{11}—.5 megohm ½ w. Aerovox 1097
R_{12}—.5 megohm pot. Utah RC500M
R_{13}—1 meg., ½ w. Aerovox 1097
R_{14}—100,000 ohm ½ w. Aerovox 1097
R_{15}—75,000 ohm, 20 w. Utah EE75M
R_{16}—10,000 ohm 20 w. Utah EE10M
R_{17}—10,000 ohm 1 w. Aerovox 1098
R_{18}—2 megohm ¼ w. Aerovox 1096
R_{19}—100,000 ohm ½ w. Aerovox 1097
R_{20}—500,000 ohm ½ w. Aerovox 1098
R_{21}—20,000 ohm 1 w. Aerovox 1098
R_{22}—1600 ohm, 1 w. Aerovox 1098
R_{23}—.5 megohm midget pot.
R_{24}—1000 ohm 1 w. Aerovox 1098
R_{25}—100 ohm, 10 w. Utah CC100
M—0-100 DCMA Meter Simpson
Sw_3—4 P4T, Federal Anti-capacity switch
S—3½" Permanent magnet speaker, Utah 3P
T_1—Class B. input. Stancor A4712
T_2—Class B. output. Stancor A3845
T_3—Universal speaker tran. Utah 8775
T_4—Plate & fil. Stancor P5059
T_5—460 KC. I.F. Guthman 4356
T_6—460 KC. I.F. Guthman 4357





Complete in a table-mounting cabinet, the portable works fb dx.

My [illegible] Portab[illegible]e

by JIM LOWE
W6JVK-W6QEK
Pasadena, California

☆

A portable that will work well with any antenna and cost only $48 for the whole rig.

MOST every amateur at some time, has wished that he might build a compact portable, which might work well on any antenna.

Having this in mind, as well as trying to design a unit which might be economically built, many circuits were considered. The circuit chosen fulfills our every need, it's simple, efficient, and yet flexible, thus making its construction easy for the beginner, as well as the old timers.

During tests, the results obtained on all-bands were very good, and better yet, the whole transmitter, including the crystal, tubes, and crystal mike, may be had for only $48.00. That's all, there isn't any more.

Not only does this make a fine portable, but also makes a swell permanent home outfit. The power on c. w. is 35 watts, and on 'phone it puts out the sweetest 20 watts you ever heard.

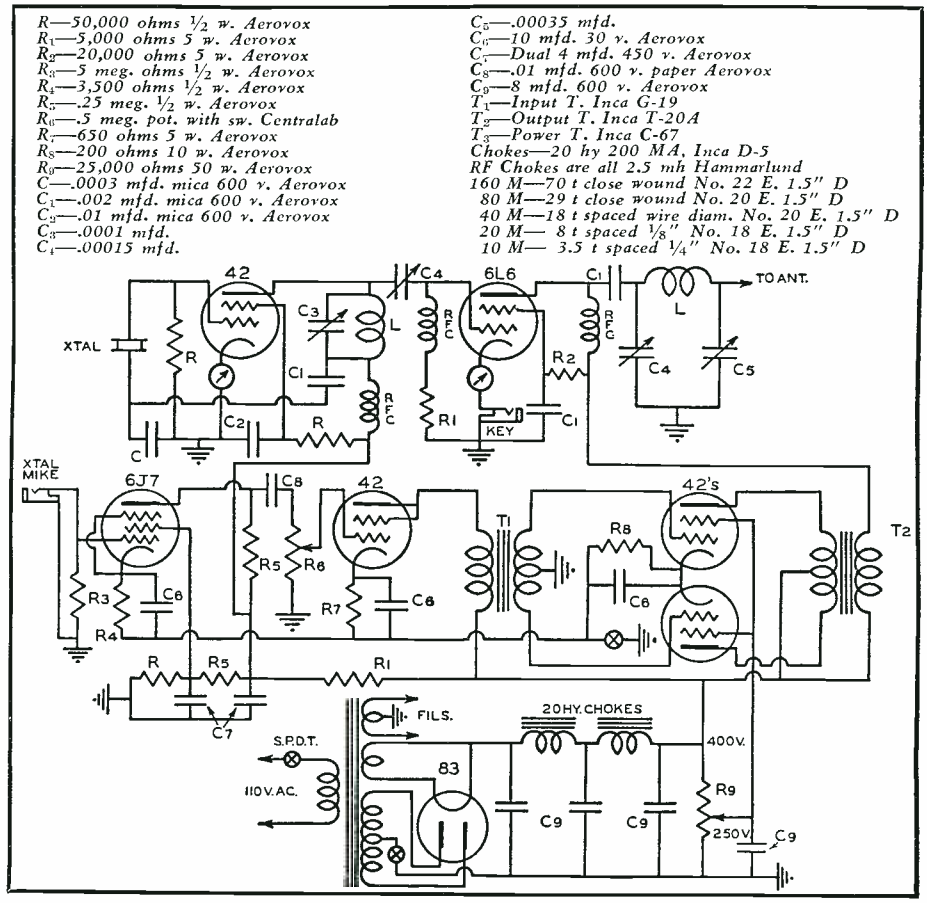
Construction

The actual construction of the unit is made on a metal chassis measuring 10"—17"—3". This size makes the transmitter ideal for relay rack mounting for home use, or to mount in a metal cabinet for portable use.

Considerable time should be spent in laying out the parts, so that all leads may be as short as possible, also make sure that all transformer and choke cores are at right-angles, thus cutting down the inductive coupling, which might cause hum to be induced. It's a good idea to have the power supply on one end of the chassis, and the r.f. stages in the center, leaving enough space on the other end for the audio stages.

Due to the fact that only two stages are used, the efficiency of every stage must be at highest peak, thus I chose a pentode oscillator, using a 42 type tube with 350 volts on the plate and 200 volts on the screen. This worked out very nicely on the fundamental frequency, but when doubling the output was quite low. To increase the output as a doubler, regeneration was added in the grid circuit as shown in the diagram, thus making it come under the heading of a *Jones "Sure-Fire"* oscillator. This circuit works very nice on the fundamental, makes a

R—50,000 ohms ½ w. Aerovox
*R*1—5,000 ohms 5 w. Aerovox
*R*2—20,000 ohms 5 w. Aerovox
*R*3—5 meg. ohms ½ w. Aerovox
*R*4—3,500 ohms ½ w. Aerovox
*R*5—.25 meg. ½ w. Aerovox
*R*6—.5 meg. pot. with sw. Centralab
*R*7—650 ohms 5 w. Aerovox
*R*8—200 ohms 10 w. Aerovox
*R*9—25,000 ohms 50 w. Aerovox
C—.0003 mfd. mica 600 v. Aerovox
*C*1—.002 mfd. mica 600 v. Aerovox
*C*2—.01 mfd. mica 600 v. Aerovox
*C*3—.0001 mfd.
*C*4—.00015 mfd.
*C*5—.00035 mfd.
*C*6—10 mfd. 30 v. Aerovox
*C*7—Dual 4 mfd. 450 v. Aerovox
*C*8—.01 mfd. 600 v. paper Aerovox
*C*9—8 mfd. 600 v. Aerovox
*T*1—Input T. Inca G-19
*T*2—Output T. Inca T-20A
*T*3—Power T. Inca C-67
Chokes—20 hy 200 MA, Inca D-5
RF Chokes are all 2.5 mh Hammarlund
160 M—70 t close wound No. 22 E. 1.5" D
80 M—29 t close wound No. 20 E. 1.5" D
40 M—18 t spaced wire diam. No. 20 E. 1.5" D
20 M— 8 t spaced ⅛" No. 18 E. 1.5" D
10 M— 3.5 t spaced ¼" No. 18 E. 1.5" D



swell doubler, and will even quadruple if you so desire. For doubling and quadrupling a quite active crystal should be used for best results.

The value of condenser C is rather critical, if too great, the circuit will not double very well, and if too small there will be excessive regeneration, causing the oscillator to be unstable. By trying different values, .0003 mfd. was found to be the most satisfactory for C, this allows enough regeneration for best operation.

Plug-in coils are used to allow fast band change-overs, as well as to have the correct L/C ratio for each frequency. All coils are 1.5" in diameter, and have the same amount of pins, so that the coils for the oscillator and the final may be interchanged, which permits fewer coils for all-band operation to be used. In winding the coils, the *hot* end of each coil should be at the farthest distance from the chassis, so as to keep the loss to a minimum. Another suggestion in winding the coils, is to use copper enameled wire, because its r.f. resistance at the high frequencies is quite low.

Now that the oscillator is finished, it may be coupled to the grid of the next tube, using C4 as our coupling condenser, and because the excitation to the final should be variable, a suitable condenser is used. Since the final tube is a 6L6, very little excitation is required, in fact if you are not careful you may overexcite its grid, and this is where the variable coupling comes in very handy as a means of control.

The final amplifier is very simple to construct. The plate and antenna coil are combined into one inductance, which makes this a simplified antenna net-work, which enables the final amplifier to be loaded up equally well on almost any length of antenna. For most efficient operation, a half wave antenna cut to the operating frequency usually works out the best. A good ground is highly important for maximum radiation. In places where one is not available, a counterpoise should be used if possible.

The plate voltage is parallel-fed through an r.f. choke to the plate of the final amplifier. It is very important that an efficient r.f. choke be used at this point, since it has the job of blocking all the r.f. from returning to ground through the modulator and the power supply.

To isolate the d.c. plate voltage of the final amplifier from the antenna, a condenser is placed in the circuit.

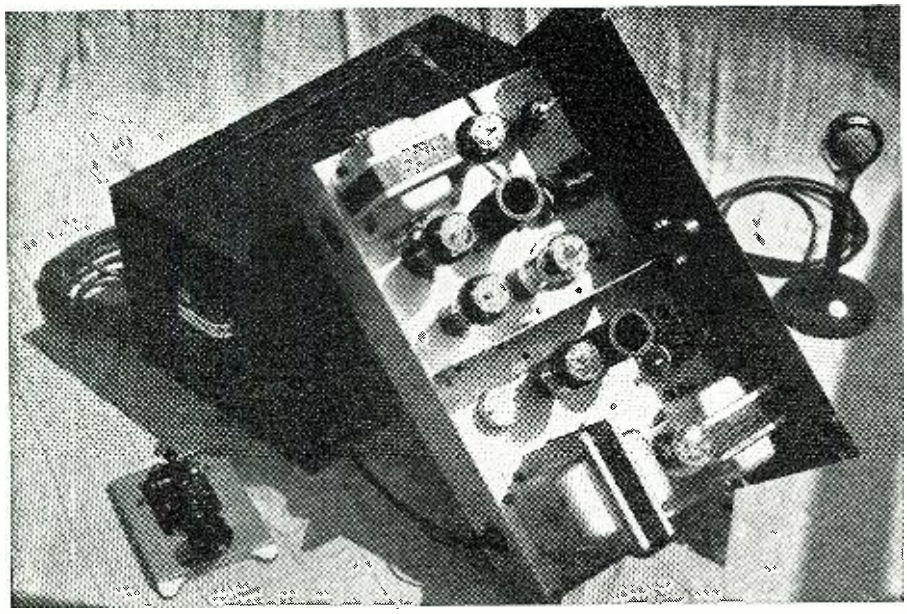
Since the final amplifier is not neutralized, it is good practice to place a shield between the oscillator and the final, thus canceling any coupling between the two coils which are wound in the same electrical plane. The reason for not neutralizing the 6L6, is that screen grid tubes are sufficiently shielded internally, so that self-oscillation does not take place with a properly designed circuit.

The speech amplifier and modulator must be capable of delivering 10 watts of audio output, since 20 watts input to the final amplifier on fone is being used. Keeping the economy factor in mind, two stages of speech amplification, followed by push-pull 42's in class A-B suggested itself. To assure good quality, a crystal mike is used to the grid of the first audio stage. The tube chosen for this stage was a 6J7. Its amplification factor when pentode connected is plenty high enough.

Resistance coupling is used between the first two stages. A gain control is also added to regulate the amount of modulation. The second stage is a type 42 hooked up as a triode, and delivers enough power to excite the class A-B 42's in the modulator to a full 10 watts of audio output. The class A-B output transformer should provide for several different impedances on the secondary winding, so as to allow a proper impedance match, for maximum amount of power transfer from the modulator to the final, as

(*Pse QSY to page* 59)

Really an excellently planned layout.



SEALS are awarded to those manufacturers whose products exactly measure up to the claims they make for them. The Seals are given out free as a service alike to the buyers and manufacturers. The former can purchase knowing that an impartial source has checked the product against claims made for it, while the latter has the opportunity of getting an unbiased opinion on the article.

For further information, write to the RADIO NEWS INSTITUTE Seal of Acceptance Div., 608 S. Dearborn St., Chicago, Ill.

Hereafter each month this Division of the publication will carry a list of products on which Seals have been awarded.

ANNOUNCEMENT is made of the following RADIO NEWS INSTITUTE Seal of Acceptance awards:

To: Solar Manufacturing Company, 599 Broadway, New York City, N. Y.
Awarded: Seal of Acceptance No. 105.00
Product: Solar Capacitor Analyzer Model CC.
Description: A commercial instrument to measure: (1) Capacity 0.00001 to 800 mfd., including motor starting; (2) Power Factor 0 to 50%, including motor starting; (3) Resistance 50 to 2,000,000 ohms; (4) Insulation resistance to 1000 megohms using test voltages to 600 volts d.c.; (5) Detects leakage and intermittents. The unit is a.c. operated and is enclosed in a hardwood carrying case of convenient dimensions.

To: Solar Manufacturing Company, 599 Broadway, New York City, N. Y.
Awarded: Seal of Acceptance No. 105.1
Product: M-408 "Minicap" Condenser.
Description: An 8 mfd. compact tubular metal can cartridge type dry electrolytic condenser. One of a representative line of capacitors sold to the wholesale parts distributors of radio replacement parts. Recommended for sale to servicemen to replace defective condensers of similar capacity and voltage used in original receiver assembly.

Seals previously awarded:

Consolidated Wire & Associated Corp. No. 100.0

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American Lava Corporation. No. 106.0

Electronic Manufacturing Engineers. No. 108.0

National Union Radio Corporation. No. 109.0

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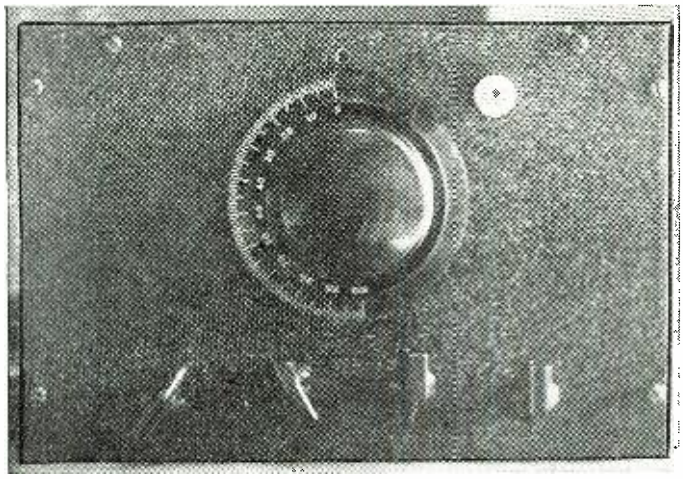
A Simple 56 MC Receiver



by **PAUL POPENOE, Jr.**
Altadena, California

Simplicity is the keynote of this receiver. It is very easy to build and should give selective results.

The front panel features a single main control which is all that is needed; the others are for sensitivity.

FOR a person contemplating the building of a five meter receiver, it is a difficult job to choose which one to construct. There are various factors which enter into the building of a five meter receiver. The cost is an important item with many hams. Another factor, which should not be overlooked, is the elimination of radiation.

A 5 meter set should be reasonably selective, but because of the nature of high frequencies does not need to be extremely so. The set need not have too high a signal-to-noise-ratio.

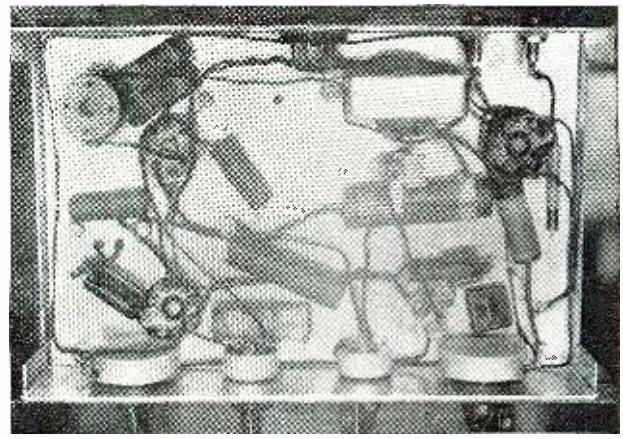
There are various sets which could be built, and each has its advantage. The superhet is a good receiver; and has high selectivity. Nevertheless, a good superhet runs up into some money. By far the simplest receiver is the self-quenched super-regenerative receiver. This receiver is rather non-selective, and is bad because of its radiation. The super-regenerative receiver with separate quench oscillator is much more sensitive and a little more selective than the self-quenched type. It does radiate slightly. A feature which may be added on to either type of set is the tuned radio frequency stage. This will eliminate radiations, and make the detector much more stable.

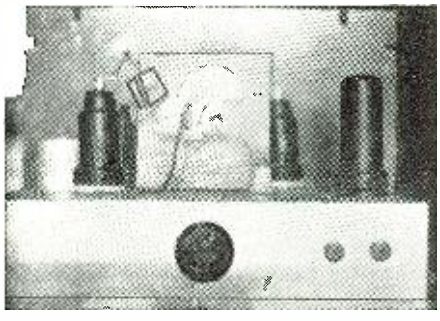
The set described here was built taking all of the above factors (and many others) into consideration. After much thought it was decided to make the line up as follows, using metal tubes: 6K7 in the t.r.f. stage, 6C5 quench oscillator, 6J7 detector, and 6F6 pentode radio. The whole set was built on a chassis 5½"x9½" with a panel 10½"x7" and a cabinet to match. Full details of the construction can be seen in the illustrations and diagram.

Although the r.f. stage does not appreciably bring up the gain of the set, it helps very materially in reducing radiation, eliminating some noise, etc. The antenna is coupled direct to the grid of the 6K7 to provide as much loading as possible. All throughout the section of the set carrying r.f. current, low loss insulation should be used; isolantite or steatite condensers, sockets, etc. The fixed

(*More 56MC dope on page* 61)

Short leads are the unfailing rule.

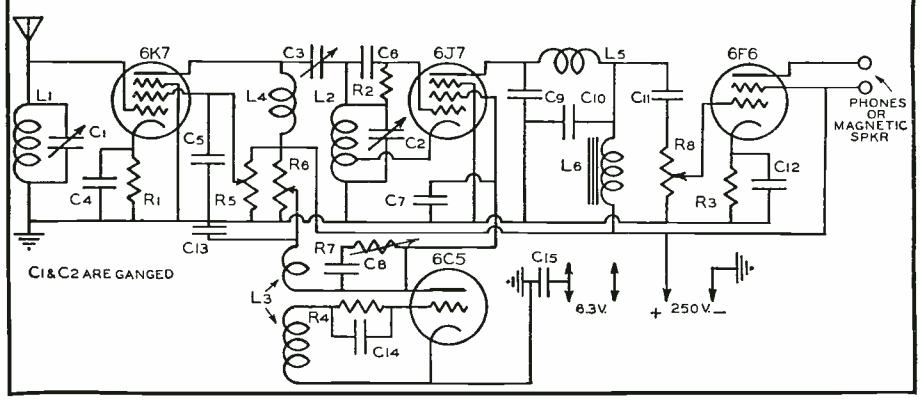




Behind the panel of the rig.

C_1—15 mmfd.
C_2—15 mmfd.
C_3—3-30 mmfd. trimmer
C_4, C_5—.002 mfd. midget mica
C_6—.0001 mfd.
C_7—.006 mfd.
C_8—.1 mfd.
C_9, C_{10}—.001 mfd.
C_{11}—.01 mfd.
C_{12}—10 mfd. (25 volts).
C_{13}—.1 mfd.
C_{14}, C_{15}—.0006 mfd.

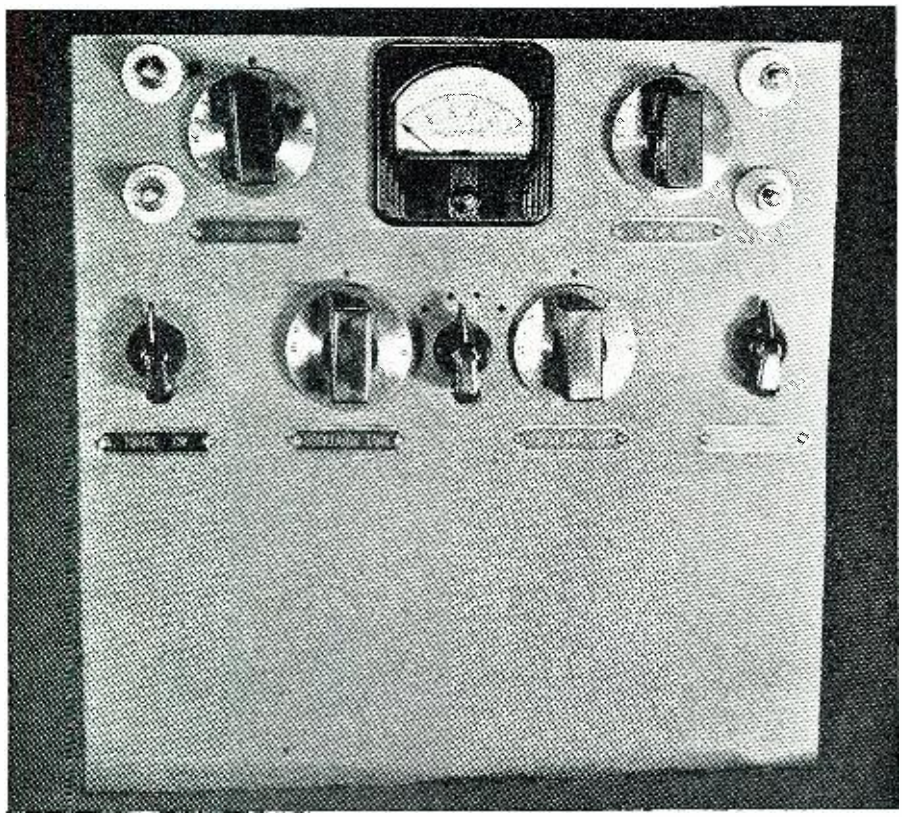
R_1—300 ohm resistor, 1 w.
R_2—5 megohm resistor, ½ w.
R_3—400 ohm resistor, 1 w.
R_4—50000 ohm resistor, ½ w.
R_5, R_8—250.000 ohm pot.
R_6, R_7—50.000 ohm pot.
L_1—7 turns No. 16 wire, ½" inside dia.
L_2—5 turns No. 16 wire, ½" inside dia.
L_3—Quench oscillator coil.
L_4—5-meter r.f. choke.
L_5—85 m.h. r.f. choke.
L_6—250 henry a.f. choke, 5 milliamperes.



5 METER SPECIAL XMTR

by EUGENE O. GLEESON
Chicago, Illinois.

Since portable-mobile operation is only permitted in the 5-10 meter bands, this transmitter is specially designed for those bands.



The entire 56MC rig is on one side and the 30MC on the other.

COMPACTNESS of portable equipment depends almost entirely upon the power output and flexibility desired. The former requires a selection of component parts which will be small in physical size and yet fall within safe operating ratings. This requirement makes it highly worth while to examine the various tube characteristic sheets in order that we may select tubes of small size and yet ones well suited to the frequencies on which we wish to operate. Of course, the power to be used will have much to do with this choice and it follows that the plate volts supply available may be the deciding factor. A good average is from 250 to 300 volts with a current rating of from 60 to 100 ma. If we decide on a value within this range we may use any one of several types of beam tubes to give us a reasonably high output with low grid-drive requirements.

The word "flexibility," as it pertains to a portable transmitter, covers a lot of ground. First, the ability to change from one band to another in the shortest possible time. Secondly, the elimination of plug in coils, which, at the high frequencies, become an endless headache if we strive to maintain a low-loss unit. In order to eliminate these r.f. losses, several versions of band-switching were tried, including the conventional coil-switch method. While this method is perfectly proper on the lower frequencies, it stands to reason that where short-direct leads are required, this method simply will not work efficiently. It was then decided that if fixed air-wound coils were to be used directly on the variable condensers and do the switching at a low r.f. potential *ahead* of these tubes, that something might have been developed. Work began with renewed interest until the unit shown was developed. The additional cost of the extra parts required for two amp. stages was well worth while as real output may be had, and what is most gratifying, the freedom from frequency shift.

Another feature of this band-change method is that when a tube is operated as a doubler, it will require twice the bias that a straight amplifier requires, and the screen dropping resistor will also be of a different value. By using the two separate stages with fixed values, it naturally permits each tube to operate at full efficiency. Then, too, we may use separate antennas and they will require no retuning when bands are changed. It is good practice to provide also for a quick method of taking the various current readings on one meter. This can readily be accomplished with a one or two scale meter with as many meter shunts as we have positions to read. The meter used has two scales of 0 to 50 ma. and 100 ma. The meter may be obtained with its shunts left out of the movement and duplicate shunts may be obtained and wired as shown to a selector switch.

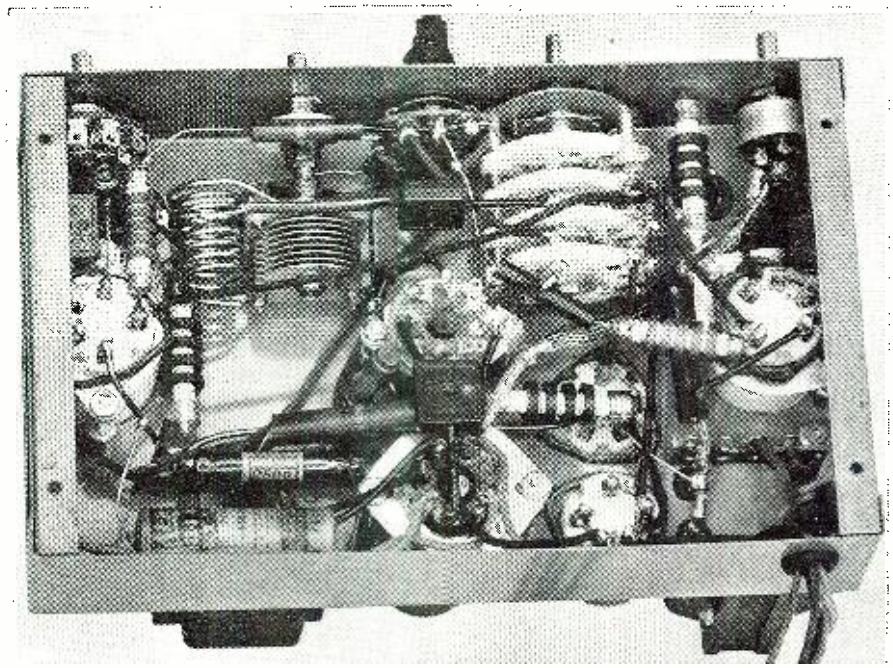
The 5-10 transmitter makes use of one or two 10 meter crystals and the choice of two frequencies in either band may be had by reversing the crystals. The oscillator uses a type 6J5G tube as a straight fundamental generator and ample excitation to the HY60 beam tubes is provided for phone or c. w. One HY60 operates as a straight amplifier on 10 meters, while the other is used as a doubler to 5 meters. The type HY60 is a new compact version of the 807, RK39, etc., and has only slightly lower outputs, while the overall size is much smaller. No neutralization is required on the frequencies used due to its excellent shielding property.

The modulator tube is a single type 6L6 operated class "A" which provides up to 6.5 watts audio from a single button carbon type microphone. A gain control is provided to adjust the level for close talking. The current for the microphone is had from a small "C" Battery when the transmitter is operating from a genemotor supply, and from a filter network from the a.c. supply when operating from the latter.

Construction

The placement of the various parts is extremely important to good performance and all leads should be kept as short as possible or operation will

An extremely compact mounting of the entire two band transmitter.



Under chassis view shows careful parts placement and short leads.

not be efficient. The tube sockets are all underslung below the chassis so as to conserve on the overall size of the unit. The oscillator tube is mounted in the center part of the chassis so as to bring the leads to the switch in a short path.

All coils are self-supported on their respective condensers as shown. The osc. plate condenser and coil is located under the chassis and is insulated from the chassis. The shafts are all isolated from hand-capacity effects by using steatite flexible couplings. By mounting the switches and condensers as shown we can isolate the grid and plate circuits of the two HY60's and keep our two final tank coil-condenser assemblies above the chassis where a very short lead to the tube cap "plate connection" may be had.

It is best to wire all of the filament and transformer leads first, followed by the various by-pass condensers and resistors.

The r.f. chassis measures 9½" long, 6" wide and 2" deep and may be made from auto steel, aluminum, etc. It is not necessary to adhere strictly to these dimensions as this size simply allowed a compact assembly. The band-change switch is one of the new steatite insulation variety with silver to silver contacts, which provide very good contact at radio frequencies. This switch has four sections and two positions and is wired as shown on the schematic. The meter selector switch has two poles and four positions and care must be taken to wire this unit properly. Reading the four positions from left to right show currents as follows: Osc. Plate; 10 meter Amp. Grid; 5 meter Amp. Grid; and Amp. Plates.

The microphone transformer is mounted on the back corner with the modulator output transformer nearest the center. The four spools shown mounted between the two Amp. tank condensers are the meter shunts and are simply placed above the chassis for convenience and to conserve space underneath.

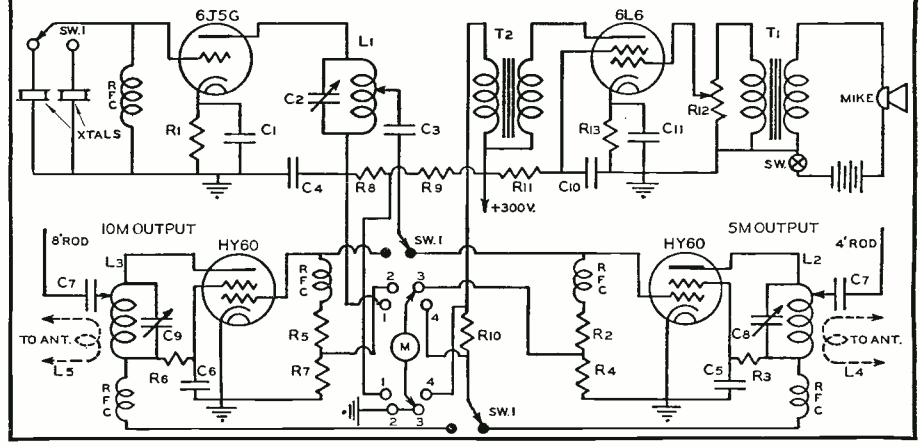
The proper method of coupling to the antennas will depend upon the type used so no provision for a link coil has been made although they may be added. A half-wave vertical rod is used, condenser coupled, on this rig and good reports have been received using this type of antenna. The output of the transmitter on 10 meters is about 12 watts with a 300 volt plate supply and about 10 watts on 5 meters. This output on 5 and 10 meters will cover many miles, and a goodly amount of DX may be had on 10 with this rig.

In order to be able to use the transmitter on both 115 v. a.c. and also 6 v. d.c., two separate supplies are used. The a.c. supply furnishes filament and plate voltages and current to operate the microphone. This is obtained by utilizing the voltage drop from the negative return of the plate transformer to ground.

An installation in an automobile requires that certain precautions be taken in order to eliminate ignition noises, which might be picked up in the receiver. The genemotor should be located near the battery and connections made with heavy wire or flexible braid. The filter system is self-contained in the unit and will effectively remove hash encountered under normal conditions. All connecting leads should be shielded and grounded. A highly efficient antenna for 5 or 10 meter mobile use is a half-wave vertical rod which is grounded to the car chassis. The single wire feed line is clipped on the rod about 14" up for 5 meters or 28" for 10 meters. The length of the rod is approximately 4

(*Pse QSY to page 65*)

T_1—*Mike to grid transformer*
T_2—*Output transformer. "1:1½ ratio A.F. Input used backwards"*
M—*0-50-100 D.C. M.A. with two 50 MA shunts and two 100 m.a. shunts Simpson 127 S special*
R_1—*200 ohm 1 w. carbon*
R_2—*50,000 ohm 1 w. carbon*
R_3—*30,000 ohm 10 w. resistor*
R_4—*50 m.a. meter shunt. Simpson 127 0-50 DC m.a.*
R_5—*25,000 ohm 1 w. carbon*
R_6—*15,000 ohm 10 w. vitreous*
R_7—*50 m.a. meter shunt. Simpson 127 0-50 m.a.*
R_8—*100 m.a. meter shunt. Simpson 127 0-100*
R_9—*2,500 ohm 10 w. vitreous*
R_{10}—*100 m.a. meter shunt. Simpson 127 0-100 m.a.*
R_{11}—*25,000 ohm 1 w. carbon*
R_{12}—*.5 megohm pot*
R_{13}—*350 ohm 1 w. carbon*
C_1—*.002 mfd. 600 volt mica Aerovox*
C_2—*75 mmf. Cardwell ZU75AS*
C_3—*.0001 mfd. 600 volt mica Aerovox*
C_4, C_5, C_6—*.002 mfd. 600 volt mica Aerovox*
C_7—*.0001 mfd. 600 volt mica Aerovox*
C_8—*15 mmf. Cardwell ZR15AS*
C_9—*25 mmf. Cardwell ZR25AS*
C_{10}—*5 mfd. 400 volt Aerovox*
C_{11}—*25 mfd. 50 volt Aerovox*



TECHNICAL BOOK & BULLETIN REVIEW

ENGINEERING ELECTRONICS, by Donald G. Fink, and published by *McGraw Hill.* This book includes 358 pages, 6x9", 217 illustrations and offers a practical volume for engineers who wish to take up or review electronic principles and their application in typical engineering problems of tube use and circuit design. Covers the fundamentals of electron physics and electron tube structures, the engineering characteristics of a wide variety of tubes, and a demonstration of the application of tubes and circuits in problems of power Transformation circuits, and Industrial Control and Measurement. Partial contents are: Electronics in Engineering. A preliminary Survey. The Fundamental Properties of the Electron. The Control of free electrons in a vacuum tube. Electron Contents in gasses and vapors. Specialized Electron Tubes. Electronic Communication Circuits, and Industrial Control and Measurement Circuits.

RADIO CONSTRUCTION AND REPAIRING, by Moyer and Wostrel. Published by *McGraw Hill.* Contains 444 pages, 5½" x 8" with 170 illustrations. A clear, simple treatment of the construction, testing and repair of receiving sets, including television and short-wave receivers, for the use of servicemen, amateurs, set-owners and others interested in the practical aspects of radio servicing. Partial contents are: Radio Essentials. Antenna and ground system, Tool equipment for receiver construction. Sources of electricity for radio vacuum tubes. Audio frequency Amplifiers. Impedance coupling for Audio amplifiers. Short-wave receivers. Construction of loudspeakers. Eliminators and Chargers for various types of batteries. Trouble-shooting. The Television Receiver, and many others.

PAR-METAL catalog for 1939 may be obtained by writing to the *Par-Metal Products Corporation,* 35-25 41st St., Long Island City, New York. This booklet contains a full line of metal cabinets and panel equipment for both Amateur and Broadcast applications. Special types of panels are shown, together with chassis to fit all of the cabinets and racks listed.

TELEVISION RECEIVER MANUAL has been published by *George H. Seward,* Los Angeles, Calif., and a copy may be had for the amount of 50 cents. This manual contains the design and construction of a complete television receiver.

PRACTICAL WAX RECORDING, by E. K. Barnes, M.E., is published by the *Universal Microphone Co., Ltd.,* Inglewood, Calif. The book has been reduced in size to fit the pocket for convenience and the amount of information has been increased to cover the many subjects relative to this highly-specialized field. Many illustrations are given so that a thorough picture may be given the reader who is interested in this art of wax recording. Equipment needed is discussed and the tolerances that must be followed if the desired results are to be had.

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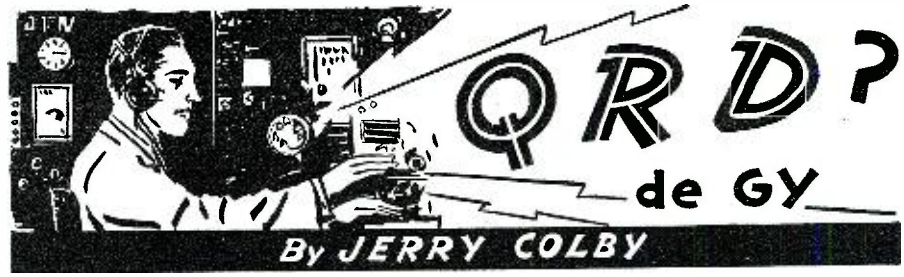


IF any one has an idea that things are bad in the States, listen to the blues song of our New Zealand brethren. The dollar has dropped so low that the price of RADIO NEWS is now sixty-five cents. And with salaries so small it becomes quite an item in the budget sheet of an op. So you see how really and truly tough things are for our south equatorial buddies.

INCIDENTALLY, W. B. Bottomly, former ship's radiop and now billeted with the *British Television System,* wants to hear from some American radiops for the comparison of notes. His address is 35 THE Avenue, Muswell Hill, London, England. Not a jolly bad idea, what, to get first hand info from a guy on the inside of television who knows all the answers.

THANKS to Hamop Larry Pearson from Brooklyn and a few others who checked on W6XBE's signal recently. This San Francisco General Electric shortwave station which is working on 15,330 kcs. or 19.56 mtrs. will broadcast from 1530 to 1900 PST directed to South America and from 0400 to 0700 PST for the Orient. The amplifier is rated at 20,000 watts and radiates 200,000 watts over an *Alexanderson* 30 degree beam panel directional antenna. As this station is primarily dedicated to good will the world over, they want to broadcast programs that listeners want to hear. Therefore, they'd be grateful for any suggestions from youse guys and gals.

F. P. CANNEY of the *SS Berkshire*—KUVG—decided to do something about the rotten sending of some of the boys, so he installed a slip recorder on his barge. He tells us that "a lot of the boys would brush up on their fists if they could see what the tape showed on the 600 band." That's one time figures wouldn't lie. The next thing we know some wise egg will have a home recorder in an Airways station and blackmail the ops for their jobs. Ah, progress!

WELL, the *FCC* doesn't take to unlawful radio operation with any degree of warmth. At the recent trial of two youngsters in San Frisco, Calif., for violations of *Sections 301 & 318* of the *Communications Act of 1934,* the court fined one $100 plus one year probation, and heaved the other fellow into the hoosegow. Crime does not pay!

WHAT a small world this is was illustrated exceptionally well during a recent confab with CBS eastern division engineer Henry Grossman. In 1922 Grossman managed a company that operated WTK, a marine shore station which handled tfc of more than 80 ships on the Lakes. Subbing for the station's regular radiop one day, he picked up a faint SOS and after some effort got the call letters WDL and the ship's name, the *SS Lake Land.* The ship was in trouble 30 miles off the coast of Milwaukee. Grossman notified the Coast Guard and the ship's crew was saved just as the vessel was about to founder. Among the survivors was the radiop, John Harper. Since then they had both been working at CBS, New York, where Harper is a staff announcer, but did not meet until 1933 at a radio engineers' dinner.

BROTHER PUTZKER hastens to answer our query as to the legality of operating a private Ham station on a freighter. He says as long as the vessel's skipper doesn't object, it sure is OK with the local RI or the *FCC. But they insist that you operate on 28 or 56 megacycles while at sea.* Of course, the radiop must have a Ham Xmtr license and a Ham license before he can do this; and you must carry the ticket with you. Also, the equipment must be truly portable. In other words, the rig must be able to be carried by hand from one place to another. And when you hit an American port, notify the local Radio Inspector and you will be permitted to work all the other frequencies without any difficulty. Well, if that doesn't cover the situation, I'll be jiggered. Putzker says there are about eight seagoing Hams doing that today. And he adds, if any one thinks that 28 megs are unworthy of attention, he wants them to know he sent his Mother a Xmas msg on December 24th from the North Sea to California with 20 watts input. . . . Laugh that off!

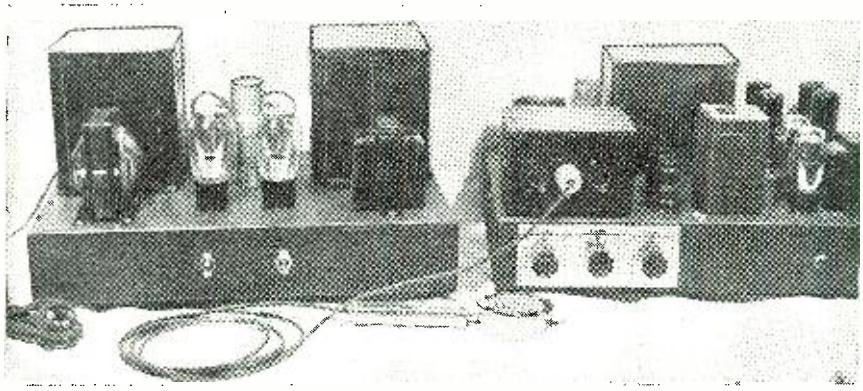
ARTA Local 7 is, in the opinion of this colyumist, one little group with whom it is a pleasure to visit. There is always a group of fellows sitting around ready to shoot the breeze, with none of the bitter or sorry attitudes usually found amongst men in various other radiop gatherings. Good natured camaraderie prevails at all times and there is no surcharge of electricity in the air, which can always be felt. One of the boys gave as his reason for this phenomena that the secretary of the local confers with the rank and file members before making any important decisions. He invites the confidence of the men, makes them his equal, and lets them take some of the responsibility. This adds to their self-esteem and it's smart operating on Secretary Yurgionas' part.

IN lifting up the morale of the boys, another idea of Yurgies is to have recreational activities for the fellows. This is a fine thought and in line with this, they have taken a few trips to visit the San Frisco local of the *ARTA* for exchanging of views and, incidentally, to take in the Fair. Your reporter feels that if more of this *esprit de corps* were shown, the human angle would eventually vanish and jealousies and petty strife would be on the way out.

THE new law which the *FCC* is contemplating will give shipping owners the right to hold physical examinations for radiops. Of course, on the surface this is considered to be the inalienable right of any organization, but if a company should use this as a weapon to get rid of a radiop whom they believe to be too old, then by all means it should be amended. Many ops have some slight physical handicap which does not interfere with their efficient handling of the equipment. But shipping owners may use this as an excuse. "When is a physical handicap not a handicap for operating?" is truly a question for a Solomon. In any case, an oldtimer, if he can still operate satisfactorily, should be given a little more consideration than is accorded a youngster with more brass nerve but less mental balance. Veterans' organizations please note!

Well, here's something else to worry the boys. This even includes the telegraph messenger boy. *Western Union* is to install telephone booths so that one can enter the booth, drop two bits into a slot and write his message down on a slip of paper. This message in its entirety will be delivered immediately by means of facsimile to any part of the United States. And by pressing a hole in the sheet into a groove, the message can also be routed by the individual to any of

(*More QRD? on page* 64)



Built on two chassis to avoid hum and other feedback troubles the amplifier-modulator presents some very late acoustic developments.

Complete instructions to build a fine P.A. system or modulator.

by LOUIS K. SANDOR, W8QNU
Piqua, Ohio

A FINE P.A. SYSTEM

MOST amateur phone operators and servicemen will spend, - - sooner or later, a considerable amount of money on their modulator or master P.A. unit.

The average "ham" graduating from C.W. to phone will profess that he is still 98% C.W. and that he is never going to phone operating very heavily. He operates his 25 watt grid modulated phone for about a month in one of the crowded phone bands and unless he is in a good location and has a well matched antenna system he will soon become discouraged with his results. He hears many amateurs, coming in R 9 plus, describing their high powered transmitters, and telling about their dx results. His ambitions soar high and you can bet your best crystal that he'll soon have high power. Many economically minded amateurs, thinking of the high cost of a good modulator, will feel that the enjoyment they will get from it does not justify the cost.

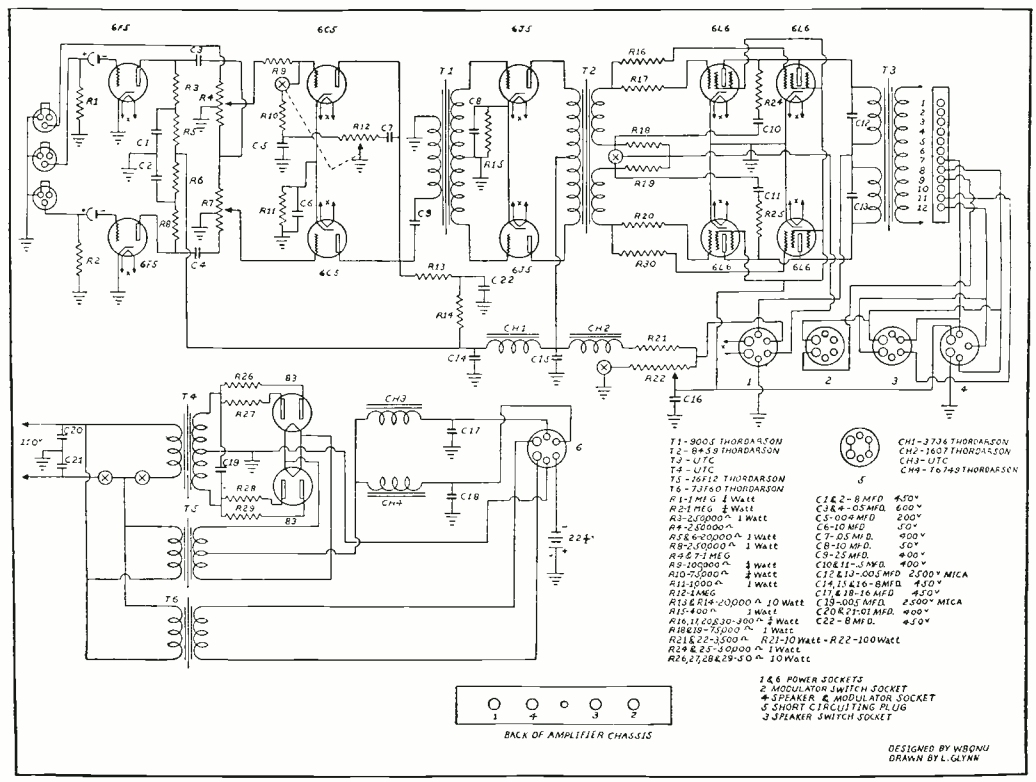
The following amplifier has been designed to work equally well either as a public address system or as a high quality modulator. For those servicemen who are engaged in some form of public address work or those who are interested in entering the field, this type of amplifier design offers some interesting possibilities. The unit certainly makes an excellent "master" system for use in those places where an especially good showing is wanted.

This amplifier provides high quality speech or music amplification and has a tone control whereby the speech may be peaked to provide a narrow channel when used as a modulator. It is good in either way.

The amplifier was built on two panels 12"x17"x3"; the power supply on one and the complete amplifier on the other. Dual 6F5's are used in the first stage to provide two microphone inputs when used as a public address amplifier. Two 6C5's are resistance coupled from the 6F5's to provide electronic mixing. Dual fader volume controls make possible a very versatile input system. A third input is provided for phono or a high output microphone.

The one 6C5 is fed through one of the faders from either of the 6F5's and has a tone control on its plate circuit. The other 6C5 is fed from either the 6F5 or the phono input. This stage has a combination bass boosting circuit and high frequency cut off circuit. The bass frequency response or the high frequency response can be controlled with a single knob, or, by turning the control to the switch side, the bass and high frequencies are automatically reduced. This position makes the frequency response better for modulation.

The parallel 6C5's are transformer coupled into pushpull 6J5's. The 6C5 plate supply is fed through a resistor filter and load. The audio signal is condenser coupled to the primary of the coupling transformer thus keeping all d.c. current out of the primary winding. This system insures lowest harmonic distortion and maximum fre-



quency response in the transformer. This particular input transformer can be any good quality transformer but should preferably be one of the humbucking type. The one listed is a special high fidelity transformer but if your funds are somewhat limited a less expensive one will serve the purpose.

The 6J5 drivers are similar in characteristics to the 6C5 but on careful study you will find that although they have the same amplification factor the 6J5 plate resistance has been reduced materially. This factor improves their driving capability considerably.

The input transformer to the pushpull parallel 6L6 output tubes is especially designed to drive the 6L6 grids considerably positive. When using the amplifier as a modulator the audio peak output is practically double that which you would get if the 6L6 grids were driven just to their positive region.

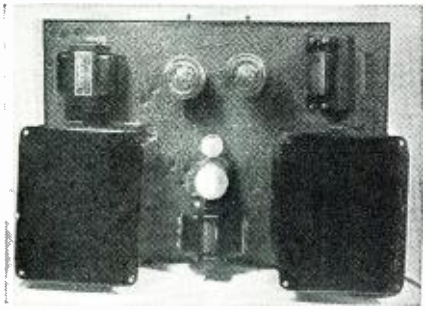
When the amplifier is used for public address work a single throw double pole switch, located on the front of the amplifier chassis, is set at open position. The output stage has 15% inverse feed-back with the switch in this position.

The output of the amplifier is limited to 60 watts because of the additional grid resistance added by the feed-back circuit. This amount of power is quite sufficient for even the largest public address jobs and the frequency response is greatly improved by the addition of the feed-back circuit. The speaker impedence matching to the output transformer is less critical because of the lower effective plate resistance of the output tubes.

When the amplifier is used as a modulator the feedback circuit is not essential because the Class C final r.f. amplifier offers a much better load to the modulator than do the speakers.

In making an amplifier that would work as a modulator as well as a public address amplifier the most difficult part of the design was the output transformer system. The use of two output transformers was one way to solve the problem. This method had been used on a former design and we were looking for a transformer that would do both jobs with the same efficiency. The answer was found in one of the new vari-match output transformers. We found that one set of terminals would work as primary for the 500 ohm speaker line match and also as the modulation match. This simplified the wiring to the plates of the 6L6's. The secondary shorting terminals were run to two six prong sockets located on the back of the amplifier chassis; the 500 ohm shorting terminal to one socket and the modulator shorting terminal to the other. A shorting plug illustrated as plug 5 was used as a switch from modulator operation to speaker operation.

Connection side of the speech chassis.



Top view of the power supply chassis.

Two type 83 mercury vapor rectifiers were used with their plates in parallel to supply sufficient current for the amplifier and the speaker fields. The 50 ohm resistors in series with the plates are necessary to provide even current distribution in the rectifiers.

The plate supply voltage for the 6L6's is fed through choke 1 which has a 500 mil rating to insure low hum in the output stage. The voltage supply to the rest of the amplifier is fed through choke T6749 which is connected independently to the rectifiers thus isolating the output stage voltage supply from the voltage supply to the rest of the amplifier.

The 3500 ohm bleeder to which the 6L6 screens are connected is kept this low to provide better screen voltage regulation. This resistor should be one of 100 watts rating. The other 3500 ohm resistor is rated at 10 watts and is used to drop the 400 volt supply to 300 volts for the rest of the amplifier.

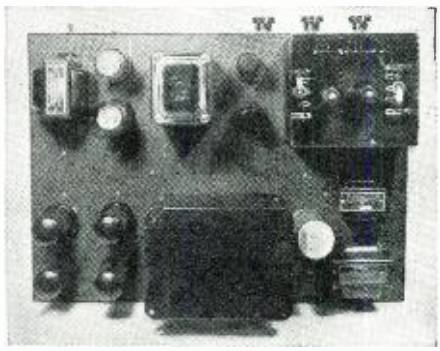
A 22½ volt C battery was used as bias supply to the 6L6 grids. This method is simple and provides the best regulated bias supply that is available.

Separate filament transformers are used and a switching arrangement whereby the plate supply cannot be turned on until the filaments are lit.

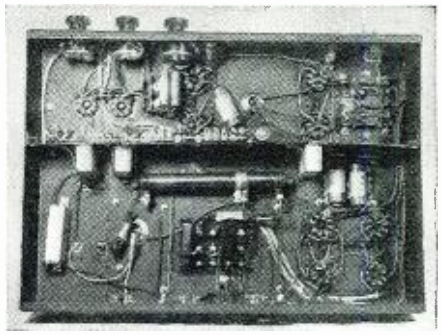
Metal 6L6 tubes were used in the output stage because it was found that the glass 6L6's had a slight tendency to oscillate due to coupling between tubes. When only two glass tubes are used in the output stage this condition does not occur.

The design of this amplifier was made very universal. No pains were spared in the entire design to make the amplifier absolutely hum free and entirely free from audio regeneration or feed-back from the output stage into the input stage.

In designing the physical lay-out of the amplifier it is very important to keep the input and output stages well isolated. This is especially true with high gain output tubes such as the 6L6. The 6L6 as an output tube has the disadvantage of being more unstable than lower gain output tubes such as the 6A3. Thus it becomes necessary to by-pass the plates with a small condenser to keep the output stage from oscillating. The use of four tubes in pushpull parallel increases the instability of the stage and therefore makes it doubly important to design the output stage carefully. 300 ohm resistors were put in each grid to insure stability. Any leads from the 6L6 plates that are more than an inch or two long should be shielded.



The mike input chassis shows the extent to which the author has gone to avoid any extraneous AC hum pick-up.



The under chassis has been carefully planned with metal separating baffles.

From the bottom view of the amplifier can be seen a shield which further isolates the output stage from all of the preceding stages. A metal cover bottom completes the shielding of the amplifier.

From the top view of the amplifier the input stage grids, bias cells, and resistors can be seen in the separately shielded compartment. The input jacks are mounted in the front of this shield thus completely shielding the input from even the filament leads of the tubes.

All mercury vapor rectifiers put out an r.f. hash which sometimes interferes with reception. In addition to the usual line filter on the 110 a.c. a .005 mfd. high voltage mica condenser was put directly across the secondary of the high voltage winding to reduce this type of interference to a minimum.

It was found that no special filter system was necessary to eliminate the r.f. feed-back when using the amplifier as a modulator. This feed-back depends entirely on the proximity of the amplifier and microphone to strong r.f.

(*More construction data on page* 60)

Antenna and reflector mounted for 56-30MC transmissions.

Portable Antenna

by EUGENE F. VALATIA
Davenport, Iowa

How the problem of operating "portable" has been solved from the antenna angle.

The Directional Antenna

WE attempted several methods of making the car antenna system lay down a better signal. We reasoned that most any half wave antenna would be better than the quarter wave as mounted on the hinge pin of the front door. It had been placed there because we found the added distance above ground, as compared to being mounted on the rear bumper, brought the signal up to a worth while amount. Some of this increase was no doubt due to the shorter transmission line from the transmitter.

We tried a half wave doublet, mounted about two feet off the car roof, at one edge. We had hoped that it might act as a closely spaced dipole, the car acting as the other half wave element. We decided after looking at the field strength meter, which was placed several wavelengths away, that the car wasn't such a good section of the antenna, being as it is, only a few inches off the ground at the wheels.

The greater spacing between vertical elements that can be secured if they are placed on the rear bumper, over one on the door pin, works very well, but they are not of equal height and we thought the angle of radiation would be too high. With the parasitic, grounded element mounted on the opposite side of the windshield, we found that as a reflector, our field strength meter showed a 5 DB increase in signal. It doesn't seem logical that we should secure such an increase, and maybe it is our meter, so we won't argue about it. It seems that not only do we have two quarter wave antennas, but the car itself enters into the picture to leave us with an antenna which is somewhat over a half wave antenna folded back on itself, and having a very peculiar shape.

If the parasitic element is tuned to resonance, the signal is simply absorbed in any direction which we could place the meter relative to the car. As it is lengthened, after resonance is passed, it isn't at all critical, and we always just pull it all the way out and know it is operating quite properly.

Of course, it makes it necessary to orient the car in the proper direction, if the directional antenna is used. If Non-Directional use is desired, we simply fold the grounded antenna down.

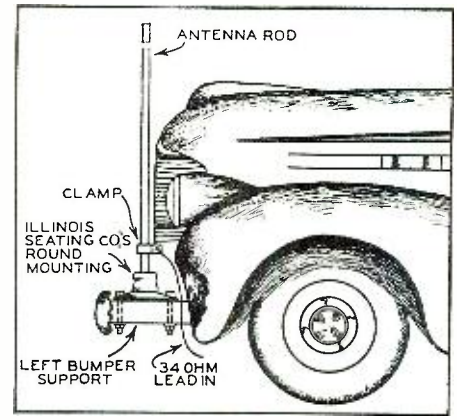
Mounting 34′ antennae

When we wanted to use a vertical antenna around 34′ in height, a different problem was presented. At first we tried mounting an aluminum rod on the usually available stand-off insulators. Aside from the fact that the rod bent badly—and quickly—and that the insulator cracked at once, we had success,—if it can be termed that.

This led us to try some different methods. We were soon pouring over catalogs and eventually tried out one of the *Illinois Seating Co.'s* products. This antenna base comes in two types. One is for use against a wall of a rooftop, and the other has a flat base for mounting *on* a roof. It was this latter type that worked well with our car.

We found that there was just enough room between the front bumper and the car proper for us to wedge the base. Fastening it with two bolts to a clamp under the bumper support was the work of a few minutes. The base was solid, and when the antenna was inserted, the "rod" worked perfectly. The rods that come with this base and made by this company are "solid"—that is, there is a wooden filling for stiffness. While this made it impossible for us to run with the antenna in a collapsed position, nevertheless, we could move about slowly (less than 45 m.p.h.) and still leave the entire 34′ of antenna up. The one trouble was that we found ourselves poor judges of distance, and we hit trees and such with too much regularity. Taking the poles out, we had no trouble in lashing them to the side of the car, and so could run as we pleased.

This is not the only type of mounting that works, however. We had the chance to see a very fine *Premax* installation on a 1938 *Chevvy*. Taking two channel irons of considerable size and weight, the ham had had these



Mounting a 34′ pole on a car bumper.

welded to the back-side of the center of the front bumper. The other end of these irons was fastened securely to the underpart of the car.

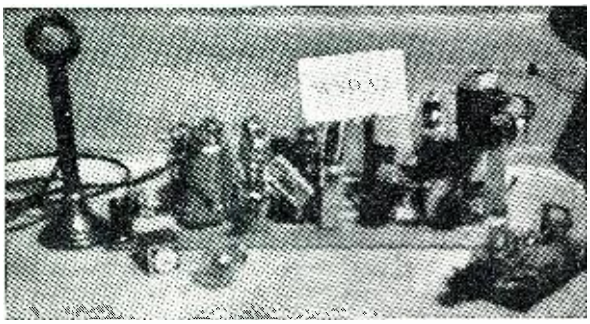
On the "T" formed by the irons, was mounted the base for the *Premax* vertical. This left quite a piece of the base extending above the bumper, and so to protect it, a wide piece of iron was welded crosswise, above the bumper as additional protection. The antenna was collapsible, and when extended, worked very well. Touring was entirely possible with it in the collapsed position. Figures of the speed that could be traveled with the antenna extended were not available.

End fed vs. center fed.

Both the verticals described above were used as end-fed antennae against ground. This made the impedance 34 ohms. However it would have been possible to feed them at the center with an extended "Y" connection and a "twisted pair" or some commercial form of that type of feeder. An open line, because of its weight, is not to be recommended. With center feed, some provision should be made for supporting the feeders, since they, too, will bow the antenna. In using the center feed, the impedance will vary slightly from 600 to 72 ohms depending on the wave-length of the transmitter used with the antenna. —30—

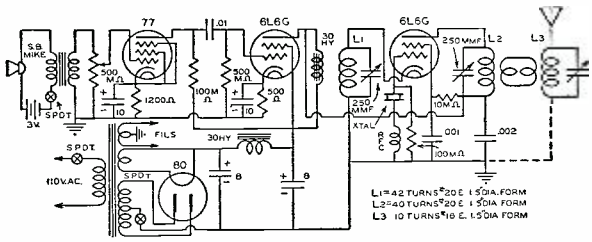
"RADIO Gadgets"

HERE is an excellent 160 meter phone rig that may be built with parts usually found in any experimenter's shack, or purchased outright at low cost. The oscillator is the popular *Tritet,* and, in this transmitter works in the following manner: The cathode portion of the oscillator tube



acts as the first stage of the unit and is tuned to a frequency slightly higher than that of the crystal. The plate tank circuit will perform as an additional stage and enough isolation from the input tank will be had so that this final may be modulated without causing frequency shift of the oscillating frequency.

The modulator tube is a type 6L6G, driven by a type 77 pentode. Sufficient



gain is provided to handle a single-button carbon type microphone in connection with a 3 volt battery. Either metal or glass tubes may be used with equal efficiency.

The power supply should be designed to furnish approximately 400 volts at 100 to 150 ma. and have a filament winding for the tubes of 6.3 volts at 3 amperes in addition to the rectifier winding of 5.0 volts at 3 amperes.

Battery power may be used or one of the vibrator packs made for the purpose will permit complete operation for *QRR* service as the complete unit may then be run off of a six volt storage battery.

The rig may be mounted on a wood baseboard or on a metal chassis, enclosed in a suitable cabinet.

Alignment Oscillator

The ham or fan who is fortunate enough to own a single-signal superheterodyne should have an accurate oscillator for proper alignment. This adjustment is much more important in the single-signal superhet than in the regular type. The alignment of these receivers should take place at regular intervals if the best results are to be obtained. Although the oscillator described was designed especially for alignment purposes, the ambitious ham will find many other uses for it. Calibration of frequency meters, monitors and home built receivers offer a valuable application of this versatile piece of equipment.

Some features of the unit are: no calibration necessary, operates on any crystal frequency, variable control for fine adjustment when desired, complete oscillator modulator and rectifier with only two small metal tubes.

The circuit may look unorthodox at first glance, but upon close inspection proves to be the goods in up-to-date style. The 6A8 pentagrid convertor acts as both oscillator and modulator. This is accomplished by employing the screen grid section in a modified Pierce oscillator circuit with the small triode section as a conventional audio oscillator to provide modulation if desired. In the oscillator, a variable condenser is not really necessary and a 250 mmfd. fixed mica condenser may be substituted.

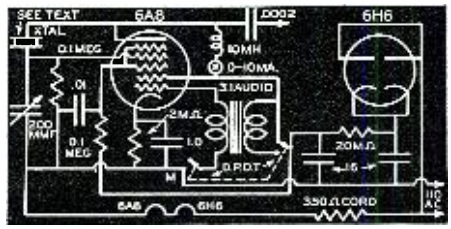
The radio frequency choke (R.F.C.) is the only inductance necessary. The modulator is a low frequency oscillator similar to those used for code practice. Since the modulator is not always needed, a d.p.d.t. toggle provides the necessary switching arrangement for optional use of this unit.

A type 6H6 is utilized in an a.c.-d.c. rectifier circuit. The two cathodes are tied together as are the plates, providing one plate and one cathode connection from the tube. A line cord resistor supplies the voltage drop in order to get proper heater voltages on the tubes.

Adequate filtering is obtained by using a dual 16 mfd. electrolytic condenser, and a 20,000 ohm resistor in place of the usual choke in order to save space.

The original rig was constructed on a chassis and panel made from a piece of masonite. The chassis is supported by the filter condenser. Wiring was done in the small space by careful planning and mechanical arrangement before wiring was started. All sockets, parts, etc., are placed so wiring will fall in natural, neat order. If the layout diagrams are followed, no difficulty should be encountered from wiring.

The original use of this unit was the alignment of single-signal superheterodynes, employing a crystal filter circuit. The crystal is removed from the receiver and placed in the oscil-

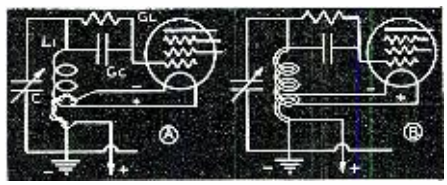


lator. The output of the oscillator is coupled to the mixer tube (1st detector) by clipping the rubber (flexible) covered wire from the oscillator to the grid leads of the tube.

The I.F. trimmers are carefully adjusted for maximum deflection of the output meter (or maximum noise if adjusted by ear.) The noise filter unit is disconnected from the receiver during this process. The I.F.'s will now be lined up on the crystal frequency.

Electron Coupling with the New 1.4 V. "Acorn" Tubes

After considerable experimental work with the new RCA "acorn" type 957, 958 and 959 tubes in an effort to produce a satisfactory 1.4 volt, ultra-high-frequency, electron-coupled oscillator, the arrangement shown was adopted. In circuits where the coil, L1, is of the usual self-supporting type, wound from No. 14 enameled wire, the minus filament is connected to the



coil at about 1/3 the distance from the "cold" end; the plus filament lead, of small insulated wire, is wrapped around the "tickler" portion as shown. In receivers or transmitters using ⅛ inch, or larger, copper tubing for the coil, the minus connection is made as outlined above. The plus connection lead, however, is run through a small hole drilled in the side wall of the tubing near the tap, and inside of the tubing for the remaining "tickler" turns as shown in Fig. 1 at "b." No filament bypass condensers are necessary in this arrangement.

Emergency Repair for "Open" Transformer

An emergency repair for an "open" or burned-out power transformer primary winding can be made as shown in the illustration. If the power transformer contains a low voltage filament winding and a filament or bell-ringing transformer with a similar

(*Gadget further on page* 56)

SIGHT & SOUND NEWS

STATION *WOR*, Newark, New Jersey, is now maintaining a twice-a-day schedule of facsimile transmissions. *RCA* and *Finch* equipment is used—not jointly, but alternately. The station reports that some 400 receivers are in use in the New York-New Jersey area.

The 50-kilowatt transmitter of *WOR* is used for the early morning transmissions beginning at 1:30 o'clock and continuing at least a half-hour. The 4 to 5 p.m. period is transmitted by *WOR's* ultra-short wave affiliate, *W2XUP*.

Jack Poppele, chief engineer of *WOR*, is optimistic over facsimile's future and is supplementing his technical supervision of the tests with talks to servicemen, dealers and luncheon clubs to help boost interest in the art of receiving printed material via radio.

SEVERAL national magazines featured television articles in recent months. The space allotted the video art was flattering indeed but the trade was astonished at the poor selection of pictures tending to show what a received television image looks like. Television broadcasters and set makers alike felt that many of the illustrations were on the "poor" side and that average photographs taken off receivers were much superior.

The incident was thought to indicate two things. First; that some interests want the public to think television is still a long way off. Second: that enthusiasts shouldn't expect too much at the start of commercial television so that they will be impressed rather than disappointed by actual transmissions.

TELEVISION stations utilize almost seven times the number of tubes used by broadcasting stations. This is revealed in a statement by C. A. Priest, of the *General Electric Company*, based on his firm's video station, *W2XB*, soon expected on the air.

He revealed that 648 tubes will be used and that failure of any one of 400 of that number will stop transmission of the television program. He declared: "The technician will have to find and replace the bad tube before the broadcast can be resumed. Of course, we expect to minimize the possibility of program interruptions through tube failures by regular inspections and tests."

TWO television booklets have been issued by *NBC*—one for trade purposes, the other for the public.

The trade booklet is intended primarily for advertisers and advertising agencies but includes material that should be of interest to receiver manufacturers and dealers, too. It is entitled "Television in Advertising" and covers such topics as "Physical Possibilities of Television," "Range of Outside Pick-up," "Range of Television Broadcasts," "Quality of Pictures," "Color Values Through the Television Camera" and other headings equally interesting. It is available through the *NBC Advertising and Sales Promotion Department*, Radio City, New York.

A more popular vein is used in the booklet prepared for the public. It tells the story of television in simple terms and features two pages of questions-and-answers. A table of "significant dates from the diary of television" is also included.

THE British *R. M. A.* has challenged the American *R. M. A.* to a television receiver race. The British manufacturers' group was irked at reports that the U. S. A. would easily pass their mark of video receiver sales and this prompted the challenge which was promptly accepted.

Outside of prestige, all the loser will have to forfeit is the price of a dinner for the winner—presumably an officer of one of the two organizations.

WILFRED GUENTHER, formerly promotion manager of *WLW*, Cincinnati, has been named coordinator of television and facsimile activities for the *Crosley Corporation*. The firm is already presenting a daily facsimile schedule in Cincinnati and has an application before the *FCC* for a television construction permit.

COMMERCIAL tie-ins with facsimile are being tested by *WOR* in the New York area. An arrangement was recently completed between the broadcasting company and the *Twentieth Century-Fox Film Corporation* which gives the film company "exclusive use of this new device for the dissemination of publicity about its pictures and players," according to the station's announcement.

WITH the inauguration of television, the *New York World's Fair* may well go down in the history books as the "Television Fair." David Sarnoff, president of the *Radio Corporation of America*, has arranged for his company to use the Fair as a "springboard" to provide the first regular television program service, at least within the metropolitan area.

Within the walls of the "radio tube" RCA building, the theory and practice of television will be demonstrated in seven distinct sections: the Hall of Television, Television Laboratory, Radio Living Room of Tomorrow, "Telemobile" Unit, Television camera set-up and model television transmitter, "Flask" type television receiver (laboratory model), and Television receiver (stock model) in a clear glass cabinet.

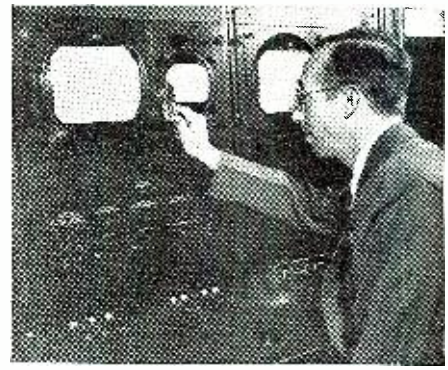
On the word of Ralph R. Beal, Director of Research, *RCA* will draw on ten hours of programs daily to service these receivers, operating from 11 a.m. to 9 p.m. The programs will consist of shows from the *NBC* studios in Radio City, outside pickups by

(*More S & S News on page* 62)

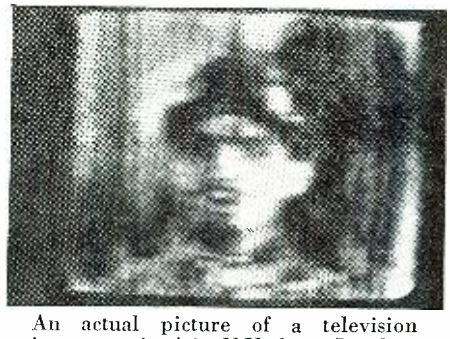
Tele-engineers C. Stec, B. Schnitzer & A. F. Murray who designed portable unit.

Larry E. Gubb, Philco's prexy looked like this when televised recently.

Philco's new electric Tele-camera.



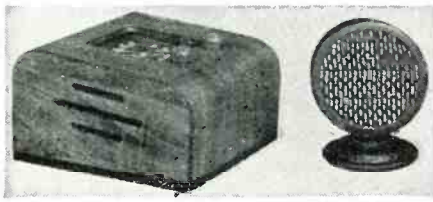
NBC's vice-prexy and chief engineer, O. B. Hanson, examines television unit.



An actual picture of a television image received in N.Y. from London.

What's NEW in Radio

Pathe Wireless Remote Control, made by Pathe Radio and Television Corp., Chicago, Ill. This newly developed Mystic Tuner wireless remote control will operate any make or model of radio on a standard broadcast band and control volume from any point



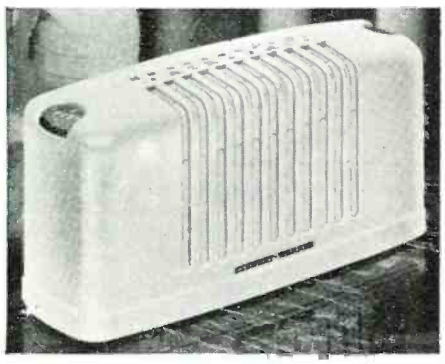
desired in any room in the house. Complete selection, without attachments or connections between radio and tuning unit. Dynamic, high-impedance microphone attachment, for use with control unit for home broadcasting, available.

Aladdin Radio Industries, Inc., 466 West Superior Street, Chicago, are publishing a 12-page instruction booklet featuring the Aladdin "Q" Control Permeability Tuner. Book-

let gives complete instructions on how to build a radio that does not use gang tuning condensers.

A. C. Cossor Ltd., Highbury Grove, London, N. 5, England, announce a new high vacuum double beam oscillograph, Model 3339. The unit features compensated amplifier gain control, deflector coils and the use of a double beam on the oscilloscope. Price is £25.

The Air-Pal, a six tube a.c.-d.c. superheterodyne, 9"x4⅜"x3", is now being manu-



factured by Stewart Warner of Chicago. The unit fits into the average overcoat pocket.

American Television & Radio Co., St. Paul, Minn., advise that they have perfected 1½ v. and 3 v. synchronous and non-synchronous vibrators for self-contained portable receivers. A higher order of efficiency is possible with the use of these vibrators.

Thordarson Electric Company has published a new supplement to their Replacement Transformer Encyclopedia, No. 243. The supplement is known by the No. 243-D and gives the correct replacement values for all 1938-1939 receivers listed in Rider's Manual Vol. IX. Copies may be secured free-of-charge.

Alden Products Co., Dept. R.N.-C5, Brockton, Mass., announce new quality adaptors and sockets for the loctal tubes. The NAALD precision contacts have passed tests of more than 1,750,000 repeated insertions without contact failure.

Harvey Radio Labs., Inc., 25 Thorndike St., Cambridge, Mass., has recently developed a new line of two-way police radios. The units are known as the PF-25 and

PF-50, which are used in the central station and the PM-15 and PM-10 which are used in the cars. Outputs range from 10 watts to 50 watts on police frequencies.

4-in-1 job cards are a boon to National Union Radio Corporation's dealers. The card separates into three parts and serves, respectively, as a job ticket, receipt form and job record card for standard 3"x5" files. The same company has arranged for an attractive animal display plug which features the statement, "If your radio howls, we will fix it," etc.

The Operadio Manufacturing Company, St. Charles, Illinois, have brought out a mobile public address system, Model No. 164, which features 110 v. A.C. and 6v D.C. combination; full 14 w. output; headphone or meter monitoring; electronical micro-

phone and phonograph inputs; "Economizer Control" for battery operation; two 12" P.M. speakers. With the "Economizer Control" the useful length of battery charge is increased 25%.

W6XBE has been completed with a carrier output of 20,000 watts. The entire station was built by General Electric Company.

RCA announces a new low-cost multi-range wave trap. The new unit has an average attenuation of 40 to 1 over the frequency range of 45-2100 kilocycles. The price is $1.85, F.O.B., Camden, N. J.

United Catalog Publishers, Inc., of 258 Broadway, New York, N. Y., has just issued its new 1939 edition of the Radio Master Encyclopedia, which is the only official radio equipment guide of the industry. The Encyclopedia contains 670 pages, bound in red vellum hard cover and is exhaustively indexed and cross-indexed. The price is $2.50.

Hammarlund Manufacturing Company, Inc., 424 W. 33rd Street, New York City, announced a 1939 second edition catalog. This new and complete 20-page catalog contains many items which have been recently added to the Hammarlund line. The catalog contains over 75 illustrations and is free for the asking.

General Electric Company of Schenectady, New York, has just designed the most powerful magnet in the world. It will lift 1500 times its own weight and is made of a mate-

rial known as "Alnico." A magnet one-half the size of an eraser on the end of a pencil will lift a five-pound flatiron with ease.

Thordarson Electric Mfg. Co. of Chicago announces an unusually versatile 8 watt am-

plifier known as T-20W08. The amplifier uses four tubes and sell for $39.50 complete, with combination speaker and carrying case.

Montgomery-Ward Co. of Chicago have just brought an attractively made up catalog for the serviceman and soundman. The booklet is called "Sound," and features the entire line of Montgomery-Ward in the sound and P. A. System field. It is free by writing the company.

Ohmite Manufacturing Company, 4835 Flournoy Street, Chicago, announces two specially designed rheostats for control of speed and direction of "HO" and "O" gauge model trains. The MT-16 rheostat and MT-14, respectively, for the two gauges, are easy to connect and assure easy continuous operation.

Sprague Products Company of North Adams, Mass., announce seven new units ranging from 500 mfd. at 12 volts to 2,000 mfd. at 25 volts dry, electrolytic condensers in round aluminum cans for use with "A" eliminators, moving picture sound equipment and other similar circuits. They are known as Sprague "HLV."

—30—

Continuous recordings require that two turn-tables be used.

With the interest in recordings so high, we are indeed fortunate in presenting an outstanding author on this difficult subject.

by MICHAEL PAUL O'HARA
Engineer, Electronic Manufacturing Engineers
Chicago, Illinois.

A Semi-Professional Recorder

IN the following paragraphs, we shall discuss the proper procedure to be used when making various types of records. The results that we may expect will depend upon the following:

1. The substance and quality of material used in the original disc.
2. The type of cutting needle and its adjustment.
3. The depth of the cut on the disc.
4. The fidelity of the amplifier.
5. The proper amount of audio at the cutting head.
6. The ability of the turntable to revolve silently and without waver.
7. The precision of the various parts of the drive and cutting mechanisms.
8. The care of the recording after it has been cut.

All of the above are important and go hand-in-hand to obtain the desired results. The first requisite may be found by making test records or by following the choice of those who have been successful in making good recordings. Remember that different types of cutting heads require discs of certain specified material and this is stated by the manufacturer at the time of purchase and should be followed.

Instantaneous recordings can best be made on the acetate coated or aluminum discs which have a soft-surface. The surface noise on this type of disc is practically inaudible when a good sharp cutting needle is used and is a very satisfactory type of disc for any type of voice or musical reproduction. Acetate discs must be carefully handled in order to insure best results, and the following may prove of much help if the reader will observe the precautions therein contained:

Always keep acetate discs in a metal container that has a tight fitting cover. This is necessary to preserve the record from dry air which would tend to harden the coating and in turn bring up the surface noises. Undue wear on the cutting needle will also occur if this precaution is not observed. The shavings should be placed in a metal can after the record is cut as these are highly inflammable, being a cellulose product.

Next, we will discuss the selection of the cutting needle. This is also a very important consideration, as the results we obtain will depend largely on the way this needle is ground and its ability to hold a keen edge. Either specially cut steel or sapphire needles will make excellent records if properly used, and the choice of one over the other will depend upon two factors: the life of the needle before it must be re-sharpened, and the initial cost. The steel needles cost a bit less than two dollars while the sapphires cost five dollars for a good quality product. The steel needle can be used to cut about a dozen good recordings before it is necessary for it to be re-sharpened. The sapphire needle, on the other hand, will last for about fifteen hours of use before re-sharpening.

We then can make our choice from the above findings and to this might be pointed out that if one is going to strive for maximum results, the use of the sapphire type will give a better chance than the steel needles. All highly-polished cutting needles should be given the very best of care as they will be easily damaged from rough handling or by dropping the needle on a hard surface. Small corks slipped over the needle point will eliminate this latter hazard.

The depth of cut is very important and can be adjusted by making a test record with different depths of cut and by observing the tests under a microscope. A good average to follow is to adjust the spring on the cutting head so that the cuttings are about the thickness of a human hair. Another accurate method is to cut the grooves so that the width of the groove being cut occupies about two parts in five. In other words, the uncut portion between grooves should be slightly wider than the width of the cut as observed under the microscope. After the depth of cut has been set a test should be run and particular attention paid to the needle as it is cutting the acetate for any noise. If any scratch is heard, it is safe to assume that the needle is chipped or has a burr that is digging into the record. No noise should be heard when the needle is cutting as this will be transmitted to the record in the form of so-called needle-scratch and will be audible when the record is played back.

The amplifier used must be selected to meet certain requirements. First, a flat frequency response is needed in order to reproduce all of the audio frequencies to the disc. This is highly

important, as a good disc is able to take these all-important frequencies and high-fidelity will be the result. A resistance coupled amplifier having an overall gain of 125 db. will afford ample amplification when used with a low level dynamic, ribbon, crystal, or inductor type microphone.

The output stage of the amplifier should use push-pull triodes having a low harmonic content and with an audio output of four or five watts *undistorted.* The impedance of the cutting heads used in the recorders illustrated are 500 ohms, and are accurately matched to the output of the amplifier. The impedance match is very important for clear reproduction and should be done at maximum gain to determine whether or not there is any distortion present. A monitor speaker should be included in the complete setup so that the audio may be heard when recording a broadcast program. If a microphone is used, the audio feedback will prevent this monitor from being used, but the decibel meter across the output of the amplifier will indicate the level of the sound.

This decibel meter is very important in order that too much audio power will not be fed to the cutting heads. The magnetic type of head may be operated at high levels as long as no distortion is present. The proper amount of audio to use can be determined by making a test record at various levels and observing these results when played back. By keeping the audio level high, say 16 to 20 db., the record can be played back at low gain settings which will bring this level far above the natural surface noise of the disc and better fidelity will result, on the average.

On the other hand, if the amount of audio is excessive, there is the danger of the needle jumping a groove with the result that the disc would be spoiled. The latest feature for the home recordist is an amplifier incorporating an automatic peak limiting arrangement whereby any sounds in excess of a pre-determined level will cause an instantaneous change in gain of the amplifier and reduce the volume automatically to that level. Do not use too much limiting when recording, as the result will be a decided loss in the effect of proper crescendo's and diminuendo's on the reproduction as it is heard when played back. If the amplifier incorporates an automatic volume expander, this effect will be enhanced by restoring these small increases and decreases to the original amplitudes.

The modern recorder contains a turntable that has enough weight to be able to maintain a steady rotation under varying loads. This feature is important, as any variation in speed if even for a fraction of a second, will cause a waver in the note that is being cut and the effect will not be a true reproduction of the original. The larger tables are driven by means of a rubber covered drive wheel that contacts on the inside of the rim of the table. This wheel is driven by a smaller wheel that mounts on the shaft of a synchronous motor. This motor is of good quality and has more than sufficient power to drive the table at constant speed.

Precision in the cutting assembly is extremely important and requires a lot of care in its design and application. The recorders illustrated make use of the overhead type of drive and are extremely efficient for accurate spacing of the grooves. The spindle is placed on the turntable where it engages three removable set screws around the hub so that no slipping can occur. The worm drive turns the mechanism that holds the cutting head, and in turn moves the head across the record at proper speed.

Cutting is done in the so-called "inside-out" manner so that the scrap shavings will collect at the hub where they will not become entangled with the needle. This method is probably the most satisfactory for all practical purposes as even a scrap of loose acetate can cause no end of racket if it becomes tangled with the needle.

After each recording is made, the cuttings should be carefully removed and placed in the metal can. All loose scrap must be cleaned off the disc so as not to be on a groove where the play-back needle would grind this scrap back into the surface.

If the reader is interested in attempting the construction of recording equipment, he must bear in mind that certain specific rules be followed if clean-cut transcriptions are to be made. First of all, he must not be content to just throw a unit together and expect the maximum results.

A heavy duty type of motor, preferably one of the synchronous types should be procured. This motor can be mounted below the table, "underslung," and rubber mounts provided so that vibration noise will not be transferred to the disc as it is recorded. A rubber wheel mounts on the shaft of the motor so that it will engage with a second rubber wheel and this in turn drives the turntable from the inside edge of the rim. These rubber wheels will also tend to reduce the vibration from affecting the recording.

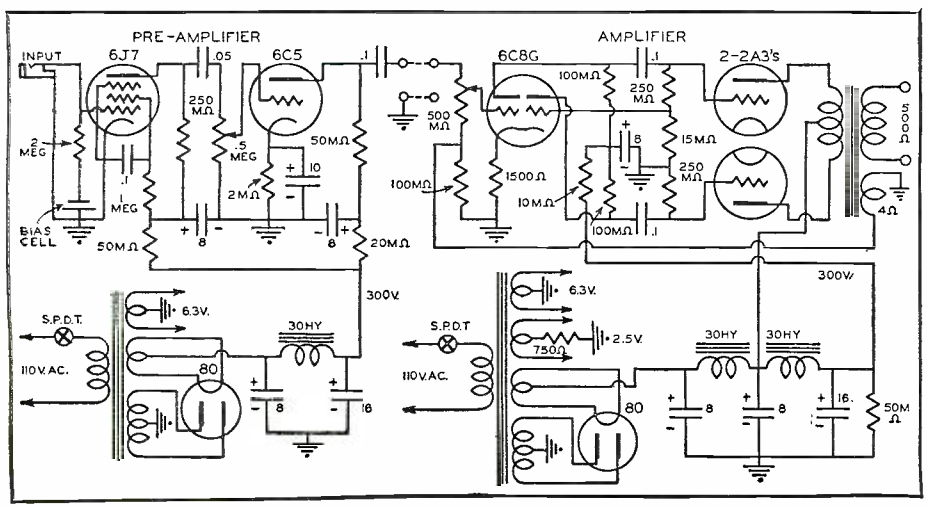
Best results will be had by using the standard speed of 78 r.p.m. The size of the rubber drivers needed will depend upon the speed of the motor and the diameter of the turntable. Therefore, a bit of cut-and-try will have to be done in order to ascertain the various wheel diameters.

A weighted turntable is a *necessity* for smooth operation of the recorder and if one cannot be obtained, a disc made from lead can be mounted underneath a standard weight turntable, provided that this is accurately machined as to balance. If the lead disc is heavier on one side than on the other, a wavering will be noticeable and the record will not be worth very much to the operator.

One manufacturer is offering an overhead drive assembly which includes the cutting head and which may be used in connection with a good turntable or record player. It is possible to make a good head from one of the older type phono magnetic pickups in the following manner. Find out the impedance of the magnet coil from the manufacturer's catalog so that an accurate match can be made to the output of the amplifier. If the pickup is of high-impedance, the coil can be removed and replaced with one having low impedance which is usually more suitable for the purpose.

While examining the pickup it will pay to replace the small rubber dampers that hold the needle armature at the exact center of the coil as these become worn out and rot with time. The needle must be centered exactly or chatter will result if the armature strikes either side of the assembly. Proper adjustments of the mechanism can be made by experiment in adjusting the tension of the rubber dampers. If these are too tight, the low frequencies cannot be reproduced due to the extreme stiffness of the armature, and, if too loose the needle will chatter and the high notes will be lost.

Provision must also be made so that the weight of the cutting head to the disc can be adjusted for proper depth of cut. In this connection, it will be necessary to rig up a spring and adjusting screw as shown in the illustra-



tion which can then be set to limit the weight of the head on the record.

A test record should then be made as previously described in order to ascertain if all adjusting has been properly made. The cutting needle should be set into the head just far enough so that when set onto the disc it will be at an angle of 90 degrees. Do not use more audio than is needed or there is the possibility of the needle jumping a groove on a loud bass note.

In selecting a suitable pickup to be used for playback, the following points should be considered: the fidelity of the pickup, the needle pressure on the disc, and the type of unit. It is imperative to use the proper needle for playback that is especially made for the type of record used. The one best suited for the acetate disc is a special steel needle having a .002 rounded point and is good for several playbacks. The aluminum discs require a soft non-metallic needle for proper playback and these are either of cactus, thorn or fibre.

Good recordings are the result of patience, knowledge of the equipment used, and the ability of the operator to judge music and other sounds and correlate these while the actual recording is being made. Remember that the surface noises are less on a good home disc than on the hard varnished commercial records and therefore are capable of true high-fidelity providing the amplifier is able to reproduce the full audio range, and, if the cutting head is also capable of the same response.

The constructor should know just what requirements are needed if he wishes to construct his own tuner and amplifier. An excellent article on a PA Tuner appeared in the November 1938 issue of RADIO NEWS. This is the proper type to use for good clean reception of local and some outside stations. The main requisites of a tuner used for recording is the ability of the tuner to pass the "complete" sidebands of the received carrier so that none of the fidelity of the original will be lost. Many modern receivers are built with a high degree of sensitivity, together with selectivity which will permit the set to be used in close proximity to a powerful local station and yet be able to receive other stations on adjacent channels without interference from the transmitter.

Sometimes the designer goes too far in this respect with the result that much of the original beauty of the music is lost as it comes from the speaker. If this type of receiver were used in conjunction with a recorder, we would not get the high-fidelity we are striving to achieve.

We must, therefore, design the tuner so that reception will be limited to strong local transmitters that broadcast the type of program we wish to record.

A simple super-het tuner such as was described in last year's July issue of RADIO NEWS may be used with very satisfactory results providing that there is a transmitter located within a dozen miles, at the most. By limiting the number of intermediate-frequency stages or by their entire elimination, as is done in this unit we may broaden the width of the signal and in turn bring up the full audio ranges that are present within the sidebands.

A fine amplifier and a good speaker are essentials.

In the above tuner, a type 6K8 mixer tube is used for the first detector-oscillator which is coupled to a type 6C5 triode through a single iron-core i.f. transformer. The output of the detector feeds to the amplifier which is an independent unit and each contains its own power supply. No gain control is needed at the tuner as this is best handled at the amplifier in one of the audio stages. Complete construction data may be found in the above mentioned article.

An improvement can be made to slightly increase the sensitivity of the unit by adding one stage of i.f. of the air-core type. If the sensitivity is too high, the signal strength may be reduced by using as short an antenna as is possible in order to receive the transmission with good fidelity.

The Amplifier

Just "any old amplifier" will not do for recording of high-fidelity programs and we must build our unit with extreme forethought and care to insure best results. The requirements of the amplifier have previously been discussed, and for those who wish to build their own units, the following will offer some help in the proper selection of the type that will be needed.

The reader is referred to the following articles on the subject that have appeared within the pages of this publication during the past several months:

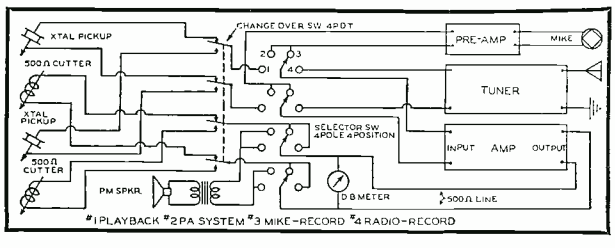
May 1938, page 45; June 1938, page 51; July 1938, page 56; October 1938, page 41; December 1938, page 24 and the articles appearing in this issue on "Serviceman's Universal P.A. System," and "A Fine P.A. System."

The thing to remember at all times is the output stage of the amplifier. Use triode type power tubes wherever possible, or, the beam tubes that have an inverse-feedback circuit arrangement that reduce the distortion and hum level in the amplifier.

Correct shielding of the various parts within the chassis assembly is also highly important for low noise and hum level.

While on the subject of fidelity in connection with recording, we may recommend that the reader pay particular attention to the selection of the speaker that finds its place as the monitor in the record position. If we are able to hear the program accurately at the same time as the recording progresses, our ears will serve as a guide to proper adjustments of the gain controls if the monitor speaker is accurately matched to the output line of the amplifier.

(*Record further on page* 64)



Service Data

by ALFRED A. GHIRARDI, B.S., E.E.

Author of "The Radio Physics Course," "Modern Radio Servicing," "Radio Field Service Data"; member Radio Servicemen of America, New York Electrical Society, Institute of Radio Engineers, etc.

APEX 9A

Oscillation, abnormally high)	1)	open-circuited 7,100-ohm voltage-divider section. Replace with new unit
Motorboating (voltages	2)	faulty condenser across the filter output. Replace with new unit
	3)	connect a 0.5-mfd., 600-volt condenser between the i-f screen or cathode circuits and ground
	4)	loss of capacity in filter condensers. Replace with new units

APEX 10 SERIES

See also Case Histories listed for Apex 8, Apex 8A and Airline 1955 receivers

Inoperative (but operates O.K. if '27 AVC tube is removed from socket)	1)	check 1,800-ohm section of "Candohm" resistor at rear of chassis
Hum, Volume control will not reduce hum to zero	1)	replace the 8-mfd. condenser under the resistance strip in the center of the chassis
Hum	1)	25,000-ohm second detector plate filter resistor "shorted"
	2)	short- or open-circuited 0.06-mfd. condenser connected across the filter choke
	3)	electrostatic shield in power transformer not grounded, or ground is "open"
Poor AVC action	1)	"gassy" '27 tube in first a-f stage. Gassy tube causes grid current flow, and a voltage drop occurs across the volume control. Replace with a new tube
Noisy	1)	the dry electrolytic condensers in this receiver are a common source of "noise." Substitute for these condensers one at a time—especially the 8-mfd. unit which by-passes the detector plate resistor
Intermittent operation	1)	faulty oscillator plate resistor. Replace with a 1-watt unit
	2)	faulty electrolytic filter condenser at input of filter system. Replace with 8-mfd. dry electrolytic unit

APEX 10-B

Inoperative, Distorted, Weak	1)	check the '47 filament winding of the power transformer for a "short" to the high-voltage circuit
	2)	replace the filament center-tap of the transformer winding with a resistor center-tap
	3)	test the bias resistor. Replace with a 425-ohm unit if faulty

APEX 12

R-f and i-f circuits dead. Audio circuit operative (plate-to-cathode voltages on r-f and i-f tubes about 10-volts; chassis-to-cathode voltages about 250-volts)	1)	short-circuited turns on 4,600-ohm section of field coil of speaker No. 2. Rewind, or replace with new coil

APEX 20

Weak reception (all voltages normal)	1)	"open" 0.05-mfd. blocking condenser in the input circuit of the '24 detector stage. Replace

APEX 26

Inoperative (faint signals from local stations only),	1)	short-circuited 0.4-mfd. screen-grid by-pass condenser. Replace with a 0.5-mfd. tubular unit
	2)	check grid wires for "chafed" insulation where they run through holes in chassis
Weak reception, Poor selectivity	1)	faulty volume control. Replace with a new 8,000-ohm unit
Poor control of volume. Intermittent volume	1)	
Oscillation, (extremely high screen voltages)	1)	open-circuited 2,560-ohm resistor. Replace with 2,500-ohm, 20-watt unit
Oscillation (detector screen voltage high)	1)	replace 2,640-ohm section of metal-clad resistor with a 2,500-ohm, 10-watt wire-wound resistor
No screen voltage on r-f tubes	1)	check black wire at loud speaker for voltage. No voltage here indicates open tap in speaker field. Repair may be made by tapping screen voltage through a 1-watt resistor from the red lead that feeds the r-f transformer. Screen voltage should read about 80 volts after repair
Oscillation	1)	clean the "grounding" contacts between rotors of tuning condensers and chassis
	2)	replace r-f by-pass condensers, using 0.5-mfd. 400-volt units
Weak reception, Selectivity poor	1)	failure of the r-f stage to peak satisfactorily, indicates leakage or a partial "short" between the chassis and the wire that runs from the grid end of the secondary of the r-f transf. to the grid of the tube—at the point where the wire runs through the hole in the chassis. Replace the wire

APEX 26-P

Oscillation, Noisy	1)	primary winding of the antenna coil "open." Disconnect one end of antenna-to-ground resistor before testing this winding for continuity
	2)	defect or partial "short" in the 2,640-ohm screen resistor

APEX 27

Oscillation	1)	clean the "grounding" contacts between rotors of tuning condensers and chassis
	2)	replace r-f by-pass condensers, using 0.5-mfd. 400-volt units
Weak reception Selectivity poor	1)	see the Case History listed for this trouble under Apex 26 receiver
Intermittent oscillation	1)	try increasing the r-f by-pass condenser capacity from 0.5-mfd. to 1.0-mfd.

APEX 28

Distortion	1)	if checkup reveals lack of plate voltage on one of the power tubes, check for an "open" in the audio choke which feeds the plate of that tube. This choke may be "shorted" out of the circuit if a temporary repair is desired while a new choke is being obtained
	2)	check the two condensers in the filter system
Inoperative (no plate voltage on tubes) (power transformer heats excessively)	1)	check filter condensers for "shorts"
	2)	if power transformer heats excessively, also check the rectifier leads for "shorts." Run them thru spaghetti tubing. Make sure power transformer has not been damaged by the excessive heating
Weak reception	1)	add small trimmer condenser to the receiver by connecting them from the stator terminals of the tuning condenser to ground. Then re-align the receiver

APEX 31

Inoperative	1)	pull out unshielded tube ('27) to check from 1st a-f to output for response
	2)	no continuity between plate socket terminal of 1st a-f and plate socket terminal of one of the '24 tubes indicates an open resistor section in the metal-clad resistor under the chassis. The small section is the one frequently found faulty. Shunt it with a 3,500-ohm resistor. (In making continuity tests, disconnect the leads to the strip.) The adjacent section is 8,400 ohms and the grounded section is 10,700 ohms
Rumbling noises	1)	tighten the r-f chokes just inside the r-f coils

APEX 32

Fading, Intermittent howling	1)	poor "grounding" of flat by-pass condenser can containing 6 condensers. Solder the can to the tube shields

APEX 36

Fades with a "plop" after 30 or 40 minutes of normal operation. (tubes and voltages check O.K. when operation is normal) (no plate voltage when fading occurs)	1)	double filter choke (which is sealed with the power transformer in a common pitch-filled can) slips down when the pitch is heated after set is in operation and touches the high-voltage terminal on power transformer. When the set cools, the contraction of the mass causes the contact to open. Heating, however, causes the same condition to repeat itself. Melt out the pitch from the can and insulate the choke and transformer from the sides of the can and from the high-voltage terminals. Reseal the unit
Weak reception at low-frequency end of dial. Normal or excessive volume at high-frequency end	1)	check the antenna choke for an "open." Replace it if necessary, and realign the receiver

APEX 41, 42

See also Case Histories listed for Airline AE-11 receiver

Oscillation over entire dial	1)	try connecting a 3,000-ohm resistor into the second r-f control-grid lead to act as a grid-suppressor

APEX 43, 44

Same Case Histories as those listed for Airline AE-11 receiver

APEX 46

See also the Case Histories listed for Apex 28 and Apex 48

Distortion on low-volume setting (after tubes have been replaced)	1)	trouble of this kind can be overcome by replacing the old volume control with another unit connected in a slightly different way. The old one is simply a resistor in the cathode circuits of the 24's. For proper replacement install a 10,000-ohm tapered unit connected with one end to the antenna lead, the other end to the cathodes of the 24's through a 250-ohm resistor, and the slider to "ground" or chassis. The break in the wire-wound resistor where the old control was connected should be closed electrically with a jumper

APEX 47

See also the Case Histories listed for Apex 28 and Apex 48

Inoperative (strong blue glow in '80 rectifier tube)	1)	cut out and tape the white lead coming out of the filter condenser block. Removal of this section of the condenser will not materially affect the operation of the receiver. However, if it is desired, another condenser can be connected externally to replace the one cut out

APEX 48

Inoperative (smoke issuing from power transformer)	1)	unsolder the rectifier leads and prevent future "shorts" by running them through "spaghetti" tubing insulation. Resolder them in place.
No plate voltage on one of the '45 tubes	1)	audio choke "open." It may be "shorted" out of the circuit without material change in receiver performance
Inoperative (no plate voltage on the screen-grid tubes)	1)	replace the 4,100-ohm plate resistor and check the 0.5-mfd. plate by-pass condenser

APEX 60, 60A

Same Case Histories as those listed for Airline AE-11 receiver

APEX 80

Weak reception (jarring the receiver brings it back to normal)	1)	faulty a-c receptacle of dynamic speaker, resulting in a loose connection and no field excitation current. Replace receptacle
Weak reception on one end of	1)	stator plates of tuning condenser have shifted out of

Case Histories

Continuing the useful case histories by a famous author. These reprints should save the serviceman much time.

	dial	alignment. Plates must mesh with similar spacing at top and bottom of plates
Oscillation at certain dial settings	1)	connect a 500-ohm non-inductive resistor directly into the grid lead of the second r-f tube. Also connect a 250-ohm resistor at grid end of the third r-f tube

APEX 99

Weak reception.	1)	4- and 8-mfd. filter condensers "open," or lowered in capacity

APEX 99A

Intermittent reception (receiver operates only when the "on-off" switch is snapped, or when one of the house lights is turned on)	1)	faulty detector tube by-pass condenser. Replace it

APEX 120

Same Case Histories as those listed for Apex 12 receiver

APEX Chassis 700

See Case Histories listed for Apex 7D

ARBORPHONE (General Service Notes)

Weak reception, Noise	1)	inspect all r-f grid return leads at the chassis for corrosion. Install a common ground wire connected to all the grid-return leads
	2)	crackling or frying noises are often due to a faulty first a-f transf. primary. Replace with a new transformer
Hum (no grid voltage	1)	grid resistor burned out due to an internally-shorted tube
	2)	center-tapped resistor connected across the 1.5-volt filament winding "shorts" to the chassis, producing the same effect
Noisy or intermittent when tuning	1)	broken lead on tickler coil. Replace with a more flexible lead. Tickler coil is mounted on a cam which moves in synchronism with the tuning condensers

ARBORPHONE 45

Fading, Insuficient selectivity	1)	clean and solder the rivets that are used on the "balancing panel" located under the chassis. Rebalance the receiver
Inoperative, Intermittent reception	1)	fraying and breakage of leads to ticker coil in '27 detector plate circuit. Replace with high-grade flexible wire, bending coil as close to r-f coil as possible without causing oscillation
	2)	"opens" in grid resistances, or "corrosion" at terminals. Replace with 600-ohm flexible pigtail type resistor, or with 400- to 500-ohm units for greater sensitivity
	3)	r-f coil grid-return wires to chassis loosen frequently. Connect a common ground to each coil, and connect to ground post
	4)	bias condenser at right of '80 tube socket loosens where bolted in place
Hum	1)	interaction between '80 rectifier and '27 detector tubes. Place a piece of sheet copper or aluminum about 3 inches square behind the license notice plate in front of the rectifier
Increasing sensitivity and improving general operation	1)	replace the '27 tube with a '56 type tube
Oscillation	1)	excessive filament voltage caused by improper setting of line-voltage tap. Set the tap in the "high-voltage" position
	2)	bend the cam which holds the tickler coil, so that it will be farther away from the detector grid coil

ARGUS (Models using 99's and 81's)

Filament voltage below normal	1)	if the filament voltmeter does not come up to 3 volts quickly, check for deterioration of the old style electrolytic condenser located inside the small black metal case in the power unit. Replace it with a new dry-electrolytic condenser having three sections of 8-mfd. each, and a 500-volt rating

ARVIN 1934 Auto Radio Sets

Excessive hum.	1)	pickup of vibrator interference by second i-f coil, as a result of the yellow wire from the volume control to power supply unit running near it. Move it away as far from i-f transformer as possible

ARVIN 1935 Auto Radio Sets

Poor quality, Low volume	1)	loose plug where the local-distance change is made. Repair plug, or replace with new unit
Excessive vibrator hum	1)	move the large yellow "A" lead running from the volume-control switch to the power supply compartment as far as possible from the second i-f coil. Shielding this wire also helps a great deal

ARVIN 1936 Auto Radio Sets

Vibrator hash.	1)	make sure that chassis is well grounded to firewall of car, using shakeproof washer on bolt
	2)	be sure to secure good grounding for the transmission line box. Ground it to the frame of the car if an under-car antenna is used, or, if a "top" type antenna is used, ground the box to some metal part known to be at the same r-f potential as the firewall. Make sure that the transmission line shielding is making firm contact with the plugs at both ends
	3)	remove front cover of receiver, and tighten the four screws holding the power transformer in place. Wiggle the vibrator in the socket, and make certain that each "grounding" tooth makes good contact with the sides of the vibrator case
	4)	in addition to regular A-line condensers, try connecting a 1-mfd. condenser across the car's A-circuit by connecting it from "ground" directly to either terminal of the ammeter or fuse block
	5)	solder a 1½-inch piece of shielding or flexible wire from the 6A7 grid cap tube shield to the frame of the variable condenser
	6)	vibrator "hash," which may occasionally increase to an undesirable level after a period of operation, may often be corrected by tightening the four screws that hold the power transformer to the chassis after the receiver has been allowed to warm up for a period of about a half hour
Mechanical hum in vibrator	1)	in some of the first few 1936 receivers delivered, a mechanical noise develops due to chattering of the vibrator against the chassis. Remove the vibrator from the set and increase the tension of the vibrator-grounding spring cup which is riveted in the radio chassis over the vibrator socket
Switch remains in "on" position	1)	remove the small stop pin located just above the volume control on the rear of the remote-control head. This pin may be extracted by prying it up with a screwdriver and removing it with a pair of pliers

ARVIN 1937 Auto Radio Sets

Vibrator hash.	1)	first warm up the set by playing it for 30 minutes. Then tighten the 4 screws which hold the power transformer to the radio chassis. This will effectively eliminate most vibrator interference
	2)	cut the grounding braid connecting the tuning condenser to the radio chassis (this particular grounding braid is located close to the point of entry of the tuning flexible shaft). Do not cut any other grounds on the tuning condenser, as this might introduce motor noise
Mechanical hum (vibrator chatters against chassis)	1)	remove vibrator and increase the tension on the vibrator grounding spring cup

ARVIN A2 Antenna

Proper method of installation for motor noise elimination	1)	the Arvin Type A2 antenna should always be installed on the front door hinge on the same side of the car on which the radio chassis is installed Drill a 7/32-in. hole to accommodate the lead-in wire. The hole should be drilled in the door sill close to the door hinge in such a manner that when the door is closed the hole through which the lead-in passes is covered by the front edge of the door The "Phantom Filter" box should be **securely grounded** to the instrument panel or the metal part of the dash **close to** the point of entry of the antenna leading into the car Shield the antenna lead wire from the "Phantom Filter" to the point where the lead passes out of the car. Ground one end of the shield to the "Phantom Filter." Ground the other end to the automobile chassis or body If motor noise is present after the antenna is installed in this way, it is generally caused by the car hood being ungrounded and may be remedied by placing in a 6-in. length (or longer, if necessary) of braided shielding over the fabric strip attached to the cowl on which the rear edge of the hood rests. Solder both ends of the braid to the cowl and if the fabric hood strip is fastened in place by metal screws, remove these and drive them through the shielding to hold it in a permanent position. Clean the paint off the hood at the spot where it rests on this braided shielding so that it will be securely grounded Usually no suppressors—not even distributor type—are needed if the foregoing instructions are followed

ARVIN P28 to P45 Auto-Radio Remote Controls

Backlash	1)	misalignment between dial mechanism and dial drive member. The small flexible shaft linking the two assemblies must not make two bends. Thin washers are used to line up these members into which the shaft is inserted
	2)	Play in worm-gear drive mechanism. This may be removed by tightening the small hex adjusting nut to the point where no backlash is perceptible
	3)	Kink in small dial drive flexible shaft. This small shaft must be straight and free from kinks. Otherwise backlash will be noticed on one end of the dial and not on the other
	4)	excessive or insufficient amount of shafting connecting dial to tuning member. When the small link flexible shaft is either too short or too long, the curve it assumes is beyond its elastic limit and the detrimental effect is similar to that caused by a kinked shaft

ARVIN 6 (Serial No. 85001 to No. 86001

Oscillation (between 1100 and 1500 kc)	1)	connect a 20,000-ohm ½-watt resistor in the B-plus lead to the oscillator. Also connect a 0.002-mfd. condenser from the B-plus leg of the oscillator coil to ground

—30—

(This series will be continued next month.—Ed.)

SHORT WAVE FLASHES

BY CHARLES A. MORRISON

and JOHN D. CLARK

By Charles A. Morrison

Frequency in megacycles *Time is Eastern Standard*

Special Good-Will Programs

FRIDAY, June 30, from 7 to 8 p.m. EST, over OAX4J (9.34) of Lima, Peru. . . . Sunday mornings, from 2 to 2:30 a.m. EST, over TG2 (6.195), "Radio Morse," Guatemala City, Guatemala. Programs will consist of light classical music.

A banquet is planned where outstanding dx'ers will tell of their experiences and you will get a chance to meet and talk with radio listeners from all parts of the country. Dx'ers who plan to attend the Convention should write to George C. Sholin, 55 Lapidge St., San Francisco, at once, so that arrangements can be made to meet and entertain you, or your party. The Northern Pacific Railway has arranged a special dx tour for all dx'ers who plan to attend the Convention by train. The "Special DX'ers Train" will leave Chicago on July 2, and dx'ers aboard will have a whole week of fun and entertainment en route to the coast, since several stops will be made to give dx'ers a chance to enjoy points of interest.

For further information about the tour, drop a line to the writer of this department, RADIO NEWS, 608 S. Dearborn St., Chicago, Illinois.

New Short-Wave Stations

On the Air

BAHAMAS—Earl Roberts of Indianapolis, Ind., reports ZNS (6.09) at Nassau, is now relaying the broadcast station with the same call, nightly to about 9:40 p.m.

CHILE—CB1510 (15.1), Valparaiso, has been testing almost daily near 7:30 a.m.

CHINA—Don Williams of Santa Ana, Calif., reports hearing a transmitter with the call letters XEOX on a frequency of approximately 11.89, at 7:40 a.m.

COLOMBIA—An unidentified Colombian on 4.755, broadcasting nightly from 8 to 9 p.m., signs-off with a selection sounding like "On Wisconsin."

CORSICA—A mystery station announcing as "Radio Corse Libre," which features vehement anti-French talks, is being heard on frequencies varying from 9.6 to 9.685, daily from 11 a.m. to noon by Alfred Tuff of London, England. Was also heard at 10 p.m., on 9.685, by Ray Botkin of Bloomington, Illinois.

DENMARK—According to Alfred Tuff of London, England, the Danish short-wave station at Skamlebak is now operating on a new frequency of 11.805, using the call OZG, daily from 2 to 6:30 p.m.

D.R.—The new Dominican station on 5.883, which signs-off nightly at 10 p.m. is still unidentified.

ECUADOR—John Larsen of Geneva, N. Y., writes that HC2AB (9.188), "Radio Telegraphio," operates nightly to 10 p.m. The interval signal is 12 chime notes, in series of three's, on the hour.

FRENCH INDO-CHINA — "Radio Saigon," P. O. Box 238, Saigon, first heard on March 14, by Chas. D. Plotner of San Francisco, California, is now broadcasting daily from 6 to 7 a.m. and from 11 p.m. to midnight on a frequency of 6.116. Reports are requested.

HAWAII—A new R.C.A. commercial transmitter at Kahuku, has been licensed to operate on 10.09, with a power of from 2,000 to 10,000 watts.

IRAQ—HNF (9.6), a new relay for Y15KG of Baghdad, is on the air and broadcasting daily from 1 to 3 p.m. Announcements in Arabic and English are made every quarter-hour. Reports should be addressed to I. Hassan Esq., Qasr el Zahoor Broadcasting Station, Baghdad. The Iraq Oil Station on 5.71, operates daily from 1 to 3 p.m. There is also a 400-watt Baghdad transmitter on 6.7, daily from 9:30 a.m. to 3 p.m.

IRELAND—"Radio Eireann" is now on the air and broadcasting daily as follows: on 17.84, from 8:30 to 10 a.m. and on 17.84 or 9.595 (alternate days), from 12:30 to 4:30 p.m. Tests are also conducted irregularly on a frequency of 11.74. According to Fred Norris of New York City, one of the first listeners to receive a verification from the new station, reports are welcome and should be sent to the Engineer-in-Chief, Irish Experimental Short-Wave Station, "Radio Eireann," Athlone, Ireland.

JAPAN—JLT2 (9.645), is now carrying the Overseas Hour for Europe in parallel with JLG3 (11.705), daily from 2:30 to 4 p.m. JLK (6.19), radiated the Overseas Hour for the South Seas, daily from 8 to 9:30 a.m., during the months of February and March, while an unidentified Japanese transmitter on 6.12, was heard irregularly from 9 to 10:30 a.m. during March.

JAVA—YDD (6.06), Bandoeng, is now on the air and relaying the native network of the NIROM daily.

LITHUANIA — Charles Guilbert of Paris, France, notifies me that LYR (9.28) of Kaunas, may be heard near noon daily. The identification is "Lieut. Vos Radio Kaunas."

MOZAMBIQUE — According to the **Newark News Radio Club**, CR7BB (15.24), of Laurenco Marques, is on the air and testing.

NEW ZEALAND—ZLIZA (8.82 or 7.14), is a portable transmitter used irregularly in connection with broadcast station 1ZB of Auckland. 4ZB (4.3), is now on the air and operating daily from 7 a.m. to 1 p.m.

PORTUGAL—CSW4 (15.12), a new frequency for "Radio National" of Lisbon, is in operation daily from 7 to 9 a.m. The announcer is a lady.

ROUMANIA—The small experimental short-wave station at Bucharest, is now said to be testing irregularly on the 19 meter band.

SWITZERLAND—The new 25,000 watt government transmitter at Schwarzenburg, should be on the air, and testing on 6.056, 9.537, 11.867, 15.306, 17.783 and 21.52, by the time this article reaches you. At the start the station will radiate programs daily to Africa, and Europe; four times a week to South America, and North America, and once a week to Australia, and the Near East. Reports should be sent to the **Swiss Broadcasting Company**, 30 Neuengasse, Switzerland.

UNITED STATES—The World-Wide Broadcasting Corporation of Boston, Mass., has been granted a permit for a new 20,000 watt international station, which is broadcasting test programs on 11.73, and 15.13, under the call W1XAR.

U. S. S. R.—A new Moscow-Komitern transmitter on 15.4, has been testing irregularly from 3:30 to 7 a.m. and 7 to 9:30 p.m. A station in Irkutsk, on a frequency of 6.65, was heard testing between 9 and 10:40 a.m. by Shokichi Yoshimura of Moji, Japan.

VENEZUELA—YV4RQ (5.02), "Radio Puerto Cabello," Puerto Cabello, is being heard nightly from approximately 7 to 9 p.m.

Under Construction

AUSTRALIA—One of the most powerful commercial stations in the world is under construction at Darwin for use by the Royal Australian Navy.

FINLAND—The Government of Finland has placed an order for a 50,000 watt short-wave transmitter, which will be installed at Pori near the Gulf of Bothnia. This station will be used to broadcast commentaries on the Olympic Games.

IRAN—Two short-wave transmitters, one with a power of 20,000 watts, the other with a power of 2,000 watts, are under construction for Iran.

LITHUANIA—The Government of Lithuania has appropriated 1 million lit for the construction of a new and powerful broadcasting station in that country.

SENEGAL—In line with the new Policy of the French Government to build powerful short-wave stations at strategic points throughout its colonies, a new 10,000 watt short-wave broadcast station is now under construction at Dakar.

YUGOSLAVIA—It is reported that the new 10,000 watt short-wave transmitter at Zenum, near Belgrade, is nearing completion, and will be testing soon on the 19, 25, 31 and 41 meter bands. The old 2,000 watt transmitter YUA will be retained as an auxiliary. Both stations will direct transmissions to various parts of the world by means of directional aerials.

Notes of Interest

ALGERIA—According to Egyptian Radio, commercial station TPZ (12.12), at Algiers, transmits programs in Arabic and French, daily from 2 to 2:30 p.m.

ANGOLA—According to the Quixote Radio Club, CR6RC (11.74) at Loanda, broadcasts Tuesdays, Thursdays and Saturdays, from 2 to 3:30 p.m., signing-off with the Portuguese National Anthem.

ARGENTINA—Larry Lundberg of Minneapolis, Minn., notifies me that the Buenos Aires station on 9.69, is now using the call LRA1 and the slogan "Radio del Estado."

AUSTRALIA—VLR (9.58) is heard weekdays to 8:30 a.m., Sundays to 7:30 a.m. 9MI (6.01), the M. V. Kanimbla, may be heard quite frequently between 6:30 and 7:30 a.m.

AZORES—CT2AJ (4.005) at Ponta Delgada, which broadcasts Wednesdays and Saturdays from 5 to 7 p.m., is being heard with good signals in the U. S. A. from 6 to 7 p.m.

CANADA—Earl Roberts of Indianapolis, Ind., writes CY5O, Ft. Albany, Ont., and CY5M, Moosonee, Ont., both on 3.42, operated by Les Missionnaires Oblats de Marie Immaculee, may be heard talking to each other in French near 8:30 p.m. New ground stations of Trans-Canada Airways, at Toronto, and Montreal, were heard testing on 7.46, at 10:20 p.m.

CHINA—XGOY (9.5), Central Broadcasting Station, Chungking, operates from 6:15 to 8, and occasionally to 10 a.m. and irregularly from 3 to 6:30 p.m. Station is heard best after VK3ME (9.5) signs-off at 7 a.m. until XEWW (9.5), comes on the air at 7:45 a.m. XOJD (6.88), Hankow, is now heard from 6 to 8:30 a.m. XMHA, Shanghai, is now operating on an announced frequency of 11.94, daily to 11 a.m.

COLOMBIA—All short-wave stations in Colombia, will be operating on the 61 meter band, or off the air, before July 1. The Colombian on 9.71, previously announced as HKF, is now believed to be a harmonic of HJ3CAF, Bogota on 4.855.

COSTA RICA—The station on 6.165 is definitely TILS, "Radioemisora Para Ti," of San Jose. R. B. Oxrieder of Corozal, Canal Zone, informs me that TIGPH (5.83), operates to 10 p.m.: TIXGP3 (5.83), from 10 to 11 p.m. and that TIGPH2 (5.883), which is on the air nightly to 11 p.m. is an entirely different station.

CUBA—COCA (9.1) is often on the air to as late as 3 a.m. COGF (11.8), Matanzas, signs-off at 10 p.m. with the organ selection "Mon Cheri."

D. R.—The Trujillo City station on 6.243 is now using the call HI1N. The interval signal for HI1L (6.485), Santiago, is four chimes.

ECUADOR—R. B. Oxrieder of Corozal, Canal Zone, announces that HCK (5.885), Quito, is back on the air after a long absence.

GUATEMALA—TGF (5.81), was heard at 8:25 p.m. calling TGM2 in Spanish.

HAITI—HH2S (5.895), Port-au-Prince, commences its broadcast at 6:35 p.m. with the news in French.

HONDURAS—Alfred Tuff of London, England, writes that HRN, Tegucigalpa, has been withdrawn from service.

MADAGASCAR—On the West Coast "Radio Tananarive" (9.69), is being heard with excellent signals from 10 to 11 a.m.

MARTINIQUE—"Radio Martinique" (9.705) uses the slogan "The Voice of France in the West Indies."

NEW CALEDONIA—Bob Hetzel of Milwaukee, Wisconsin, reports that FK8AA (6.122) verified immediately by return mail but the total elapsed time was still four and a half months.

NEWFOUNDLAND — Commercial station VOFB (12.31), relays the new Government broadcast station VONF irregularly.

NICARAGUA—According to Martin Olthoff of Independence, Kans., YNLG (6.61) signs-off at 9:15 p.m. with the familiar "Good Night Song." YNOP (5.46) signs-off now nightly at 9:30 p.m.

NORWAY—R. C. Messer of So. Portland, Maine, reports an attractive QSL card from LKV (15.17), which pictures the broadcasting station on one side and a photograph of Ulvik Hardanger, saying "Welcome to Norway, the Land of the Midnight Sun," on the other.

PANAMA — Famous English commentator George Williams now has charge of all programs over HP5G (11.78) and HOA (2.34) of Panama City, Panama. The international hour, is being broadcast over these stations daily from 1 to 2 p.m. The English news period is at 1:30 p.m.

PAPUA—VHSU (8.07), Port Moresby, is being heard near 8 a.m.

POLAND—L. Lundberg of Minneapolis, Minn., reports hearing SP25 (11.74), just between GSD and COCX, from 7:36 to 8:35 p.m. Polskie Radio has written John Evanovsky of Passaic, N. J., that SPD and SPW are only temporary stations which will be withdrawn from service as soon as the more powerful transmitters are completed.

SIAM—HS6PJ (19.02), radiates the news in English, Mondays at 8:50 a.m.

S. S.—ZHP (9.69), Singapore, is best heard near 7 a.m.

TAIWAN—JIB (10.535) broadcasts the news in English at 9 a.m.

TRIPOLI—IQN (9.47), may often be heard talking in Italian on a commercial schedule at 5:25 p.m. Roy Waite of Ballston Spa, New York, writes that IQX (14.915), verified through the Minister of Marine, in Rome.

U. S. A.—Earl Roberts of Indianapolis, Ind., has been hearing the National Park Service stations in the Great Smoky Mountains National Park at 8, 8:30 and 9 p.m. All stations operate on 3.41, and the main transmitter is located at Gatlinburg, Tenn., while temporary stations are in service at Greensboro, N. C., Blanket Mountain, Green Briar Mountain, etc.

YUGOSLAVIA—YUA (6.1), Belgrade, comes on the air at 12:43 a.m. with the national anthem. At promptly 12:45 a.m. one note on a gong is heard and the news in Serb-Croatian follows.

Special Transmissions of Interest

Daily—8 a.m., news in English, over ZBW3 (9.525), Hong Kong; 1:20 p.m., news in English, over 2RO6 (15.3), Rome, Italy; 6 to 7 p.m., "Brazil on the Air," in parallel with PSH, over PSE (14.93), Rio de Janeiro, Brazil; 7 p.m., news in Portuguese, over GSE (11.86); 8:30 p.m., news in Spanish, over GSB (9.51).

Sundays—2 to 2:30 a.m., special dx program for North America, over TG2 (6.195), Guatemala City; 5 to 5:30 a.m., program from Vatican City, over HVJ (9.66).

Saturdays—3 p.m., talk in French, over PSE (14.93), Rio de Janeiro, Brazil; 9:30 to 10 p.m. "Hawaii Calls," over KQH (14.92) and KKH (7.52) of Kahuku, Hawaii.

AUSTRALIA—During May, VK2ME (9.59) Sydney, will operate Sundays from 1 to 3, 5 to

9 and from 10:30 a.m. to 12:30 p.m.

BRITISH GUIANA—VP3BG (6.13) is now operating from 10:15 to 11:15 a.m. and from 3:45 to 7:45 p.m.

DOMINICAN REPUBLIC—HI1N (12.486), operates daily from 6:40 to 10:40 a.m. and from 5:10 to 10:10 p.m.

FRANCE—According to the **Newark News Radio Club**, Paris Mondial is now operating as follows: over TPA2 (15.243), 6 to 11 a.m.; over TPA3 (11.885), 2 to 5 a.m. and 11:15 a.m. to 6 p.m.; over TPA4 (11.718), 7 to 9:15 and 9:30 p.m. to midnight; over TPB3 (17.85), 9:30 to 11 a.m.; over TPB6 (15.13), 2 to 5 a.m.; over TPB7 (11.885), 7 to 9:15 and 9:30 p.m. to midnight, and over TPB11 (7.28), 11:15 a.m. to 6 p.m.

INDIA—VUM2 (11.87), Madras, is now operating from 3:30 to 4 a.m. on Mondays, Wednesdays and Fridays only. VUM2 (4.92), still operates from 6:30 a.m. to noon.

JAPAN—The revised schedule of overseas broadcasts from Tokio is as follows: daily, 1:30 to 2:30 a.m., over JZK (15.16); 7 to 7:30 a.m., over JZK; 8 to 9:30 a.m., over JZJ (11.8) and JZK; 2:30 to 4 p.m., over JLG3 (11.705) and JLT2 (9.645); 4:30 to 5:30 p.m., over JZJ and JZL (17.785), and 8 to 8:30 p.m., over JZL (17.785).

UNITED STATES—W2XAD, Schenectady, N. Y., now operates as follows: on 21.5, 8 to 11 a.m.; on 15.33, 11:15 a.m. to 6 p.m.; on 9.55, 6:15 to 9:15 p.m. W2XE, New York City, N. Y. is now operating on 9.65, daily except Saturdays and Sundays from 10:30 p.m. to 1 a.m. W6XBE, San Francisco, California, is now operating daily on 9.53, from 7 to 10 a.m. directed on Asia, and on 15.33, from 6:30 to 10 p.m., directed on South America.

VENEZUELA—YV3RX (4.99), Barquisimeto, broadcasts daily from 10 a.m. to 11 p.m.

Frequency Changes

BRITISH HONDURAS—ZIK2 to 5.3 (now using call ZIK3).

COSTA RICA—TIPG, San Jose, reported to have moved to 9.695.

CUBA—COBC to 9.985; COBZ to 9.03; COBX, variable near 9.21; COCD, variable near 6.136; COCM to 9.85; COCQ to 8.85; COCX, highly variable from 11.735 to 11.42; COCW to 6.33.

D. R.—HI1J to 5.88.

ECUADOR—HC1GQ, Quito, to 9.17; HC2CW, Guayaquil, to 9.135.

HAITI—HH2S, Port-au-Prince, to 5.895.

PANAMA—HP5J, Panama City, jumping around again between 9.588 and 9.604.

PHILIPPINES—KZIB, Manila, to 9.497.

U. S. S. R.—RV15, Khabarovsk, to 4.273.

Data

ALBANIA—Herbert Campbell of Athens, Pennsylvania, one of the first to receive a verification from ZAA, Tirana, reports that this station is operating on 7.85, daily from 6:30 to 7:30 a.m. and on 6.085, from noon to 1 p.m. On Fridays from 6:40 to 6:50 a.m. letters are answered over the air in French. Reports should be sent to Stasioni Radiotelegrafik ZAA, Tirana, Albania.

ARGENTINA—LRU (15.29), Buenos Aires, operates daily from 7 to 9 a.m. and LRX (9.66) from 6 to 6:45 a.m. and from 9:15 a.m. to 10 p.m.

BELGIAN CONGO—Hal Clein of Los Angeles, Calif., notifies me that the commercial stations in Belgian Congo, operate as follows: OPM (10.33) and OPL (20) of Leopoldville, 10,000 watts, at 1 a.m. and 7 p.m.; OTO (12.64), 1,000 watts, and OTD (8.20), 300 watts, Leopoldville, irregular; OOF (13.25), 1,000 watts, Stanleyville, 12 midnight and 11 a.m.; OOD (6.96), 300 watts, Stanleyville, 1 and 10:30 a.m.; OOQ (6.95), 200 watts, Stanleyville, for aviation contacts irregular, and OOT (6.96), 50 watts, Stanleyville, 12:30 and 11 a.m.

BELGIUM—ORK (10.33), "Radio Ruysselede." Ruysselede, 20,000 watts, verifies promptly with a white card having large red call letters.

CHINA—According to a QSL card received by Don Williams of Santa Ana, Calif., the call letters for the Kweiyang Broadcasting Station at Kweichow, which operates on 7.01, are XPSA. Roger Legge of Binghamton, N. Y., writes that a letter from the Ministry of Communications, Chungking, verifies his reception of XTU (12.07), XTS (11.38) and XTJ (11.691). It would seem from this that the correct call for the Chungking station on approximately 11.38, is XTS.

CURACAO—PJC1 (9.091), verified in five weeks with a plain QSL card, according to Bob Hetzel of Milwaukee, Wisconsin.

DUTCH GUIANA—PZH (6.8) is now issuing an attractive white QSL card picturing the studios and transmitter in blue. In the upper right corner the red, white and blue tri-color flag is shown. Reports should be sent to Gouvernements Radio Dienst, Paramaribo, Suriname.

D. R.—HI2X (11.97) and HI3X (15.268), Trujillo City, operate Tuesdays and Fridays from 8:10 to 10:10 p.m. and on Sundays from 7:40 to 10:10 a.m.

ECUADOR—The National Radio Club reports that HC1PM (5.725), "El Palomar," owned by J. Leonardo Ponce, P. O. Box 664, Quito, operates Sundays from 9 to 11 p.m. HC1JB (14.42) and HC2JB (12.46) of Quito, operate daily except Mondays from 7 to 8:15, 11:30 a.m. to 2:30 p.m. and from 4:45 to 10:15 p.m.

ENGLAND—The news bulletins from Daventry are now being given as follows: daily, 3, 8:15, 11 a.m., 1, 4:30 (Sunday 4:05), 7:45 (Sunday 7:30) and 11 p.m. Transmission IV, now opens at 12:22 p.m. and transmission VI has been extended to 11:30 p.m.

GUADELOUPE—The correct address for

FG8AH (7.44), is, Andre Haan, Boite Postale 125, Pointe-a-Pitre, Guadeloupe. Announcements in English and French are made every quarter-hour.

GUATEMALA—TG2 (6.195), "Radio Morse," relays TG1, Guatemala City, daily 7:30 to 10 a.m. and 6 to 11:30 p.m., Saturdays from 6 p.m. to 3 a.m. and on Sundays from 3 to 8 p.m.; TGQA (6.4), "The Voice of Quezaltenango," relays TGQ of Quezaltenango, daily from 8 to 11 p.m., Saturdays from 8 p.m. to 1 a.m. and on Sundays from 7:30 a.m. to 3 p.m.

HONDURAS—HRD (6.235), "La Voz de Atlantida." La Ceiba, verifies with a pink and blue QSL card which gives the operating schedule as weekdays from 8 to 11 p.m. and Sundays from 4 to 6 p.m. HRN (5.875), "La Voz de Honduras," Tegucigalpa, power 500 watts, operates daily from 7 to 10 p.m.; issues a blue QSL card with call letters in red.

INDIA—The All-India Radio Stations are now issuing large white QSL cards, picturing a large map of India in blue, and the letters A I R across the map in aluminum color.

JAVA—All reports on Java stations should be sent to The Nederlandsch-Indische Radio Omroep Maatschappij. (N. V.), Koningsplein 5, W. Batavia (Centrum), Java, Netherlands East Indies.

MACAO—Harold Amers of Pomona, Calif., states that a verification received from J. Estrela, Chief of Radio Station CRY9, Government Broadcasting Station, Post-Office Building, Macao, gives the schedule of CRY9 (6.08), as Mondays only from 8:30 to 10 a.m.

MANCHOUKOU—Jack Wells of Phenix, Ala., writes that JDY (9.925), Shotokugai 3, Dairen, operates from 7 to 8 a.m. The QSL card is black, yellow, red, grey, and orange, with a picture of native girl and the call in black.

SOUTH AFRICA—The South African Broadcasting Corporation of P. O. Box 4559, Johannesburg, notifies me that the new call letters for all South African short-wave stations are now as follows: ZRG (9.523) and ZRH (6.007), Pretoria; ZRL (9.606) and ZRK (6.0975), Capetown; ZRO (9.7529), and ZTD (4.876), Durban, and ZRJ (6.0975), Johannesburg.

SPAIN—At time of writing "Radio Malaga" is still operating as follows: on 7.22, daily from 10 to 11 a.m. and from 3:30 to 5:40 p.m. and on 14.44, from 5:45 to 7:30 p.m. EAQ (9.855), "The Voice of Madrid," Madrid, is off the air at present, but will probably be put into operation again by the new Nationalist Government under General Franco.

ST. KITTS—The Caribbean Broadcasting Service, operators of ZIZ (6.384), state they are considering printing QSL cards in six different basic colors so that listeners will be encouraged to report on at least six separate transmissions to secure the whole set of cards. The Saturday night test transmissions over ZIZ may be resumed in the near future.

TURKEY—"Radio Ankara." operates as follows: over TAQ (15.195), daily from 5:30 to 7 a.m. and over TAP (9.465) from 11:30 a.m. to 5 p.m. The opening announcement is "This is Ankara calling; transmitting the Turkish National Program." The closing announcement is "Dear Friends and Listeners, we are now closing down." This is followed by the Turkish National Anthem. The programs are announced by both male and female announcers and identification is made in Turkish, French, German and English. **The Post Bag** is Saturdays at 3:20 p.m. Reports are welcome and should be sent to the Correspondence Department, Radio Ankara, Ankara, Turkey.

UNITED STATES—Reports to W6XBE, Treasure Island, San Francisco, Calif., were confirmed at first by means of letters but attractive QSL cards are now being issued.

Amateur Reception Notes

Kay I. Kibling, W2HXQ, 336 Oakland Beach Ave., Rye, New York, in charge of the Reception and Entertainment Committee of the New York World's Fair Amateur Radio Station, would like to hear from any short-wave listeners or amateurs who are planning to visit the Fair, so that she can send advance information of interest and arrange to meet them personally.

ALASKA—K7FST of Kotzebue, Alaska, sends a light blue and white QSL card showing a polar bear and seal under the Northern Lights. He receives about 1,000 reports a month but only replies to all who send return postage.

BURMA—According to W6ITH, who worked XZ2EX (14.06), P. O. Box 380, Rangoon, at noon, XZ2EX said his QRA would reach all XZ stations quickly.

COOK ISLANDS—Ray Messer of South Portland, Maine, reports reception of ZK1AA (14.01), 600 watts, at 1:25 p.m.

DUTCH NEW GUINEA—PK6XX with the Archbold Expedition, is again being heard early mornings with excellent signals. He has a complete set of variable crystals giving continuous coverage from 14.000 to 14.400 kilocycles, but he is usually found on about 14.007.

FRENCH INDIA—FN1C (14.04), operated by D. Paterson, Gondalpura, Chandernagore, French Bengal, was heard by Bob Hetzel of Milwaukee, Wisconsin, at 1:30 a.m. He is said to contact AC4YN daily at 9:30 a.m.

JARVIS—KG6NVJ (28.39), 50 watts, one of four young fellows temporarily on the island with the U. S. Department of Interior Expedition, was worked by W6ITH at 8:12 p.m.

MOZAMBIQUE—According to Ama-Touring, CR7AK (14.319), 200 watts, states he will be on daily from 10 p.m. to 1 a.m. He QSL's promptly with a pink card having call in dark blue.

NEW GUINEA—John May of Wilkinsburg, Pennsylvania, is the fortunate recipient of a QSL card from VK9WL (7.079) at Salamaua, which states that he uses a 6 watt battery operated transmitter. Salamaua is a town of 150 Europeans and 1,000 natives.

NIGERIA—Bob Hetzel of Milwaukee, Wisconsin, reports ZD2H (14.3) Q4/R5 at midnight.

PALESTINE—ZC6EC has returned to England.

PHILIPPINES—KA1PI (14.14), P. O. Box 849, Manila, has been putting about the strongest signals into the United States ever recorded from Asia.

PITCAIRN—VR6AY was off the air for several months due to some technical trouble with his transmitter that he was unable to discover himself until the radio operator of a passing ship put in to give him assistance.

SOUTH-WEST AFRICA—John DeMyer of Lansing, Michigan, finally got a reply out of ZS3F through the expedient of sending him a ready-made addressed and stamped reply card. ZS3F said he had all of the cards ready to go forward but he was too broke to mail them.

Last Minute Notes

August Balbi of Los Angeles, Calif., writes that he is hearing two new Chinese stations daily, namely, XGOV (11.91) from 7 to 10:30 a.m. and XGOX (17.81), from 9:30 to 11:30 p.m. These stations are believed to be located in Chungking.

RV96 (15.18) of Moscow, U. S. S. R., is being heard nightly from 12:15 to 2 a.m. with very strong signals. A powerful new station in Poland, was heard testing on a frequency of 15.38, from midnight to 1 a.m.

By JOHN D. CLARK

All times are Pacific Standard

Nippon

THE *Broadcasting Corporation of Japan* made wholesale changes in carrying stations for the Overseas Broadcasts, effective on April 1.

The new JLT (6.19 meg.) which replaced JVP (7.51 meg.) only a short time ago, has now been taken off the air in favor of JZK (15.16 meg.) from 5 to 6:30 a.m. JZK is also used in place of JZJ (11.8 meg.) from 4 to 4:30 a.m., and from 9:30 to 10:30 p.m.

The 5 to 5:30 p.m. transmission, together with the 1:30 to 2:30 p.m. broadcast is now carried by JZL (17.785 meg.). The latter program is also released simultaneously through JZJ.

Two new stations JLG3 (11.705 meg.) and JLT2 (9.645 meg.) will henceforth be employed from 11:30 a.m. to 1 p.m.

So much for the JBC's Overseas Programs. It should be noted, however, that changes have also been made in the stations which relay programs from the regular Japanese National Network. JVN (10.66 meg.), which has been on the air regularly since 1935, will in the future be used only for phone work, and its relay broadcast programs will be carried by the new JVW3 (11.725 meg.) from 10:40 to 11:20 p.m., and from 1 to 5 a.m. Afternoon and early evening relay transmissions are still handled through JVH (14.6 meg.) but it is expected that a shift will be effected at almost any time.

The Broadcasting Corporation of Japan announces that plans are being made for further extension of the present broadcasts, and details will be announced in this column next month.

An unidentified Oriental station, believed to be JVW (7.25 meg.) has been reported near 6:45 a.m., partially blocked by a powerful code station. It is understood, also, that a station JVW2 is licensed to work on 9.665 meg., but as yet this frequency is not being employed on any regular time schedule.

A new Nipponese phone, as yet unidentified, has been logged on approximately 6.6 meg. near 6 a.m. with announcements and conversations in English.

China

After using 9:50 meg. for a period of thirty days, station XGOY of Chungking has now shifted to approximately 11.90 meg., and is transmitting programs of Oriental music and talks from 5 to 7:50 a.m., and from 8 until the station fades out between 8:30 and 9 a.m. The call-letter announcement "X-G-O-Y—X-G-O-Y" may be heard distinctly just before close-down at 7:50.

XGOX, sister station to XGOY and located in the same city, is still on the air from 6:30 to 8:30 p.m., using a frequency of 15.19 meg. Volume has weakened considerably, however, and it is very possible that this transmission may be shifted to XGOY in the near future.

XPSA of Kwei Yang, China, owned and

operated by the Chinese government, seems to have settled on a frequency of 6.99 meg. after shifting around between 6.98 and 7.14 meg. News in English is now given at 6 a.m. with program announcements at 7:05. The balance of the broadcast consists almost entirely of native Chinese music. Although the announced schedule is 4:50 to 7 a.m., the station is often heard until as late as 7:30 or 8 o'clock. One report indicates that XPSA is also transmitting near 10:45 p.m., but this has not been confirmed as yet.

Announcing call letters which sound like XRVA, a new Chinese Broadcast is reported on approximately 9.33 meg. near 5 a.m.

Treasure Island

Treasure Island's powerful new short wave transmitter W6XBE is being received with good volume in all parts of the globe. The station is now broadcasting to Asia on 9.53 meg. from 4 to 7 a.m., and to South America on 15.33 meg. from 3 to 7 p.m.

Singapore

ZHP seems to have increased its power during the past 30 days and hundreds of Pacific Coast listeners are now reporting good daily reception. The station has also extended its schedule and is now on 9.69 meg. from 1:40 to 6:40 a.m.

On certain occasions, when programs are relayed from London, ZHP stays on the air until 7 a.m. and even later.

Philippines

KZRG of Manila is being received nightly on the Pacific Coast from 11:15 to 11:45 p.m., broadcasting news and market reports. This transmission is not listed in any schedule, but is nevertheless heard regularly with good volume on 9.50 meg. Just before sign-off the announcer states that KZRG will return to the air at just 7 p.m. (Manila Time) or 3 a.m., PST.

The approach of summer has weakened the signals of W1XK after 5 a.m., and the American station no longer interferes with Manila's KZRM which may now be heard in the west with surprisingly good volume on 9.57 meg. until 7 a.m. daily.

Manchukuo?

A powerful new Oriental broadcaster has been heard by many listeners on approximately 6.13 meg. near 5:30 a.m. The exact location is still unknown as we go to press, and the only clue to its identity is the announcement of call letters "M-T-C-Y." The only language used during announcements is a strange Oriental tongue which seems to be neither Japanese nor Chinese. Yet the call letters are given unmistakably at regular intervals. Programs consist almost of native music.

West Coast Tuning Tips

Our listeners tell us: that VLR3 of Melbourne, Australia, is being heard on 11.88 meg. as early as 9:30 p.m. Sundays and irregularly on other days; . . . that Finland's OFE is weakly audible on 11.78 meg. near 11 p.m.; . . . that "Radio Boy Landry" on 6.20 meg. has been staying on the air until 7 a.m., announcing the last 30 minutes in French; . . . that a station KNLG, located on a Coast Guard cutter, has been heard calling KNLH, a pilot station on Canton Island near 11:45 p.m. irregularly. KNLG is on 9.05 meg., while KNLH is on 6.75 meg.; . . . that station RFN in Khabarovsk, U.S.S.R., is back on 6.83 meg. until 6 am. with a tremendously strong signal; . . . that a new station PMD of Bandoeng, Java, is working on 7.99 meg., and is heard from 11 p.m. to midnight, irregularly; . . . that the weak signals on 6.90 meg. near 6:30 a.m. are from the new station YI5KG of Baghdad, Iraq; . . . that a new Parisian broadcaster is being picked up on approximately 7.28 meg. from 4 to 9 p.m. News in English is released from 8 to 8:20 p.m. regularly; . . . that PMH (6.77 meg.) of Bandoeng, Java, is now remaining on the air until 7:30 a.m., together with PLP (11.00 meg.) and PMN (10.26 meg.); . . . that OZH2 of Skamlebaek, Denmark, is audible on the Pacific Coast near 7:30 a.m., using a frequency of 15.32 meg.

Miscellaneous

West Coast listeners should note that now for the first time consistent overseas reception is available on 25 meters before midnight. The British GSD (11.75 meg.) and the French TPA3 (11.88 meg.) are coming through with tremendous volume, the former after 10:30, and the latter after 11 p.m. In addition, Tokyo's JVW3 (11.725 meg.) is excellent from 10:40 to 11:30 p.m., and Melbourne's VLR3 (11.88 meg.) may be received as early as 9:30 p.m.

Asiatic DX Log

During the past few months many listeners have requested that we publish a DX log for Asiatic stations, giving information on the schedules, wavelengths, etc. of the weaker and more irregular trans-Pacific broadcasters. Such a log appears below, and a similar log, covering the stronger and more reliable Asiatic transmitters will be printed in this column next month.

3.04 meg., YDA, Batavia, Java, heard well in winter months, but weak in summer months. 2:30 to 7 a.m.

3.48 meg., ???, Wellington, New Zealand; fair volume from 8 p.m. Saturday to 4 a.m. Sunday irregularly.

3.49 meg., XYZ, Rangoon, Burma, very weak from 4 to 7 a.m.; used simultaneously with 6.01 meg.

4.30 meg., ZL4ZB, Dunedin, New Zealand; heard irregularly on Saturday and Sunday mornings near 3 a.m.

4.81 meg., YDE2, Solo, Java; fair in winter months and weak in summer months. 2:30 to 5 a.m.

4.85 meg., VUC2, Calcutta, India; fair volume from 4:30 to 7 a.m.; Church services from 4:30 to 5:30 Sunday.

4.88 meg., VUB2, Bombay, India; audible very weakly between 4:30 and 6 a.m.

4.92 meg., VUM2, Madras, India; reported with fair volume from 3:30 to 5 a.m., and weak after 5.

4.96 meg., VUD2, Delhi, India; extremely weak from 4:30 to 5 a.m., and inaudible after daylight.

5.15 meg., PMY, Bandoeng, Java; fair signal strength from 2 to 5.30 a.m. daily.

5.17 meg., YDX, Medan, Sumatra; relays programs of YDB (9.55 meg.); fair volume from 4 to 7 a.m.

6.01 meg., XYZ, Rangoon, Burma; heard with fair volume from 4:15 to 7 a.m.; announcements in English; also on the air from 7 to 8 p.m., but recep-

tion unreported at that time in this country.

6.01 meg., VK9MI, S.S. Kanimble; Audible with weak signal between 2:30 and 4:30 irregularly.

6.08 meg., ZHJ, Penang, Straits Settlements; 3:40 to 5:40 a.m. daily with weak volume; English announcements.

6.085 meg., CRY9, Macao, Portugese China; Fair volume on Monday from 5:30 to 7 a.m., and irregularly on Wednesday from 5:30 to 6:15 a.m.

6.11 meg., ????, Bangkok, Siam; Unidentified Siamese station reported irregularly near 6 a.m.

6.12 meg., FK8AA, Noumea, New Caledonia; Scheduled Tues., Wed., Thur., Fri., 11:30 p.m. to 12:30 a.m.

6.16 meg., VPB, Colombo, Ceylon; Fair signal strength from 4 to 6:30 a.m. irregularly.

6.17 meg., ZHO, Singapore, Straits Settlements; sometimes used simultaneously with ZHP (9.69 meg.) between 2:40 and 6:40 a.m.; announcements in English.

6.20 meg., "Radio Boy Landry," Saigon, Indo-China; fair volume from 2:30 to 6:30 a.m. irregularly.

6.24 meg., ZGE, Kuala Lumpur, Straits Settlements; Scheduled Sunday, Tuesday, Friday from 3:40 to 5:40 a.m., but reported to be off the air temporarily at present.

6.425 meg., PO6ZA, Dutch Guinea; reported irregularly with weak volume near 11 p.m.

6.50 meg., ????, Khabarovsk, U.S.S.R.; strong station, but extremely irregular between 2 and 6:30 a.m.

6.54 meg., YHSU, Port Moresby, Papua; weak signals between 3:30 and 6 a.m. irregularly.

6.72 meg., VK2MA, City unknown, Australia; heard irregularly from 1:30 to 5:30 a.m. Sunday mornings relaying the programs of VK2ME, Sydney.

6.88 meg., XOJD, Hankow, China; audible irregularly between 3 and 5 a.m.

6.96 meg., ???? Wellington, New Zealand; on the air Saturday 8 p.m. to Sunday 4 a.m. irregularly.

7.10 meg., FO8AA, Papeete, Tahiti; volume quite good Tuesday and Friday from 8 to 9:30 p.m.; recorded music and announcements in English.

7.255 meg., JVW, Tokyo, Japan; new station reported at irregular intervals between midnight and 5 a.m.

7.31 meg., 4 p.m., Port Moresby, Papua; weak signal strength from midnight to 2 a.m.

7.99 meg., PMD, Bandoeng, Java; heard irregularly with extremely weak volume near 11 p.m.

8.07 meg., VHSU, Port Moresby, Papua; usually operates simultaneously with 6.54 meg. from 3:30 to 6 a.m. irregularly.

8.09 meg., YDX, Medan, Sumatra; scheduled to relay YDA and NIROM network near 11 p.m., but heard very irregularly in this country.

9.37 meg., XOY, Chengtu, China; heard with fair volume but very irregular from 6:45 to 7:30 a.m.

9.51 meg., HS8PJ, Bankok, Siam; good volume; operates only on Thursday from 5 to 7 a.m.

9.51 meg., HS8PJ, Bangkok, Siam; good China; on the air from 3 to 7 a.m. irregularly; also scheduled 9 to 10 p.m., but never reported in America on this transmission.

9.53 meg., VUC2, Calcutta, India; Extremely weak and usually inaudible from 11 p.m. to 1 a.m.

9.55 meg., VUB2, Bombay, India; Extremely weak and usually inaudible from 1:30 to 4 a.m.; also on the air from 6.30 to 7:30 p.m., but blocked by American station.

9.56 meg., XGAP, Peking, China; Volume weak and partially blocked by Germany's DJA from 6 to 8 a.m.

9.59 meg., VK6ME, Perth, Australia; Weak signal strength daily except Sunday from 3 to 5 a.m.

9.59 meg., VUD2, Delhi, India; Volume fair from 4:30 to 8 a.m.; also scheduled 6:30 to 8:30 p.m. and 10 p.m. to 1 a.m., but reception unreported on these transmissions.

10.90 meg., "Radio Boy Landry," Saigon, Indo-China; operates irregularly from 12:30 to 1:30 a.m. and 7 to 8 a.m.; Also reported near 6 a.m.

11.42 meg., XGRV, Chungking, China; heard weakly and irregularly from 4 to 5:30 p.m.

11.53 meg., ????, Philippine Islands; unidentified station reported several times near 6 a.m.

11.69 meg., XTJ, Hankow, China; audible irregularly with fair volume between 4 and 6:30 a.m.

11.87 meg., VUM2, Madras, India; scheduled 12:30 to 1 a.m. daily, but usually inaudible in America.

11.90 meg., "Radio Hanoi," Hanoi, Indo-China; on the air irregularly near 5 a.m.

15.15 meg., YDC, Bandoeng, Java; Usually used in summer and heard with fair volume from 2:30 to 7:30 a.m.

15.16 meg., VUD3, Delhi, India. Irregular and now replaced by VUD4 (15.29 meg.) from 6:30 to 8:30 p.m.

15.30 meg., YDB, Sourabaya, Java; operates from 7:30 to 11 p.m., but received very irregularly in America.

15.51 meg., XOZ, Chengtu, China; extremely weak but audible irregularly from 6:45 to 7:30 a.m.

19.02 meg., HS6PJ, Bangkok, Siam; fair signal strength; works only on Monday from 5 to 7 a.m.

The Video Reporter

(*Continued from page* 14)

production manager of BBC, is coming to the network in an advisory capacity to work with Gilbert Seldes. He will remain a month, giving the CBS lads some pointers on British methods.

A LONG list of big-name talent is available to both networks right at the start of regular television transmissions. It seems that the headliners of radio, stage and screen are eager to get in "on the ground floor" regardless of monetary returns.

Important figures in politics and public life have also accepted early participation in television experiments.

One thing television is assured of is an ample supply of headlining personalities.

THE recognition of photographic technique in television is indicated by NBC's appointment of A. Burke Crotty, head of its photo staff, to the new post of production manager of the television mobile unit.

In his new duties, Crotty will supervise the newsreel-type crew manning the vans equipped to pick-up and relay programs from points outside the studio.

by W. C. Dorf

SINCE the last issue, television has advanced so rapidly that it has become the center of interest in New York's radio activities. Newspapers and periodicals are carrying daily news items and advertisements are now appearing on televisors, both in assembled units and in kits. The large radio chains have held open house for the press to preview their new tele-studios, several new companies entered the manufacturing field, new transmitters were introduced and special vision displays took place. That the past month was unusually active and outstanding as far as television was concerned is clearly evident by the following brief outlines on a few of the important developments:

After many obstacles, the Columbia Broadcasting Systems' television transmitter installation atop of the Chrysler Tower is practically completed and ready for operation. The complete job was under the direction of Dr. Peter Goldmark chief television engineer of CBS. The height of the installation above the street, the small space the construction engineers had to work in, and the fact that life in the office building had to go undisturbed while materials were being hoisted to the tower multiplied the problems. However these difficulties are things of the past and Dr. Goldmark predicted more or less regular experimental test programs to go on the air around April 15.

THE staff doctors, internes and nurses of the Israel Zion Hospital of New York were recently witnesses of television inaugurating a new era in medical teaching. A demonstration conducted by the *American Television Corp.* enabled the hospital staff in a room 500 feet away from the operating room, to view the surgeons hands and hear his comments as he performed an actual abdominal operation. Telecasting equipment has been installed permanently in the hospital and additional kinets or televisors are to be installed in the offices of staff doctors so that they can watch difficult or unusual operations. An electric camera was suspended above one of the hospital's regular operating tables and surrounded by four lights equipped with metal water jackets.

THE General Electric Co is enrolling prospective television servicemen, planning to give these men a thorough course in the installation, care and servicing of a modern televisor. The present opportunities in the television field are increasing daily. Placements will go to those who are trained in the fundamentals.

RUMORS from good sources, report that Dumont will be in the field shortly with a 22-tube receiver equipped with a 14 inch kinescope. Its tuning range will take in four separate channels. General Electric is planning to bring out four or five different chassis, one with push-button control. Andrea has a 25-tube set with a 12 inch tube, under construction.

ENGINEERS are said to be developing a radio relay system to bounce television pictures from city to city on a 500 mc. channel. It is planned that automatic stations, located on lofty towers, buildings or hills will relay the telecasts. The relays, it is expected, will be located about twenty miles apart.

Advertising and Television

IN an address before the Advertising Club of New York, Mr. John Black of the J. M. Mathes agency pointed out that selling by television is not something for the future but is present now and on our doorstep. He thought that television, which unites the sight appeal of the printed word and the sound appeal of radio, promises to be the apex of all advertising media.

The speaker declared that the best authorities agree that there is no immediate prospect of national coverage via the new medium, but regional coverage "is an early likelihood," according to Mr. Black, and it is time for advertising men to begin concentrated studies of all phases of television.

W2XVT—Telecasting

ALLEN B. DU MONT Labs. W2XVT, Passaic, N. J., has been reported on the air with video and audio signals every morning from 8 to 9 a. m. Check them on 45.25 and 49.75 mc. Their power at present is said to be about 50 watts.

Big Names in Radio

ON the completion of its recent initial public financing of 600,000 shares of common stock at $6.00 a share. Farnsworth Television and Radio Corp. proposes to begin manufacture of television transmitting and receiving apparatus based on inventions of Philo T. Farnsworth, its director of research. A part of the cash proceeds of the offering, together with additional shares of common stock, will be used for acquisition of the business and properties of The Capehart, Inc., and certain properties of General Household Utilities Co.

RCA Paves the Way

OUR correspondent on the Pacific Coast reports that the RCA tele-exhibit at the San Francisco Golden Gate International Exposition is televising the "looker-ins," passing before the iconoscope and the receivers at the rate of 12 to 15 per minute. This goes on for 8 to 10 hours daily, which is plenty f. b. for television. Missionary work which will pay in sales of receivers when tele hits its stride. The RCA exhibit at the Worlds Fair here in New York will televise the visitors in the same way, but of course in New York "ahem" in a bigger and a better way.

To Introduce Kits Under $60

WE have word that Louis Pacent of the Pacent Engineering Corp. will come out shortly with

a complete line of kits and Receivers. Louis Pacent is an old pioneer in radio, always to the front with the best in receiver developments, lately with phono pickups and sound recording equipment. It is reported that the televisors are to be marketed at a low price, with kits to sell around $60. —30—

Five Band Mobile

(*Continued from page* 24)

the battery and the *genemotor* in order that a voltage drop will not occur due to the heavy current drawn by the motor.

The other half of the chassis is used to mount a complete a.c. pack as shown. A common filter network is used to take care of both the genemotor and the pack.

Effective filtering for high-frequency operation is had by using the r.f. chokes and by-pass condensers to keep any and all r.f. from returning to the power supply. A change-over switch is provided to shift the filter input to the power supply from the source being used. All of the tube filaments connect in parallel with each grounded on one side directly to the chassis. Hum is not noticeable when operating from the a.c. supply.

The speaker is mounted on the panel where it will occupy the space between the genemotor and the filter choke and will be under the switch as shown. This speaker is a *Utah* 3½" permanent magnet type having a 3 ohm voice coil.

The portable works equally well on both power supplies and the plate voltage is the same, so performance is identical in both cases. By placing a small amount of bias on the 6N7 modulator tube, the plate current variations are kept within limits for good regulation from the power supply.

Operating Data

The proper crystal is inserted into the six prong socket mounted under the milliammeter. This type of socket was chosen so that the crystal could be mounted in one of several positions for easiest access. Variable crystals are used on the 80 and 40 meter bands that allow 6 kc. variation on the former and 12 kc. variation on the latter. The indicator lamp will glow dimly when the crystal is working properly and any excessive current passing in this circuit will show in the lamp's increased brilliancy.

The 6L6 amplifier stage is tuned in the following manner. Set the antenna condenser to about full capacity and then tune the plate condenser for the usual resonance dip. Tune the antenna condenser to bring up the current to the 6L6 to a maximum of 60 or 70 ma. at resonance. The condenser capacities may be raised by adding small air-tuned units of 100 mmfds. across each one as it will be found that the full capacities will be needed in most cases.

The unused coils are shorted out when the switch is rotated and will not absorb energy from the coil being used.

The speech equipment should be tested before the final assembly is made. A 5,000 ohm resistor of ten watt rating is connected across the output of the modulation transformer. This resistor should have a tap across part of the resistance so that a speaker or pair of phones may be connected temporarily as a monitor to test the audio.

The microphone injut jack is completely enclosed within an aluminum shield together with the grid resistor. This is necessary in order to prevent hum from getting into the amplifier. Test the unit with the gain wide open so that the presence of hum or distortion may readily be heard.

The receiver should also be checked for over-all performance on the antenna to be used for portable work.

This portable has been used as a 10 meter mobile. —30—

As I See It

(*Continued from page* 14)

facsimile transmission, the proper type of antenna is required outdoors. Furthermore, the receiver used should be free from oscillator drift so that the signal fed into the recorder remains constant in level. Freedom from noise is imperative. We usually tolerate a certain amount of noise in a radio broadcast, but noise will just about ruin a facsimile picture.

In contrast to normal broadcast reception, where we accept whatever signal is received, a definite signal level is required in a facsimile receiver, otherwise the picture will be very light, if recorded at all. In this connection, it is true that the criterion is the voltage at the recording stylus, which means that given sufficient amplification at the receiving point, and if the original signal is clear, proper facsimile pictures can be obtained with comparatively low signal level at the antenna. However, if a complete facsimile outfit is purchased, it requires a certain signal input level in order to develop a good picture.

Granting trials and tribulations during the present experimental period, the quality of the paper used is also a factor. We have found that all rolls of paper are not the same—that is, all rolls intended for the same outfit. Some rolls produce a picture of better contrast than others.

The interest in facsimile is growing very rapidly and while it is difficult to identify its destination, we feel that some of the facts given here will prove of value to those readers who have come in contact with such devices or who may be called in by the experimentally inclined variety of facsimile listeners or viewers, if we may call them by these names.

At the present writing 11 stations are transmitting facsimile pictures on frequencies within the conventional broadcast band and 3 stations are broadcasting over the high-frequency band. From well established sources we learn that this total number will be increased at least two-fold before 1939 passes. With regular schedules maintained, interest cannot help but grow and it might not be a bad idea for service stations located in towns where facsimile is being broadcast and where a good signal is available, to use the transmission as a means of attracting attention to the store. As a matter of fact, it is not such a bad publicity stunt for use by department stores or other establishments. The idea can be sold.

Open Your Eyes and Look Around

IT has always been our contention that the sphere of operation of the radio serviceman has been too narrow. He has lived radio receivers and has felt that therein were the boundaries of his life. That's been a fallacy and is daily becoming more so.

Granted that the average serviceman has found it difficult to keep apace with radio receiver developments, he is forced into the position where he must expand his field of knowledge and his field of activity. Consider for the moment the newly exploited wireless record players. Records were dead for years. The radio industry ruined the phonograph business. However, persevering people, one man in particular whom we know, felt that the record business was not dead. Campaign after campaign was tried until interest picked up and phonograph record sales began to mount.

Then came the wireless record player. Whether any one particular device is better than another is of no consequence. The fact remains that here is a miniature transmitter which will require service. The cost of the device is sufficiently high so that service is justified. The nature of the device is such that some time or other something can go wrong. That something is wrong can be discerned instantly by reduced signal output or distortion. Small as the device may be, the serviceman must know some-

thing about the operation of a transmitter. He must know something about modulation, the operation of oscillators, the operation of pick-ups, the relation between audio and radio frequencies in a transmitter, the operation of motors, etc.

We recognize that motors and pick-ups have been used in receivers equipped with phonograph turntables, but very little attention was focused upon those subjects. All the interest centered upon the receiver circuits. A process of modulation occurred in the mixer tube in the conventional superheterodyne receiver, but all attention was focused upon the circuit, rather than the operation.

The problem of modulation appeared in every test oscillator used by radio servicemen for the past 18 years, but we never paid any attention to what took place in the oscillator; we were concerned with its use as a signal source and its frequency range and its accuracy. Limited vision is responsible for the present condition that new items being sold represent new technical developments.

We never know what the future has in store. No one can say what radio equipment will be in every automobile. Already we have heard about, as a matter of fact, have seen some equipment, the micro-wave transmitter used in traffic control, the idea being that instead of sounding a horn, which is audible, micro-wave is radiated and is picked up by the car ahead and he drives to one side to let the man behind pass him. Maybe all cars will be equipped with transmitters, so that Mr. Vandermillion can tell his butler to chill the champagne and Mr. Joe Doaks can tell his wife to heat the stew, he is on his way home. Who knows!

Take the cathode-ray oscillograph as another example. Thousands were sold and thousands are on the shelves gathering dust. Maybe you're not fully familiar with its operation, but is that any reason why you should not become familiar with how it works? Men who have had the instrument for years admit that they do not know how it works—that they have not found the full application in radio servicing.

Maybe the device is not applied as easily as you would like. Maybe the device does not have all of the radio applications you would like. But it is still a good unit. You already have the unit. Why not try to think about future applications? It is used in television. Maybe it will not be used forever, but it will be used for quite some time and is being used today. The tube has applications in industry. It is being used in connection with any number of different industrial applications, vibration checking in moving equipment from such widely varied field as establishing the resonant period of rotating grinding wheels, to what element in a business machine is the source of the noise. Learn how the cathode-ray oscillograph works.

It willy never do you any harm and may do you much good.

It is used in the automotive field. Facsimile is being used to make records of operations in the clock industry. There is no limit to the application of the various devices now being offered to the radio serviceman in fields far removed from radio. There is every justification for assimilating as much data as possible concerning present developments. Not that we dream of one service organization taking care of all types of service work, but that an organization is prepared to go into various fields and perhaps find a spot better suited to the individual or to the organization. And it is not an impossibility that a good radio service organization located in a mill town or factory town cannot build up a perfectly good clientele among the factories for the servicing and possibly, even installation of radio equipment in industry.

Town and Country

WE got a letter the other day from a serviceman who has an establishment here in New York and in the course of this letter he made a statement that set us to thinking. The gist of his statement was that he made it a practice to take in small receivers for servicing in the hopes that eventually he would be called in to service the large receivers he almost always saw in the homes where they had the little four-tube jobs. Furthermore, he admitted that in most cases he took a financial licking or at the best broke even on the majority of such jobs.

As I see it that serviceman has a problem. Here he is operating in a city with an unstable population and by that we mean that a good fat percentage of the inhabitants of Father Knickerbocker's town think it absolutely imperative that they move from one apartment to another every couple of years. It's true they may move only a block or two, but in a city of this size that's sometimes the equivalent of moving to a different town in other parts of the country. As soon as they move, they are besieged with advertisements for a new milkman, a new butcher, and, of course, a new radio serviceman. And being as susceptible to the written blandishments as the average New Yorker is, the chances are that when his receiver goes bad, he picks up the phone and calls in the new serviceman, totally forgetting the fellow who fixed up his little job last year. It's tough, but it's true.

On the other hand, the same procedure in suburban districts or in the country might be considered good business practice. In the first place most people in small towns own their homes, they do not even think about selling them every year or two. Therefore the serviceman who just breaks even on fixing up a so-called "secondary" receiver has a right to expect that he will be called upon to repair the large set if it needs attention. Business in small towns is conducted differently than it is in cities—everyone knows everybody else and if a serviceman does a good job once for a family, he is their serviceman for then on. Suburban folk have their tradespeople and it just never enters their heads to change except for a mighty good reason. . . . We could quote you case after case where people in small towns have done business for twenty, thirty and even more years with the same merchants. Once confidence is established, that's all there is to it.

No, we do not think that the serviceman in a large city whose clientele who lives in apartments and hotels should take a licking at random in the hope of future business. It's too much of a risk. Where a loss is inevitable, it must be taken, but as a business-getter, it just isn't worthwhile. —30—

High Voltage Power Supplies

(*Continued from page* 21)

The next step in designing a power supply is to determine the percentage of ripple permissible in the various circuits. Assuming that a ripple of 2 per cent is permissible in all of the various stages to which the supply furnishes energy, and consulting the manufacturer's ratings, a pair of suitable chokes are selected. For the voltage divider network calculated, it is found that chokes with a current carrying capacity of 200 milliamperes will have a d.c. resistance of approximately 70 ohms. The inductance of the filter chokes is to be approximately 20 henrys, and the swinging choke to swing from 8 to 35 henrys.

In calculating ripple, the lowest value of inductance in the swinging chokes is used. The percentage of ripple obtainable is calculated by using the formula $\frac{1}{C_1 L_1 C_2 L_2}$. Knowing the values of inductance, the values of condensers necessary are obtained by substitution until the proper percentage of ripple reduction is made.

The next operation in order is to determine the voltage drop in the rectifier. This may be obtained by referring to the tube manufacturer's data on the particular tube suitable for this application. With the figures obtained by adding the voltage from the output of the power supply, and the voltage drop in the rectifier tube, it is then necessary to refer to the manufacturer's catalog of transformers to select the proper transformer as described in a previous article. If, however, it is found that manufacturers do not have transformers giving the exact specifications required, it is always safer to select a transformer having a higher voltage and current rating than that required.

In the construction of a power supply, it is well to caution the builder that high voltage power supplies are *lethal machines* and all precautions must be taken to prevent contact with living beings. —30—

Lesson 5, Television
(*Continued from page 12*)

denser, but the 0.5 H inductance is an obstacle. The 60-per-second groups of vertical (field) pulses, each considerably longer than a line pulse, find the .001 mfd. condenser a bit small and so build up in the 0.5 H inductance to discharge through the 0.1 mfd. condenser.

The fourth method of frequency separation, shown in Figure 41, is a development of Marshall P. Wilder, W2JKL. Its action is, apparently, something like this: The No. 1 diode is so adjusted that the plate is slightly negative to cathode. The No. 2 diode is similarly adjusted but the bias is somewhat greater. As the short line pulses hit the plate of the first diode, they are just sufficiently positive to cause current to flow; and corresponding pulses appear at the "horizontal" output point. The longer field or vertical pulses not only pass diode No. 1, but build up a voltage sufficiently positive to offset the higher negative bias on the second diode's plate, and a powerful pulse appears at "vertical" output. The difference in the sizes of the output condensers materially aids in this discrimination.

Automatic Gain Control is not absolutely essential to the successful building and operation of a tele-ceiver but it is so easy to add, costs so little, and offers so many advantages, I personally feel that the odds are all in favor of including it.

For example, A.G.C. will hold signals at a constant level at the video detector despite wide variations in strength at the first tube. While u.h.f. signals vary but little from the phenomena we call reflected-wave fading, there may be considerable variation from swaying of the antenna or its transmission line; also because of movement of nearby large metallic objects, as discussed in article three. No manual readjustment of controls is necessary when switching from one station to another if an A.G.C. is operating. Consistent performance of the Frequency Separator is assured if constant signal level at the video detector is maintained.

The counterpart of A.G.C. in sound receivers is the A.V.C., which we have been accustomed to operating from the d.c. drop across a diode resistor. It thus operated on average carrier amplitude, and its function is to maintain a constant level at the 2nd detector. In present-day television transmission the average carrier amplitude does not remain constant through various scenes and subjects because it shifts with the average amounts of black and white in the subjects being televised. As between a scene that is largely white in background, and one that is very dark, the average carrier level varies as much as 4 or 5 to 1.

The one factor that *does* remain constant in the complex stream of video signals, blanking periods, pulses and pedestals is the sync pulses. Though the intervening video signals stay at low amplitude for awhile because of a preponderance of white in the picture, or climb close to the blacker-than-black level because of shadows or lack of light in the scene, the peaks of the sync pulses always reach the same amplitude. They thus form a reference point for proper operation of the Automatic Gain Control.

An excellent circuit for gain control is shown in Figure 42, where a 6H6 is used as both video detector and A.G.C. rectifier, with any suitable triode as the gain amplifier. The action here is that the rectifier is so operated that it draws current from the detector's load resistor only at moments of high amplitude (the pulse peaks), and this current charges the condenser in the A.G.C. rectifier's cathode circuit to a d.c. value equal to the top amplitude of the sync pulses. The cathode resistor is so chosen that it approximately maintains the charge at this level between line sync pulses. As this potential is always proportional to the amplitude of the peaks of the pulses, rather than to the varying average carrier, it is amplified in the triode and utilized to control the gain of the first two I.F. amplifier tubes.

Figure 43 illustrates another method of securing A.G.C. Here a dual-triode tube, type 6F8G, is used, and so connected that it functions as amplifier and diode. The result is that the amplified signals from the triode (both video and sync) are rectified by the diode to build up a charge in capacity "C." The resistor "R" is so selected that it maintains this charge close to the d.c. potential produced by the sync pulse peaks, and this current is filtered for use in controlling the bias of i.f. stages or a combination of r.f. and i.f.

Should one prefer, for any reason, to omit A.G.C. when planning his receiver, the connections of Figure 44 are employed. The grid returns of the second and third i.f. stages may be connected to a fixed bias of negative 2 or 3 volts. The grid return leads from the converter and 1st i.f. are brought to a 50,000-ohm potentiometer which permits a variation of from zero to 20 volts negative bias to these tubes. If this plan is utilized, it will be unnecessary to incorporate a Contrast Control later on, which would otherwise be essential.

The final steps in the conversion of vision-modulated radio signals into a living, moving, enjoyable image, portraying events as they happen, will be covered in the next issue. Either of these two important elements—video amplifiers or sweep generators—is, in itself, a fascinating study.

Reference Reading

Scanning Sequence and Repetition Rate of Television Images

R. D. Kell, A. V. Bedford and M. A. Trainer

"Television" Volume I.—RCA Institute Press, New York.

—30—

Hamchatter

(*Continued from page* 17)

upon this type of chiseler. After all, the SWL who sends return postage is a rarity and should be encouraged. [*O.K., bo, let's not argue pro or con on the SWL question.—ED.*]

W9PWF works south Africa on 28 mc. sitting in his car. He has a complete machine shop in his basement, even has an automatic screw machine; also he makes his own tubes for transmitting.

W9ZYL went on a DX rampage recently. Earl says he worked several new countries on 14 mc. with low power.

W6USA, on Treasure Island, is booming in these days on 14 mc. but W6ISH is giving him plenty of competition. Wonder how many of the boys still have cards from W6USA the Olympic Games station of 1932?

K6OGI has been trying to contact his brother, who is on ten meters. Seems he puts in a whale of a signal but the Chicago boys don't get out to Honolulu any too well.

Those super-power foreign propaganda spouters on the 7 mc. band are proving a poor investment. The cw boys are doing a swell job of cutting them to pieces. This is another instance of how amateur radio has come through in a pinch and are doing a real service to our country. It might be a good idea for the *FCC* to consider waiving the one kilowatt limitation as well as the adequate filter provision. In cases where the amateur finds one of these nuisances hogging our bands, it would seem the lesser of the two evils.

SEEMS this column was guilty of a slight error in giving so much credit to W9TIZ for that remarkable antenna. It now develops that he had considerable help from W9YWT and W9NLP.

W9YWT says he held skeds four days in succession with W1FLO, the powerful little 4½ watter up in Manchester, N. H. George says he was consistently R8 here in Chicago. It doesn't seem possible but then ham radio is replete with just such instances.

W1CWH is recovering from an attack of scarlet fever. Les took advantage of the enforced vacation to rebuild his speech amplifier. He also swung the coils around in the final stage which seemed to give him more soup; at least the tank condenser arcs occasionally now. He is running a kilowatt on 75 and 20 meters and is planning to put the rig on ten as soon as he can get a beam up for that band. Les is a real oldtimer, his ham activity dates back to 1909.

W6KIN has a novel method of modulation. He simply inserts the modulator tube in series with the filament return lead from the modulated stage and it really works out very nicely for him; no chokes or transformers are needed.

VE2EA is having the time of his life these days. It is maple syrup time around Sherbrooke, Quebec, and Roy is a man who can take his pancakes but somehow we doubt if he can leave them alone. He has offered to send us a sample of freshly made maple sugar which will be immediately converted back into syrup in accordance with Roy's instructions and applied to a big stack of pancakes right where it will do the most good. We are planning to have police protection as long as the maple sugar holds out.

Funny how so many of our politicians resemble "Ridgerunners."

W9NSK is temporarily off the air. He is rebuilding his receiver, also enlarging the transmitter and erecting a vertical antenna. An ambitious program!

WE pass this along with our tongue in our check. It was heard on 14 mc. A round table was in progress. Several of the local boys were planning a fishing trip for the morrow. Finally the question of bait came up as such questions do. One of the boys suggested a most extraordinary method to obtain worms. He was apparently serious and, we believe, sober. He claimed he drove two iron rods into the ground about three feet apart, wired with an electric iron in series to the 110 volt house current. He claimed a bucket of water poured on the ground between the iron rods would produce plenty of worms for a fishing expedition. Oh, yeah?

But how did he overcome the usual trouble of a fishing trip—the fact that almost always someone wants to fish?

Some time ago this column carried a story about the B.C.L. who had an obsolete set which brought in ham sigs on the broadcast band. The amateur to whom the complaint was made suggested that a formal complaint be made to the *F.C.C.* He even furnished the address, knowing that "bloopers" are illegal on the broadcast band. That particular blooper is no longer in existence. Do you still think we should page Lee Sheldon, Mr. Editor? [Yes, for paging exercise.—Ed.]

We know one amateur who gets so much grid current that he blew out a set of new "B" batteries that were being used for bias to the final.

What ham can measure percentage modulation directly with the "S" meter on his receiver?

One amateur who cleaned that big heap of dust out of the corner and found a complete forty meter rig underneath. He used a brush made from neck bristles of a ridgerunner.

Funny how some fellows will call on the fone to bawl us out for leaving them out of "Hamchatter" but never think to call in time to make the deadline. Heck, fellas, we are not a mind reader.

WHEN will folks learn that it is necessary to have a license to operate a transmitter? The *Federal Communications Commission* means business and is really cracking down on bootleggers. This statement has been published hundreds of times in every radio publication, but the practice still persists. In fact, it actually is increasing. It would seem that general warnings are not effective so here is a specific instance of what actually happened to one persistent young bootlegger.

He assigned himself a call and built a fone rig that really went to town on five meters. None of the hams were fooled. They all *knew he was a bootlegger* and he was warned repeatedly that he would surely be caught, as a matter of fact, he was caught. The *R.I.* came out and finding the culprit was a minor merely demolished the rig and warned the youngster that his activities were unlawful and any further violation would be prosecuted.

The stupid bootie was very quiet for a while. The bug had bitten deeply, however, and though he had plenty of opportunity to learn the code and obtain a legitimate amateur license, he devoted his time to rebuilding his five meter fone rig. At first he was very cautious and only came on the air for short periods of time. Gradually his confidence returned and the time came when he could laugh off the repeated warnings from the amateurs with all the old abandon.

Came a dawn, as dawns have come from time to time, three big cars pulled up in front of the bootlegger's domicile. Several well dressed gentlemen got out and rang the door bell. "We'd like to see W9—" said one. "Come right in," invited the youngster's mother. The gentlemen did come in and when they came out they brought our young friend along with all his radio apparatus. He is out on $1000 cash bail pending trial in the federal court. Being a minor, it is doubtful whether the government will ask the full penalty, but surely this lad's experience should serve as an object lesson to others who may think they can defy the federal government. *Crime,* as has been said before, *does not pay!*

HP1A told us that he was the only amateur station in Panama. He said that he was ex-K5AN, and had moved from the Canal Zone to Panama — just down the street. A large number of Southern California Amateurs have been working him on 10 meter phone, and he comes through fine. Inasmuch as he has relatives in various parts of Southern California he is very anxious to contact Southern Californians, in particular.

The length of the DX Test was just right, as it permitted the maximum number of

QSOs, the minimum amount of sleep; and those who kept at it continuously, found by the end of the contest, that there were few stations left to work per day.

W6PAP, as editor of the new *Tattler News* is doing a fine job. It makes a very interesting publication.

W6BY has been designing some special rotary beams. We all remember him as the editor of the fine antenna book "R-9 Sigs".

Did you ever know why there are so many tall amateurs? Well, the reason is that when tall young fellows are growing up, the girls won't look at them as they are so awkward, so naturally they drift into something where they won't have to be stared at. This quite often is amateur radio, and when they grow up they still like it, and of course, they still don't like girls. [What do you YL's think of that? Ed.]

W6CHU was appointed ARRL Activity Manager of the *Bell Club*.

W6NLZ showed up fb in the DX Test. There were many pink tickets for poor notes this year, so we guess that the *FCC* is checking up on sigs more intensively.

W6FEX secured 1000 points during the last two days on phone, and had a great time, which meant about 30 QSO's mostly on 10 meter phone. Some of the high cw scores in Southern California were: W6GRL — 160,000; W6CUH — 50,000; W6CNW — 80,000; W6DOB — 41,000; W6QD — 42,000.

Others having good scores were: W6VB, W6LYM, W6GRX, W6GHU, W6FZL, W6ANN.

A few months ago, one of the finest around-the-world relays in existence, was being organized and run by W6LPZ. He has been so busy working on the transmitter, W6QUT, that he has had to drop the round-the-world relay for the time being.

We all wondered how W6QD could shift so quickly from 20 meters to 10 meters. We find that he didn't have to shift. He was transmitting on 20, and the rest of us heard him on 10. He worked several foreigners that way, and saved considerable time in shifting, as when 10 meters is really good, it takes only a few watts of harmonic output to do the job. He also has a Corn Fed Kilowatt on 10 meters in case he wants to throw another switch.

W6POZ, and his "Plumber's Delight" rotary antenna, worked SU1CH, in Egypt on 10 meters for a half hour or more. SU1CH said he had been working for *ERPI* as an exchange engineer eleven years ago. He said he knew Hollywood, Manhattan Beach, Redono Beach, and Los Angeles. These exchange enginerships from European technical laboratories are certainly fine. We all remember G5SA, who spent six months with us here from the *British Broadcasting Company*, as an exchange engineer with *ERPI* in Hollywood.

ONE of the most consistent phones in this area is CO2CR, who some have dubbed the "Whispering Marvel." It seems as if he were whispering, for fear he might waken other people in the house, or perhaps he lost his voice temporarily during the DX Test, calling "CQ, Contest."

It was nice to see our old friend, K7PQ, Ketchican, Alaska, show up on the last day of the phone test, although we do wish that he had been there all week, so that the boys could have talked with him. A friend of his K7HFL spent some time in Long Beach, loking over the ham stations and visiting the hams.

Southern California Amateurs will be delighted to know that ZS6DV is coming over to visit from South Africa.

This year, W6GRL, won the phone tests decisively, with 110,000 points, and W6AM received 57,000 points towards second place. This is the third consecutive year that W6AM has been second on the phone contest, and the second consecutive year the W6GRL has been first, for the Los Angeles section.

The only other high score we have heard so far is W6NHK, with 20,000 phone points.

The "Everlasting Scotchman," W6FDO, has been helping some of the boys rebuild. He is a good mechanic, and does a fine job.

W6OCH and W6ITH, both received over 100,000 points in the phone test. It seems as though they were working everybody, and they certainly received fine results. W6OCH finally nosed out the winner with 103,000.

W6ITH, on top of an eleven hundred foot mountain does it by "sheer whollop," and many good beams tune over the 35 acres he has available on top of this mountain.

W6OCH has ten clean cut 10 and 20 meter curtain and diamond antennas pointed in definite directions. Each antenna has 8 half wave phased in two layers.

Some of the other good phone scores are: W6KR, — 35,000 points; W6CQS, — 30,000 points; W6TT,—11,000 points.

THE Bay district didn't have such high scores as Southern California, topping with W6ONQ at 28,000, and W6HB at 18,000.

Of course, all these scores mentioned are unofficial, and at the time this magazine goes to press, no official scores have been turned in to the league, and no report is out.

W6LFC has been confined to his home with the flu.

W6MQM has been organizing emergency nets all over Southern California, and is doing a very good job of it.

W6DEP has one of the finest, and all around usable portables for mobile, use, for any ear we have ever seen. It operates all bands, 10 to 150 meters, and will receive anything from 4 to 550 meters, while in motion, or standing still, although, of course, legally it is only used in motion on the 10 meter band.

During the DX Test, Foreign amateurs can help relieve the QRM situation on their own frequency by simply not answering anyone on their own frequency until all others have been QSO'd. In this way the ones with electron coupled oscillators, and variable crystals will have moved from the foreigner's frequency, in order to sit on the stations frequency that is being worked.

QRM does not exist as far as five or ten KC away from the foreigners and in this way the foreigner will soon have a clear channel all to himself.

During the recent DX Test, some foreigners didn't realize this and they would answer everyone on their own frequency, and consequently their own frequency became so jammed that it was almost impossible to read them.

Who has any information regarding VR6AY? He used to come in so well, and so frequently before his storage batteries wore out, and we just wondered when he would be equipped once more. We miss him.

W6OAM, and W6KW visited W6QD during the DX Contest.

The *Hi-Fi-Delta Radio Club of San Diego* continues to be active and at the present is organizing a Field Day Group to enter the next Field Day with a 50 watt transmitter.

THE *Helix Club*, also of San Diego, will enter with a Trailer.

The *Palomar Radio Club*, in the general vicinity, has three portable rigs ready for the Field Day Contest, this June.

Several of the Western Amateurs, who ordinarily enter the Field Day will be in Chicago, attending the *Radio Trade Show*, so will miss out on this event.

W6KW is doing a good job of editing *Mike & Key*. This is a mimeographed sheet, published monthly at San Diego, and distributed free of charge to all amateurs in both San Diego and Imperial Valley County.

W6FZB now has 500 watts on 40 meters. He is also about ready to show up on the air with a single 100TL on 10 meters.

Frank C. Jones, and Jack McCullough were each scheduled to be one of the speakers at the *Oregon Amateur Radio Association* Annual Ham Fest, held at Eugene, Oregon, April 22 and 23.

W6MKW, who has 15 watts output in a 75 meter phone, is still looking for another New Zealander to add to his 75 meter QSO Phone. Last month he worked ZL2BN.

W7EK visited a number of Southern California Amateurs, during the last week in March. Many of us will remember his

clean cut operating of 18 years ago, as well as of today.

FP8AG, St. Pierre Island is putting in an R9 signal to the West Coast.

W6GY, our old friend, Ben McGlashan, is working Australians easily these days on phone.

K7GSC puts a fine signal into the West Coast from Alaska, and gives us another usable Alaskan on 20 meter phone. When he is on, he comes right through during the day, even at 9 or 10 A. M.

W7FQV puts in a signal these days on 20 meter phone.

Rodger Jackson was elected president of the *Long Beach Poly Hi Radio Club*. Thirty or forty embryonic amateurs are making their radio debut by this means.

W7RT is rolling along with his marvelous set, and has been working lots of DX.

W6JRM is doing a good job as SCM of the San Diego Section.

W7KV is piloting for the United Air Lines as usual.

Present plans include 10 meter mobile on the high seas with W6AM at the mike and key, from July 4 to July 16. W6AM will be on the yacht *Contender*, enroute from Treasure Island to Honolulu, in the Honolulu Yacht Race. —30—

Do Your Televising

(*Continued from page 8*)

second anode voltage, focusing as fine as this may not be possible. In this case the focusing control is adjusted until the edges of the picture are sharp and not rounded, and also by watching the detail improve with correct adjustment. By using a high voltage and low beam current, ordinary oscilloscope tubes will focus down quite well for a 60 to 100 line picture. Other small tubes are available with extra fine focusing for 441 line images.

One of the controls on the rear of the c.r. tube chassis is for adjusting the synchronizing voltage, and one for the voltage on the sweep tubes (size of picture). The other two are for centering the picture on the screen.

A five inch lens placed in front of the 3 inch c.r. tube makes the picture appear about 4 inches square. A terminal strip (which should be shielded because of the danger of the high voltage) is mounted on the side of the chassis. Wires leading from this down to the power supply are covered with spaghetti tubing and taped together. The back half of the c.r. tube is covered by a shield which also supports the socket. The socket should also be shielded.

Power transformers must be placed as far as possible from the c.r. tube to prevent hum in the image. Even the magnetic field of the earth has a slight effect on the electron beam. If the c.r. tube and power supply are all on one chassis, the field of the transformers may extend all through the chassis, causing hum. The rectifier tubes usually warm up before the sweep tubes which allows the spot to stand still on the screen for a time. At any time the spot is standing still the intensity control should be turned down to avoid burning the screen.

In the sweep circuit tube (128A's or 885's) the grid is biased to or beyond, plate current cut-off. When the condenser builds up sufficiently to discharge through the tube (thus ionizing the gas) the grid loses control while the discharge is taking place. After the discharge the grid regains control. A synchronizing voltage of a few volts applied to the grid holds the oscillator in step with the transmitter.

The maximum average plate current for an 885 should not be more than 3 milliamperes. This does not usually give enough output to sweep the spot all the way across the screen, when the high voltage of the c.r. tube exceeds 500 volts. Inclusion of an inductance in the plate circuit of the sweep tube gives twice the voltage output, so that 1,200 to 1,500 volts may be used on a 3 inch c.r. tube without exceeding the rating of the sweep tube, and still give a full sweep. A higher second anode voltage on the c.r. tube requires more sweep voltage, but gives a finer focus.

Higher voltages on the c.r. tube help to eliminate hum. At 20 frames per second, hum on the grid of the c.r. tube causes three dark and three bright horizontal bands in the picture. Hum in the line frequency sweep circuit causes the sides of the picture to be wavy. Hum in the frame frequency sweep circuit causes the distance between lines to vary, some of the lines being close together and some far apart, giving an effect of six horizontal "bands." Several of these effects may be caused by hum in the high voltage supply. Hum on the grid of the c.r. tube may come from the high voltage supply or from the video amplifiers.

The grid coupling condenser for the c.r. tube must be a high voltage mica type, because the cathode of the tube, although negative, is at a high voltage point, the chassis being positive.

If the picture is upside down or words read backward, this may be corrected by either reversing the connection to the two "free" deflecting plates or by turning the tube, or both. Lines far apart at the top of the picture and close together or overlapping at the bottom indicate a non-linear frame frequency sweep. If the picture is crowded on one side and spread out on the other, the line frequency sweep is not linear. Phase shift is observed when the top of the picture leans to one side, caused by the low video frequencies arriving later than the highs, that is, when the picture has large dark or bright areas.

A good way to check the frequency response of the amplifiers in the camera and receiver is to hold a piece of black tape on a white background. This background may be a two foot square piece of cardboard placed on a music stand. While watching the received picture, hold the tape vertically and slowly turn it to a horizontal position. If it fades out of the picture when it is turned horizontally, the low frequencies are not coming through and the picture will be hard to synchronize. If the tape fades out in a vertical position the high frequencies are not coming through.

—30—

Bench Notes

(*Continued from page* 15)

sible. The set responded with noticeably increased volume.

The static, the customer told me, had been intermittent; and, as I asked perfunctory questions about his refrigerator, cellar equipment, and hair dryers, the racket began. I unpacked my tools again and went to work.

Don't give this model your blessing until you have *checked the dual buffer condensers across the two sections of the high voltage winding.* The tuned antenna makes shop work on this model subject to doubt, particularly if the complaint is noise; work in the house if possible. Unsolder the dual condenser leads for trial—there should be a pronounced difference between the noise levels with the buffers and without. If defective, replace with the highest voltage rating paper condensers you can squeeze in between the power transformer and the *BA* base.

Serviceman's College

WE in the servicing field are on the verge of major changes. What these changes will be, not one can say as yet. It is fairly certain that the changes will be of great importance in the profession, and that those of us who are to stay will be called upon to perform great feats of adaptation before we fit into the new order. Most of us will need help.

Those of us who have survived since 1922, when we started with a screwdriver and a hope, have done so only because we have been willing to adapt ourselves to various changing conditions. The record, unfortunately, shows the serviceman is a very difficult person to change. Many of us—because earning a living makes primary demands on our time and money—are contending with today's market with instruments and methods which, although they were hot stuff in 1929, have cooled off considerably since then. We are not entirely to blame.

At least half of the blame should go to those who sell us our tools—parts, tubes, and meter manufacturers; advertising experts; system advocates; and everyone else who makes his money by selling us the prerequisites of the profession. (For the sake of brevity, let us call them "wholesalers." Since my purpose is to avoid singling out any group while I offer a plan to benefit us all, the most general designation is the best.) The wholesalers have tried to educate us into modern methods through a description of their up-to-date specifications. But—instead of demonstrating what they had to sell *in terms of customer profit,* they satisfied themselves with dry, detailed data which described some part or meter at rest in a jobber's store-room.

Why, since their wares are made for our use, don't the wholesalers send their equipment into a proving-ground, where it will be tested under conditions for which they are designed?

Why is it a wholesaler cannot see that, regardless of the excellence of his product from a technical standpoint, a serviceman is slow to spend money unless it has been proved to him—in terms of *customer profit*—that the product will increase his income? Wholesalers have felt our reluctance to spend, and accuse us of unwillingness to change and improve our methods. The wholesalers have been in the business as long as we, and have changed as little; we both suffer as a result, forgetting both groups are paid with money from the *set owner*. The wholesaler who proves his equipment in the customer's home is giving the serviceman a reason to buy.

All these faults: the need for adaptability on the part of the serviceman; his inability to help himself; and the need for opening up a wholesalers' market, can be taken care of in one single project. I offer—for the mutual good of those on both sides of the fence—the suggestion that a *Servicing College* be inaugurated.

The College would be started as a typical radio store in a typical town; (remember Muncie, Indiana, in *Life?*) it would be managed by an impartial judge, who would rotate manufacturers' equipment, giving each company's products a fair trial; staffed by servicemen who make their money in their own stores, in various parts of the country. These servicemen, since actual conditions are being simulated, would be paid for their work, and would have transportation paid to and from the experimental point.

Each call, as it came into the store, would be analyzed from every possible angle, and would answer such questions as: Did the customer like this method of approach, following X's advertising? Was the use of Y's instrument good for this particular set, having this particular trouble? Why was the customer offended when the chassis was checked in the house? Could a *J* resistor have been mounted more quickly than a *K?*—and a thousand others. The data thus derived would be up-to-date, vital, and of the utmost importance to those of us who wish to create our markets from some process more tangible than wishful thinking.

The College — naturally — would make a profit; and hence would become its own Foundation. The net could be used for transportation in rotating staffs—so as to get a typical personnel; or to award small prizes to those who used methods and equipment most intelligently. If a section of the country was notoriously tough, a trailer could be sent from the main proving-ground to learn what was wrong, for the benefit of the nearby repairmen; while I realize it is impossible to tow good-will, a trailer would —by bringing sensible servicing methods into a "dead" locality—awaken both customers and the misguided repairmen who were competing themselves into the ditch.

Competition? No; for the influence of the Foundation would be to introduce better servicing methods; and modern, ethical, properly-priced competition would not be the kind of knifing which has sprung up here and there in the business—but would come into any locality to assist the servicemen already there into making a decent living, and they could work for the Foundation, or from the trailer, if they so wished. Clean competition never hurt anyone.

In presenting the idea, let me forestall any misunderstanding which might result from the use of "college." The suggestion does not concern a radio school; our present schools are excellent, and this plan will not conflict. The qualification for entry into the *Foundation* will be experience in the field; that for school entry, the lack of it. Perhaps a more suitable name will be suggested. My plan is simply a means for improving conditions within the profession by putting servicing parts, methods, and equipment under test surveillance.

The initial expense of the plan is small; the amount, when divided by the number of willing wholesalers in the country—who will start the ball rolling—gives a surprisingly low quotient.

The publishers of RADIO NEWS, having made this space available for the use of servicemen, have made possible the announcement of my suggestion. In the future—after the *Foundation* gets under way—they have given permission for our use of these pages in reporting analyses, results, and business detail.

From now on, it's up to you; your response will determine the amount of merit in the idea. I look forward hopefully to the next month's mail, for it will indicate what proportion of the servicing profession is serious-minded. —30—

Radio Gadgets

(*Continued from page* 34)

secondary winding is available, the arrangement shown may be used.

The secondary of the power transformer should not be excessively loaded nor operated for long periods of time. Otherwise, the low voltage windings are likely to heat excessively and short-circuit or burn out. Operation for thirty minutes or so at a time is perfectly safe.

Small Variable Condenser Measurements

To measure the capacity of variable condensers take a reading in the low range, noting the capacitance with the plates in full mesh. Next take a reading with the test leads or one of them disconnected from the condenser. This will give the amount of capacitance in the leads, which is then subtracted from the first reading. This then shows the true value of the condenser. Finally take a reading with the plates out of mesh, subtracting the value of the test lead capacitance. Thus we have the minimum to maximum capacitance of the condenser. —30—

Serviceman's Experiences

(*Continued from page* 18)

remember to take it off your wrist when you bathe, and don't wind it up too tight."

"Many thanks," the lady laughed. "Now—come up to the house and service my *Brunswick Panatrope*. You know, I never *play* this midget—I only pull the antenna wire off before I go shopping for a radio man. 4626 Dexter Place—seven-thirty."

That night, Al smiled very unpleasantly when he showed me the receipt for the *Brunswick* work, but I wasn't discouraged by the lucky fluke that scored "one" for him.

The score stood two to two when the fifth test call came in—from the *Barn Grill*—a neighborhood beer garden, owned by a man so stingy he covered up his clocks at night. It was my turn to go out on this call—which would determine our future store policy on small sets—and I knew the conditions were almost ideal for losing money.

The bartender pointed to a corner table. The set, disconnected, laid in an ash-tray. "I wouldn't plug it in just now," the owner warned, "it's still wet. I took it off the back bar when it stopped playing, and it fell into the water-trough while I was working on it."

I opened it happily, knowing in advance the repair would cost more than it was worth. I checked on the damage and reported: "Not worth fixing. First, it would have to be thoroughly desiccated and scraped. Then, the r.f. coils have to come out. The tubes, which are more than three years old, should be replaced. You also will require new sockets—I notice something sticky covering the contacts."

"That last," the barkeeper announced, "is the result of a compliment Cassidy paid to a songstress last St. Patrick's eve. He poured a pony of Cointreau into the back of the set after listening to an especially touching song he thought was *My Heart Belongs to Paddy*. How much will it cost to get it into shape?"

"To tell the truth," I replied, startled by his foolishness, "I didn't add it up—I took it for granted you'd rather buy a new set than spend so much on this one. Even at its best, this model would sound like a basement delivery of a load of pea-coal!"

"Are you a salesman, or a repairman?" he asked, as his spit curl straightened ominously.

"I try to be both," I replied.

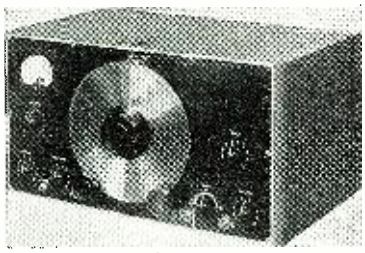
"Well, *I* called a *repairman*," he said, leaning over the stick. *"How much?"*

"Twenty-two fifty," I estimated, "so you see, it's better to—"

"When can I have it?"

"Five days," I said, "but $22.50 is more than you paid for it, isn't it?"

"It is," he answered, "—it's a gift from my mother-in-law, given to me the day we opened here. She paid $7.65 for it. We celebrate the anni-



versary next Thursday—and there's an extra bottle of the best in the house for you if you get it back before then."

"That," I responded respectfully, "is a very tender sentiment. I dare say there are few men who would spend so much money on a piece of junk simply because they held their wife's mother in such high esteem. I admire you for your noble tenderness."

"Noble tenderness—hell!" he snarled. "She *owns* the joint!"

It is now the policy of *Salutary Sales & Service* to accept work on all radios, regardless of dimension, mass, or initial cost. If we can see them, we fix them. I have applied for a patent on an asbestos nose-guard, and have become quite proficient in the use of my tweezers and jeweler's eye-piece.

—30—

Send-'Ceiver

(*Continued from page 20*)

sis space at the left and the upper left with space left upon the chassis and panel for the addition of an r.f. power amplifier when desired, as well as a one or two tube modulator for phone operation when using a carbon (7C5 modulator) or crystal (6SJ7 and 7C5 modulators) microphone respectively. Only the simplest version, a one tube, 5 band, crystal controlled 10-15 watt c.w. telegraph transmitter is here described. It consists of a 7C5 beam power tube as a crystal oscillator with choice of one to three crystals in any amateur band or bands from 10 through 160 meters. Crystal selection is by means of lever switch SW2, which while shown as single-pole-three-position, also carries a duplicate set of such contacts which, when the "rig" grows to two-tube m.o.p.a., is used to switch oscillator plate coils which are added on the chassis. In single tube form, the oscillator plate circuit uses the coils L2, L3 and L4, switch SW3 and tuning condenser C12 (which would be in the power amplifier plate circuit when the second tube is added. This saves wiring changes as the "Send-'Ceiver" grows. Cathode bias by means of R11 by-passed by C11 is used, together with a new type of r.f. grid choke RFCZ now available which is effective right down through 5 meters. Keying jack, J2, is in the cathode circuit, while voltage regulation of the power supply is so good that keying is clean and free of "chirping" due to voltage variation with keying. Screen voltage is provided through voltage divider R9, R10, with screen by-passed to ground for r.f. by C13, and with C17 the plate r.f. by-pass condenser. Three plate coils, L1, L3 and L4 together with 165 mmfd. tuning condenser C12 enable the plate circuit to cover two adjacent amateur bands for each coil, coils being selected by lever switch SW3, which also through duplicate sets of single-pole-three-position contacts as upon SW2, switches link coupling coils located upon each plate coil for optimum antenna coupling for each band.

Still another lever switch, SW4, having four poles, with two circuit and one off positions, is diagrammed. By means of this switch the antenna, which can best be a center-fed half-wave doublet, is alternately connected to transmitter or receiver by operation of this switch knob, at the same time that plate power is transferred from transmitter to receiver and vice-versa. In its third, or off, position SW4 also breaks the filament circuit to turn off all power when batteries are used.

The actual construction and wiring is simplicity itself. By examining the illustrations herewith, each part can be mounted using 6/32 screws, nuts and lock-washers if the "Send-'Ceiver" is not to be shaken apart by vibration. C1 and C2 mount by their shaft bushings, with a single nut on the front panel, and with their long rotor (ground) lugs bent to just touch the cadmium plated chassis, to which these lugs must be soldered. C12 mounts with two 4/36 screws, nuts and lock-washers so that both its stator support studs and its rotor bushing are insulated from panel and chassis. C11, C15 and C16, all in one can, are mounted by twisting their small "ears" with pliers over on the bottom side of the chassis, to which one of these ears must be soldered. These three condensers are identified by symbols stamped, together with capacity of each condenser, on the side of their can. These symbols correspond to the shape of the holes through which their soldering lugs project through the bakelite bottom washer of the can. CH3 mounts directly with its own four mounting screw nuts beneath the chassis, CH2 and CH1 mounting as shown with two screws, nuts and lock-washers each. All sockets mount similarly, while their contact lugs are identified by numbering from 1 to 8 clockwise direction starting with number 1 just to the left of the Octal keying slot, loktal center grounding lug, or left large filament pin hole of other types, all as seen from below. Switches SW2, SW3 and SW4 mount with their yellow faces visible, using two screws, nuts and lock-washers, as in Fig 2, with their shafts projecting through slots in chassis, and panel. Their knobs are simply pushed onto their flat shaft levers.

The complete receiver coil assembly mounts by one single shaft bushing nut on the front panel, and has six color-coded connecting wires for primary, secondary and tickler connections. Jack J1 must be insulated from the chassis and panel with one extruded fibre washer on inside and one on outside. Resistors and paper condenser all mount by their connecting leads, which either tie to terminal lugs of sockets or other parts, to insulated mounting-lug strips or to grounded chassis lugs held under mounting lugs. Wiring is equally simple, and each connecting wire is about as short and direct as it can be made.

Well insulated push-back hook-up wire, size 19 to 22, should be used. Cut to length, the insulation should be pushed back from the end to be soldered to a lug, and the bare end then wound one full turn around the lug and squeezed tight to the lug before soldering. If this is done tight mechanical joints will result which will stand the abuse of continued vibration in an automobile or other mobile installation. This is the only correct way to make soldered connections—solder alone should never be depended upon for a mechanical joint—only to sweat into an initially tight mechanical connection for purposes of better electrical contact. Only resin-core solder should be used, with a hot, well tinned and *clean* soldering iron. This is the secret of clean, smooth—yes, even shiny—soldered joints.

Testing is simple in the extreme. If connections are correct the receiver will work "right off the bat," as will the transmitter as soon as a crystal is plugged into one crystal socket, with resonance found by rotating C12 for maximum glow of a ¼ watt neon lamp held in the fingers by its glass bulb and with its base tip touched to the stator lug of C12.

My Pet Portable
(*Continued from page* 26)

well as for best quality.

All audio grid leads should be well shielded so as not to pick up any stray r.f. fields. All cathode circuits are tied to ground through a common switch which is incorporated on the audio gain control, this allows the entire plate voltage to be removed from all audio stages, thus saving the audio tubes as well as the extra power. When this switch is in the "off" position, more power may be applied to the final for code operation. By turning the gain control to the right, the speech and the modulator are again in operation, and once again we are on phone.

Only one power supply is required for the entire outfit and this is comparatively inexpensive. A receiver type transformer may be used. For best regulation, a type 83 rectifier was chosen for its low internal voltage drop. The transformer should deliver 6.3 volts at 5 amps., this being necessary to supply the current to all the filaments, except the rectifier. The plate winding should deliver 800 volts center-tapped at a current rating of 200 ma. Three 8 mfd. 600-volt-working filter condensers are used with two 200 ma. 20 henry chokes to filter out the a.c. R9 acts as a bleeder as well as a voltage dropping resistor for the screens of the class A-B 42's.

Two switches are incorporated in the power supply, one in the 110 a.c. line for the purpose of warming the filaments, and the other in the lead going to the center-tap of the high voltage transformer, this being used to control the entire plate voltage.

(*Please turn the page*)

One meter is used to read the plate current for both the oscillator and the final amplifier. Since there is more than one circuit to be metered, a closed circuit jack is inserted in the cathode of each stage for this purpose. This permits plugging the meter in either stage at will. Once the transmitter is in tune, the meter should be left in the final amplifier stage to check for proper operation.

For c. w. operation a closed circuit key jack is connected in the cathode of the final. Removing the plug the circuit completes the circuit for phone operation.

Doubling

Three crystals may be used for all-band operation. A 160 meter unit may be used for 80 meters by doubling in the crystal stage. A 40 meter rock may be used for 20 meters in the same manner. This does away with doubling in the final amplifier. The builder will find that the efficiency will be a little higher when working the oscillator and the final on the same frequency.

Isolantite sockets are used in all the r.f. stages, both for the tubes and coils. In the audio stages, bakelite sockets may be used, since the loss at audio frequencies is so very low. The tuning condensers should also be insulated with isolantite, mycalex, or some like low-loss material.

It's very important that a proper modulation transformer be chosen if correct operation is to be achieved. The correct load impedance for the secondary of the modulation transformer may be found by dividing the plate and screen current of the final r.f. amplifier by the plate voltage × 1,000. Thus with a plate voltage of 400 volts and a total plate and screen current of 50 ma. the correct impedance to match the final would be 8,000 ohms. This will be the correct value if the transmitter is operating properly. The modulator is matched to the final so as to transfer the maximum amount of audio power as possible, as well as to furnish the best quality.

The secondary of the modulator transformer should be designed to carry the total plate and screen current to the r.f. final amplifier. For 20 watts input to the final on phone, the normal current will be 50 ma. with 400 volts on the plate.

Tuning

All tubes should be placed in their respective sockets except the 6L6 in the final amplifier. The crystal and all the coils should be inserted, while the filaments of the tubes warm. Insert the meter plug into the oscillator jack, and then disconnect the plate voltage to the audio stages, by turning the audio gain control all the way to the left, to the off position. Having done this the plate voltage may now be applied to the oscillator.

Rotate the crystal tank condenser until a dip in plate current is noticed. Then tune for the greatest dip. The crystal oscillator plate current will vary, according to the frequency used, anywhere from 10 to 35 ma.

If no dip is found, check the coil and connections. Also make sure C4 is at minimum capacity. If connections are OK, and the crystal is active, try adding or subtracting a few turns from the plate coil.

Next plug in the 6L6 tube into its socket and allow it to warm. Insert the final coil and connect the antenna. With the plate meter still in the oscillator circuit, apply the plate voltage once more. Adjust the coupling condenser C4 to about half capacity, and again adjust the crystal tank condenser to the greatest plate current dip. Remove the plate meter from the oscillator and plug into the final amplifier jack. Rotate C3 to the greatest plate current dip. C5 acts as a loading condenser, which should be adjusted for proper plate current, this being about 50 ma. for proper phone operation. C3 should then be adjusted again for resonance.

When this is accomplished, the r.f. unit may be considered as working correctly. Plate current indicated in this stage also includes the screen current.

Trouble shooting in the final may be accomplished, as far as the coils are concerned, in a similar manner as described in checking the oscillator.

Now try the audio to see how it works. To do this the tubes in the r.f. stages should be removed from their sockets.

Place a 8,000 ohm bleeder across the secondary winding of the modulation transformer, and across a portion of this resistor connect a magnetic speaker. Plug in the crystal mike and apply the plate voltage, by turning the audio gain control to the right.

If the circuit has been faithfully followed, and the parts laid out properly, no trouble should be experienced. If however, you do have trouble, the regular procedure of checking the plate voltage, tubes, and connections should be followed. —30—

Fine P. A. System

(*Continued from page* 32)

fields. The use of a two wire shielded cable instead of the usual single wire cable on crystal microphones will reduce feed-back a great deal, and, in some cases, entirely remove it. The reason for this is relatively simple when analyzed. When a single wire shielded cable is used the outside shield is one of the conductors of the microphone currents and is actually in the grid circuit. Therefore, even a short microphone cable shield in a strong r.f. field might have a large voltage drop across it due to its inductance reactance. When a two wire shielded cable is used the return circuit for the microphone currents are made on the extra conductor inside the shielding out of the r.f. field. The shield is not connected to the microphone when using the two wire cable.

—30—

Simple 56 M.C. Receiver

(*Continued from page 27*)

condensers in this section of the set should be midget micas. Trimmer condenser C-3 serves as a coupler from the r.f. stage to the detector.

The 6J7 detector is electron-coupled and supplied with quench frequency from the quench oscillator. The adjustment will be explained later. L-5, C-9, C-10 serve as a network to filter out some of the quench frequency and pass the signal frequency.

The quench oscillator is conventional in design, and can easily be hooked up by following the diagram. The coil used was a *National* quench oscillator coil. This unit was used because of its mechanical structure as much as anything else. It is shielded and easy to mount. No difficulty will be experienced if the coil is hooked up according to the markings on the under side of the coil. R-6 adjusts the quench voltage. R-7 adjusts the screen voltage to the 6J7. Condenser C-7 is important because it regulates the quench frequency; .006 mfd. was found to work best in this particular setup.

The audio stage is impedance coupled. This arrangement provides enough gain to operate a speaker on most signals, and provides much more gain than would a resistance coupled audio stage. In the audio frequency portion of the set it is not necessary to use the same low loss insulation as in the r.f. section.

After the set has been wired, using the shortest possible leads, it should be checked over to see that all wires are in their proper position. Now the set is ready for operation. It may take a little time to get it working properly; but any extra time is worth it in added performance.

The first thing to work on is the detector. The audio gain is turned full up. The cathode tap is then adjusted to about two or three turns from the grounded end of the detector coil. Then potentiometers R-6 and R-7 are adjusted until super regenerative hiss is heard. However, this does not mean the quench oscillator is working. So the 6C5 is removed from its socket, and if the hiss stops, the oscillator is working. If the quench oscillator will not work it is probably wired up wrong, and the circuit should be checked over again. Be sure all the by-pass condensers are connected properly.

After the detector and the quench oscillator are working, move the cathode tap on the detector coil so that the set super-regenerates at about one-third of the full setting of the potentiometer R-6. The coil on the set built by the author has the cathode tap at one-half turn from the grounded end of the coil. However, the tap will vary for different sets.

The tap adjusted, the r.f. stage can now be hooked onto the detector. The antenna circuit is loaded, and then C-3 is adjusted, and is increased in ca-

pacity until the detector will just super-regenerate evenly over the band with R-6 at more than two-thirds of its full setting.

Tuning up the set is easy after the above operations are completed. The r.f. stage will resonate over a wide band of frequencies and is not difficult to line up. First, set R-6 at the point of super-regeneration. Second, tune the detector circuit until a signal is received. It may be best to use some kind of an oscillator to determine if the set is operating in the 5-meter band. If not, the coil can be squeezed together until the set tunes. If this will not work the coil can be changed. Third, tune the r.f. stage for maximum signal. Then adjust R-5 and R-7 for best signal conditions. R-8 the audio control is, of course, adjusted to suit the operator's own requirements.

The set is now ready for use. If the correct procedure has been followed the set will work very well, and will be efficient for general all-around communication work.

Universal P. A.

(*Continued from page* 9)

The one-half "vibrator" primary has been designed with a turns ratio of 3.2 to 110 as far as the a.c. primary is considered. The heaters are now connected to this total winding and the proper 6.4 volts supply is impressed.

The power supply has the advantages of universal operation, simplicity of change-over, and conservative rating. The plug-in vibrator unit can be easily tested and replaced, and is economical in cost. The use of a regular 110 volt a.c. phono motor reduces the cost of the equipment and assures required constant speed. The switches provide added convenience and the circuit is doubly fused for safety.

The inclusion of a phono playing equipment is of great convenience for in majority of sound installations phonograph music is required for entertainment or for a musical background. The inclusion of the needed essentials in a single compact cabinet is a great aid to portability. Another external high-impedance, high level input is also provided and may be used for a separate record player or radio tuner unit. A fader control allows changing from one input source to the other and also controls the volume.

Two individual inputs are used for any of the low-level, high impedance, microphones. With a total gain of 123 db., plenty of amplification is provided even for a studio velocity type microphone; while crystal, dynamic, and non-polarized velotron microphones may also be used.

Vibrator hash noise usually presents several problems in high gain amplifiers, but the correct placement of parts, careful shielding, use of bias cells in grid circuits of the input tubes, and inverse feed-back, all aid in this connection—the hum level may truthfully be called non-existing.

A review of the schematic will suggest numerous electrical advances. But to the serviceman who usually works with single, radio receiving set type, tone controls, the dual controls will be of special interest. Notice that in connection with the low frequency control a very large series blocking condenser is used. This condenser keeps d.c. plate voltage away from the grid of the 6N7G inverter, but offers little opposition to audio signals. While the one megohm resistor is wide open, the current finds an easy path through the smaller .00025 mfd. mica condenser. The reactance of a condenser is inversely proportional to the frequency and the "lows" will be reduced. When the potentiometer is reset, so that its resistance is considerably lower than the reactance of the condenser, very little discrimination for the lower frequencies is present.

The other tone control by-passes the high frequencies when the resistance of 250,000 ohm potentiometer is reduced. But even with the control's total resistance in the circuit, the desirable but limited by-pass of the "highs" is accomplished with the second .002 mfd. condenser.

The inverse feed-back acts through three stages and requires very little input voltage. Only a single turn is used for this purpose on the output transformer, and even this low voltage must be reduced by means of a voltage divider network. This feedback is essential for limiting distortion and hum, and for reducing the value of the tube's plate impedance.

The available output impedances have been selected to serve any number of speakers used without matching transformers or for feeding a 500 ohm line. Two receptacles are provided and the impedance matching is performed with a handy-rotary selector switch.

An output level db. meter may be installed on the front panel and easily connected. Jacks are also provided for a small monitor speaker and input to an additional booster stage for greater power requirements.

For the active serviceman, who needs one system for a wide variety of requirements, there cannot be a more versatile, better adapter universal amplifier. This amplifier is ideal for portable use. It can be easily carried about, is compactly built, and is sufficiently sturdy to withstand considerable abuse. —30—

Sight & Sound News

(*Continued from page* 35)

the "telemobile" unit and motion pictures picked up by means of a special scanning device.

The *RCA-NBC* "telemobile" will furnish many of the most interesting programs as it roams around the grounds picking up spectacular Fair events and moving into New York to catch outdoor incidents with topical news value.

Coincident with the opening of the Fair, the *NBC* television station, *W2XBS*, will go into operation on a daily schedule from Radio City on April 30. Thomas H. Hutchinson, manager of the television program division, will supply a regular service to residents of the metropolitan area who own receivers. Previews of these programs

will be held four afternoons a week for the next four weeks.

CBS is also rushing its television plans but is not certain they will be ready in time to participate at the Fair. Installation of the transmitter in the Chrysler tower is now going on in the face of great obstacles. Donald Hunter Monro, television production manager for the *British Broadcasting Corporation*, is coming to this country shortly to act as consultant with Gilbert Seldes, *CBS* director of experimental television.

The *General Electric Company* will give its Fair Guests not only an opportunity to see television in action but to take part in its programs. A talent director wil shepherd them before the camera and give them a short course in acting for their own amusement and that of their friends in the audience.

A studio in the *GE* building will be equipped with a number of television receivers, a camera and transmitting equipment, according to an announcement by Dr. W. R. G. Baker, managing engineer of the radio division. The receivers will be able to pick up all the television programs broadcast in the New York area during the Fair.

Visitors to the *Westinghouse* exhibit also will be invited to speak and act for a few minutes before a television camera. They will go through their paces in a glassed-in studio and the crowd in an adjacent room will hear their voices and see their images on one of four *Westinghouse* receiving sets. About 125 persons can be accommodated at a time.

The *Ford Motor Company* shows signs of being television-minded. A receiver will be installed in the executive lounge of the *Ford* building for the entertainment of guests and as a means of advertising the line of cars. The idea is described as a gesture of courtesy and not as an indication that *Ford* will enter television manufacturing.

Facsimile has been quietly demonstrating its worth for some months but the general public is apparently not aware of the strides it has made. Mr. Whalen recently addressed a letter to Alfred J. McCosker, board chairman of the *Mutual* network, congratulating him on the inauguration of the first facsimile network, linking *WOR*, Newark, *WGN*, Chicago, and *WLW*, Cincinnati for experimental transmission.

"The new era we are entering," said Mr. Whalen, "demands adaptation of facsimile broadcasting, natural companion of television, to the many phases of our economic, cultural and spiritual life. It is fitting, indeed that this new means of communication should make its initial bow at an exposition dedicated to the World of Tomorrow."

Thus, *Crosley* will stage the first large-scale demonstration of facsimile in its Fair building. The main exhibit will be the *Crosley Reado*, a printer designed by the *Finch Telecommunication Laboratories, Inc.* Visitors may see printed matter and pictures transmitted over the kilocycles and recorded on paper at the receiving end.

The R. C. A. building also will be the scene of a pretentious facsimile exhibit. Scanning apparatus will pick up the material as prepared in a "City Room" in newspaper style and reproduce it on receivers in the *Radio Living Room of Tomorrow*. This equipment will transmit at the rate of one eight by twelve page every eighteen minutes and is intended for home use.

DON LEE Television station *W6XAO* is on the air with live talent and film programs for an hour each night, Mondays through Saturdays, in addition to the weekly daytime transmission. Activities of the sight-sound station are under the supervision of Harry R. Lubcke, television director of the Don Lee Broadcasting System.

RADIO ENGINEER Charles Norton couldn't wait for *General Electric's* television studio at the *New York World's Fair* to be completed. He mounted one of the new *GE* table model television receivers on the roof of the building in order to test its reception quality and locate principal interference sources. One of the principal hazards to overcome is less than 50 feet away—the 10,000,000-volt lightning generator in Steinmetz Hall.

—30—

QRD?

(*Continued from page* 30)

the large principal centers over the country.

TO scare the radiop further, is the coming convention between *ARTA* officials and shipping owners for the purpose of ironing out the difficulties which have cropped up since the shippers have decided to install phone equipment on Lake vessels. The *ARTA* men are going to insist on their ops being present when the eqipment is being operated. What the outcome of this one-sided affair will be is a hard question to answer. All is in the lap of the Gods but unfortunately, progress cannot be halted, in spite of the fact that the reliability of telegraphy can't be beat.

'TIS indeed strange, this working of the Fates. About two years ago, your scribe contributed his quaint(?) philosophy to a situation that was causing the whole radiop union situation to rock. The *CTU-Mardiv* was emerging from the chaos of doubt, and for other reasons, from the *ARTA*. At that time I remarked as how the radiop might emulate the *femme* who, being fought over by two suitors, decided to marry a third as the lesser of the two evils. And now we see the emergence of a third union known as the *ARTA of Louisiana, Inc.* . . . This is being led by Fred Howe, the former secretary of Local No. 2 of the *ARTA*. What the outcome of this whole disagreeable situation will be, is still undecided. But what it is doing to the morale of radiops in general is the thing to fear. They have been treated, mistreated and defeated time and time again by intrigue, selfishness and envy until the time may be close at hand when a radiop won't know whom to call friend. If this whole setup should go under the waves of distrust, ye ed does not believe that there ever will be another organization for radio officers. The only thing wrong is that every faction thinks they are right. So with this for a thought and with 73 . . . ge . . . GY. —30—

Semi-Professional Recording

(*Continued from page* 39)

A complete survey on the choice of microphones and circuits will be found in the article entitled "Mikes, Mixers, and Monitors" which appeared in the August 1938 issue of RADIO NEWS. All types of microphones were discussed.

Now, let's make a record; assuming that we wish a recording of some favorite artist or orchestra that will be on the air in a few minutes, we place a new disc on the turntable after dusting off any dust or finger marks. The selector switch as shown on the diagram turned to the "record" position from the amplifier, and the tuner or receiver tuned accurately to the station wanted. This output should be further adjusted to bring the combined level to that selected and noted from our previous tests. The recording head is slid over to the inside of the disc in readiness for action.

If an announcement is made and not wanted on the record, we can stand by until the "build-up" is nearly over. Start the turntable and carefully lower the head down onto the revolving disc. Watch the db. meter all the time the recording is going on, as by this observation, proper operation can be made on later recordings.

(*Next page, please*)

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By using two duplicate tables and cutting heads, continuous recordings can be made of entire programs, etc. In this case, both of the cutting heads must possess the same characteristics if the same quality and response is to be enjoyed. If one table turns either faster or slower than the other, a difference in pitch will result when played back, so it is imperative that each table turn at *exactly* the same speed. This may be checked by means of a stroboscope and neon lamp.

For playback, the switch should be placed in playback position as marked on the panel. This connects the playback pickup to the input of the amplifier and the speaker to the output of the amplifier in place of the cutting head. Recordings can also be made from microphone pickup by placing the switch to proper position which connects the mike to the input and the output to the cutting head.

In conclusion, let it be remembered that there are occasions now and then for special types of recordings such as sound effects, etc. The larger cities present ample opportunity for making such specimens and by a bit of careful planning, many interesting subjects will be found for this interesting work. Keep all of the equipment clean and well lubricated, clean the rubber parts with alcohol and grease the cutting feed screw with vaseline. —30—

5-10 M. Transmitter
(*Continued from page* 29)

feet for 5 meters or 8 feet for 10 meters.

If desired, a heavy (No. 10 or larger) two wire cable may be used from the car battery to the portable units when used at a camp location. These leads may be twenty to fifty feet long if they will carry the 8 to 10 amperes required from the battery.

Tuning is accomplished by selecting the band wanted on the switch and rotating the meter switch to its first position. "Osc. Plate" and tuning the Osc. condenser for a sharp dip on the meter, indicating resonance. The "Amp. Plate" condenser used should likewise be tuned with antenna connected to maximum output or a plate reading of 60 ma. maximum, the average current being about 50 ma. at resonance or minimum dip on the meter in the far left hand switch position. Grid current to either HY60 tube may be read on the 0-50 ma. scale on the meter and this reading will be from 3 to 4 ma. maximum. Plate volts to the 6J5G tube should not exceed 250 and the Amplifier tubes 350 volts and 200 volts screen. Note that plate and screen modulation is employed and that the screen dropping resistor terminates after the point of modulator transformer output.

Type 6L6 tubes may be used in place of the HY60's but these will require neutralizing and will be harder to adjust on 5 meters, as the plate connection is at the bottom of the tube rather than from a top cap, which would re-

quire long plate leads to the tuning coil-condenser.

If c. w. is to be used on 10 meters, the transmitter may be keyed in the Osc. Cathode return to ground.

Winding of the three tank coils may be done quite easily by using a ⅝" dia. dowel rod for a winding form. One end of the wire may be held in a vise and then by walking towards the vise while turning the form, the wire may be kept taut and should be close-wound. All of the coils are wound with No. 12 copper wire. L consists of 8 turns No. 12 with turns spaced after winding to one wire diameter. L2 has 12 turns No. 12 spaced to a length of 1½". L3 has 4 turns No. 12 spaced to a length of ¾".

If a link is desired to be used with concentric cable, etc., the approximate number of turns will be as follows: L4, 2 or 3 turns No. 12 which should be adjusted for coupling until plate reading reads normal. L5, 1 or 2 turns spaced one diameter and coupling adjusted for normal plate current.

The tap to the Osc. plate coil will be about two turns down from the plate end. —30—

Within Earshot

(*Continued from page 4*)

The unit will consist of three chassis. The first will contain the Cathode-Ray tube and associated circuits, the second the power supplies and the third the RF tuning details. By utilizing this method, the experimenter and home builder will always be able to keep abreast of the times and try out the latest RF circuits without tearing down the entire receiver. The circuit is a composite of all those that Mr. Thompson has been able to digest, and will present the best features of each. Watch for the 1939 RADIO NEWS TELECEIVER!

* * *

NEXT month we will bring out our newest creation, the "All-Purpose" transmitter-receiver. It should delight the heart and soul of every marine fan, and ham. Fuller details of this unique instrument will be found on page 61 of this issue. All month the office has resounded to the whine of electric drilling and sawing, and the result will really be "something to write home about." We plan to exhibit it at the Radio Part Show in June in Chicago. If you are there do not fail to drop up to our room and see it.

Incidentally, while we are on the subject, we want to thank all the manufacturers who made the construction of the unit possible. More on that will appear in the articles which commence with the July issue of R. N.

* * *

MUCH has been written about facsimile, and much has appeared in the papers about this fascinating subject. We have been able to get a loan of one of these instruments, and plan a story of just how much of a thrill it is to get up in the morning and read the news that was received during the night. A full construction of this unit will appear here soon. Watch for it!

* * *

YOU, servicemen! Have you ever wondered just what kind of a set with which to stock your shelves? Have you ever thought that if you could guess correctly just what sort of merchandise your customers would buy, that you could increase your profits and cut down on the dead wood in your store? Well, we are going to try and help you. We cannot tell you exactly what you should buy for resale, but we hope to be able to indicate what has been selling in communities like yours, so that you may be guided. Watch for our "Serviceman's Survey of Sales."

* * *

SUMMER will soon be upon us, and we wish to run some story of a ham's radio vacation much the same as we did last year. If you have interesting experiences with your portable rig, and would like to tell the fraternity about it, do not hesitate to send in a MS on it with pix. We will be happy to feature it in the September issue.

* * *

BY the time that this reaches you, television will be here in the main cities of both coasts and probably also in Philadelphia and Chicago. The serviceman will be wise to make himself familiar with the servicing of these sets, and also keep himself informed on the newer developments in the field of shortwave radio. With the world going from one War Scare into another, the shortwave broadcast will become more and more popular, since many will want to hear what is going on first hand. Remember that good shortwave reception is somewhat dependant on antennae and the general installation. Freedom from noises which drown out the foreigners is also a help. It will pay handsome dividends to be on the alert with the shortwave customer. It will also be profitable.

* * *

ONE of the most frequent inquiries is, "What radio school shall I attend?" We are not in a position to differentiate between schools, since we believe that for the most part, each school gives just what you pay for. The best schools are those which will always send you a prospectus in advance so that you can pick out the course of study that appeals to you.

In the final analysis, we think that the finest of them all is that maintained by the U. S. Army in the Signal Corps. Information on the Signal Corps can be had from the Army Hdqtrs nearest your home, or from the War Dept. in Washington, D. C.

* * *

AND that seems to wind up another column for the month. K. A. K.

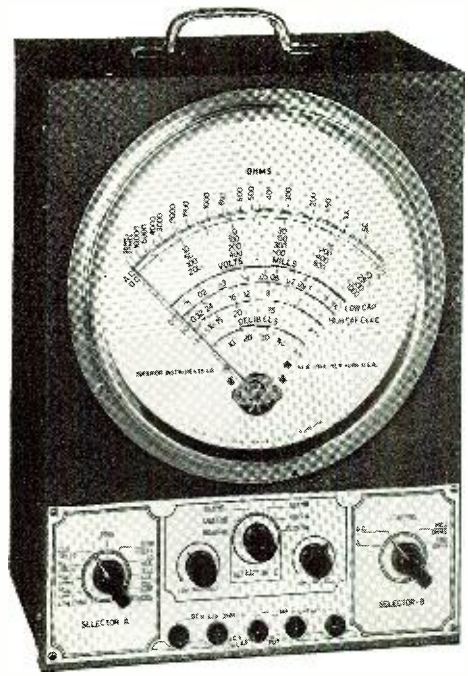
—30—

SUPERIOR PRESENTS 5 INSTRUMENTS from its NEW 1939 1100 series!!!!!! Never before has Superior offered so much for so little! Always the Best Buy in the Instrument Field, Superior in this new 1100 series gives you even more value! We have incorporated many refinements, many new features . . . all proven to be sound and practical. We urge you to read the descriptions below carefully; see how these instruments fit your needs. Buy direct from manufacturer and save 50%.

Superior Instruments Are Guaranteed for One Year

Superior Announces —for the First Time!!

THE NEW GIANT NINE-INCH
X-RAYOMETER



FEATURES:

★ Built-in power supply enables resistance measurements up to

30 MEGOHMS

(Without external batteries or power supply)

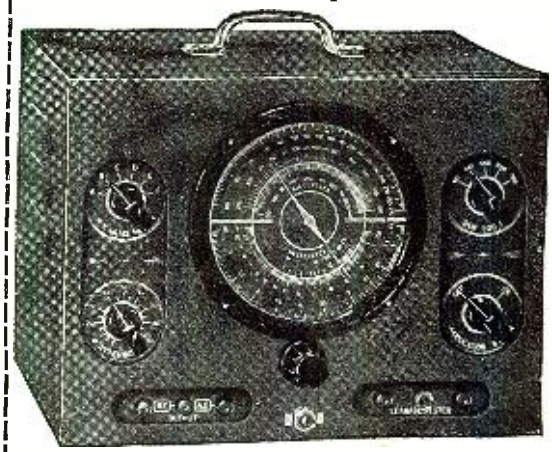
★ ½ Ohm easily read on low ohm scale
★ D.C. volts up to 2500 volts
★ A.C. volts up to 1000 volts
★ D.C. currents up to 25 amperes
★ 2 Capacity Ranges. Micas, papers, electrolytics read up to 50 Mfd. 2% ACCURACY.
★ PERCENTAGE OF LEAKAGE of electrolytics read DIRECTLY on scale.
★ Insulation, inter-elements and all other leakages directly read up to 30 megohms
★ 4 Output Ranges up to 1000 volts
★ 2 Inductance Ranges up to 703 Henries
★ 3 Decibel Ranges
★ Cathode Ray high voltage power supplies easily measured

SPECIFICATIONS:

Resistance Measurements in three ranges: 0—1000 ohms, 0—100,000 ohms, 0—30 megohms. Less than 1 ohm easily read on meter scale. D.C. Voltage measurements in five ranges: 0-50/0-250/0-500/0-1000/0-2500 Volts. **Television and other high voltage power supply circuits easily measured.** A.C. Voltage measurements in four ranges: 0-50/0-250/0-500/0-1000 Volts. D.C. current measurements in five ranges: 0-50/0-250/1 Amp/10 Amps/25 Amps. High current ranges suitable for automotive and industrial work. Capacity directly read on meter scale in two ranges: .005—1 Mfd./2 Mfd.—50 Mfd. Percentage leakage of electrolytic condensers directly read on meter scale. Actual condition of condenser quickly determined. Insulation, inter-element and A.V.C. leakages directly read on meter scale up to 30 megohms. Output measurements in four ranges: 0-50/0-250/0-500/0-1000 Volts. Built-in blocking condensers enables rapid alignment of radio equipment. Inductance measurements in two ranges: 1—7 Henries/7—703 Henries. Decibel measurements in three ranges: —10 — +29/—10 — +43/—10 — +49. Audio frequency measurements in both radio and P.A. amplifier.

X-Rayometer utilizes an etched aluminum panel and comes housed in a new army grey crystalline, heavy-gauged cabinet. Complete with test leads and instructions. Size 13⅜" x 10" x 6". Shipping weight 20 pounds. Our net price..... **$17.95**

THE NEW MODEL 1130-S
SIGNAL GENERATOR
WITH AUDIO FREQUENCIES



SPECIFICATIONS:

1. Combination R.F. and Audio Signal Generator, R.F. 100 kc. to 100 Mc., A.F.—100-7,500 cycles. All Direct reading, all by front panel switching. 2. R.F. and A.F. output independently obtainable alone or with A.F. (any frequency) modulating R.F. 3. Accuracy is within 1% on I.F. and Broadcast bands; 2% on higher frequencies. 4. Audio frequencies in 5 bands; 100, 400, 1000, 5000, and 7500 cycles. 5. Giant airplane full vision, direct-reading dial. 6. Condenser and other leakages tested to 100 megohms. 7. All services on 90-130 volts A.C. or D.C. (any frequency).

Model 1130-S comes complete with tubes, test leads, carrying handle, instructions. Size 12" x 9" x 6½". Shipping weight 15 pounds. Our net price..... **$11.85**

THE NEW MODEL 1150-S
SUPER-ALLMETER
Featuring the New Sloping Panel

A genuine achievement! For accurate and rapid measurements. Note the following features: A.C. and D.C. Volts. A.C. and D.C. currents. Resistance. Capacity. Inductance. Decibels. Watts.

SPECIFICATIONS:

D.C. Voltage: 0-15, 0-150, 0-750 volts D.C.
A.C. Voltage: 0-15, 0-150, 0-750 volts A.C.
D.C. Current: 0-1, 0-15, 0-150, 0-750 ma. D.C.
A.C. Current: 0-15,0-150, 0-750 ma. A.C.
2 Resistance Ranges: 0-500 ohms
500-5 megohms
High and Low Capacity Scales: .0005 to 1 mfd. and .05 to 200 mfd.
3 Decibel Ranges: —10 to +19, —10 to +38, —10 to +53.
Inductance: 1 to 700 Henries
Watts:

Based on 6 mw. at 0 D.B. in 500 ohms, .006000 to 600 Utilizes new 4½" square 0-1 d'Arsonval type meter with precision resistors housed in our newly devised sloping case for rapid and accurate servicing. Model 1150-S supplied complete with test leads, tabular charts and instructions. Size 10" x 7¼" x 4¼", shipping weight 9 pounds. Our net price..... **$11.85**

PORTABLE COVER 75c ADDITIONAL

THE NEW MODEL 1180-S
SET TESTER
A Complete Laboratory All in One Unit!

Featuring Our New Type Sloping Panel for Precise and Rapid Servicing

A complete testing laboratory all in one unit! Combines Surerior models 1140-S and 1150-S. For specifications read the description of both these models herewith. Comes housed in sturdy, black case with sloping panel for rapid and simple measurements. Complete with test leads, tabular charts, instructions and tabular data for every known receiving type tube, including many transmitting types. Size 11¼"x9¼"x5"; shipping weight 18 pounds . . . Our net price.... **$17.85**

PORTABLE COVER 95c ADDITIONAL

THE NEW MODEL 1140-S
TUBE TESTER

A really modern tube tester conforming to all standards of good engineering practice. Utilizes a 3" d'Arsonval type meter with calibrated scale. Furnished in a sturdy black case with sloping panel for easy operation. Removable cover and carrying handle for either portable or counter use.

SPECIFICATIONS:

1. Tests all 4, 5, 6, 7, 7L, octal and loctal base tubes, including diodes.
2. Tests by the well-established emission method for tube quality, directly read on the GOOD—BAD scale of the meter.
3. Affords separate neon test for leakage and shorts between elements.
4. All services performed by the use of only five controls at maximum, and many tests do not require working all the controls.
5. Supplied with instructions and reference table so that the filament voltage and emission measuring controls may be properly set for the enumerated long list of tubes, which includes all tubes commonly encountered in servicing.
6. Works on 90-120 volts A.C. 60 cycle.

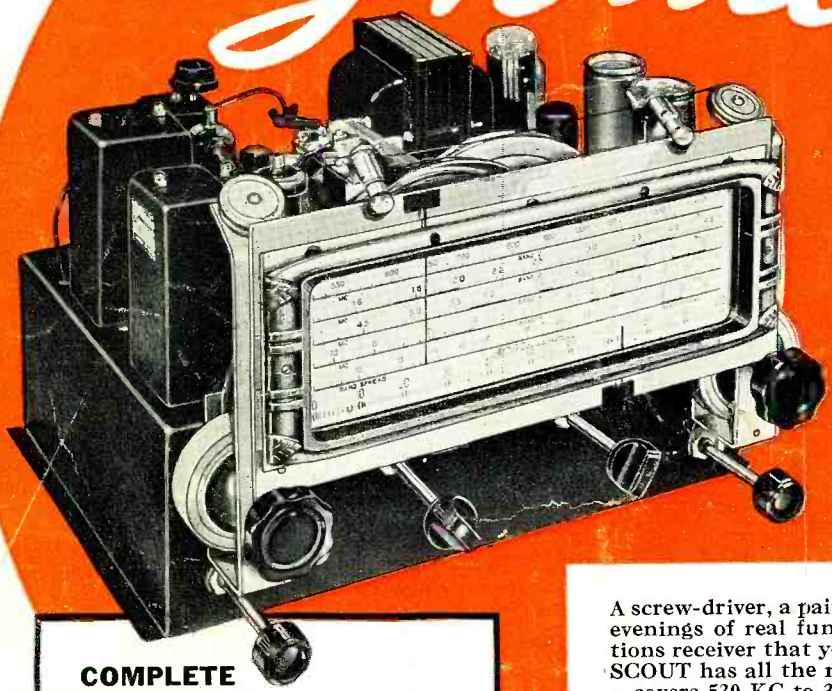
Model 1140-S comes complete with instructions and tabular data for every known receiving type of tube as well as many transmitting types. Shipping weight 10 pounds, size 10" x 7¼" x 4¼". Our net price..... **$10.85**

PORTABLE COVER 75c ADDITIONAL

SUPERIOR INSTRUMENTS CO.
136 Liberty St., NEW YORK, N. Y. RN6

YOU'LL BE PROUD TO SAY

"I Built It!"



8 Tube Traffic Scout Communications Receiver Kit

A screw-driver, a pair of pliers, a soldering iron, a few evenings of real fun—and you have a communications receiver that you'll brag about. The TRAFFIC SCOUT has all the most desirable amateur features—covers 530 KC to 32.4 MC (9.25 to 565 meters) in 5 bands; 530-1575 kc, 1.51-4.6 mc, 4.18-12.5 mc, 7.3-18.5 mc, 11.2-32.4 mc. Has the new Meissner electrical bandspread and flywheel tuning, Ferrocart (iron core) I. F. Transformer, and full vision Slide Rule Dial.

Every detail has been simplified by the Meissner engineers to make this receiver easier to assemble. The coil assembly is fully wired and mounted on the wave-change switch ready for use, completely air-tuned and pre-aligned. The chassis is factory drilled—all you need do is connect the parts terminals with hook-up wire according to the detailed and easily read pictorial wiring instruction sheets and you have a receiver with unexcelled performance, one you'll be proud to put through its paces. And it's guaranteed to work or we'll fix it for you!

See the TRAFFIC SCOUT at your Parts Jobber, or write Dept. N-6 at the factory. Ask for FREE 44 page catalog describing AC and Battery operated Meissner Kits from 1 to 14 tubes.

COMPLETE KIT OF PARTS

Includes the following: Pre-aligned 5-band Coil Assembly; 3-gang electrical band-spread tuning condenser; band-spread dial and escutcheon; punched and drilled chassis; Ferrocart (Iron Core) I. F. transformers; B. F. O. transformer; volume and tone controls; switches; sockets; power transformer; electrolytic, paper and mica condensers; resistors; miscellaneous small parts; screws, nuts, washers, etc.; hookup wire; solder; complete pictorial and schematic diagrams as well as clearly written instructions for assembling, wiring and operating. (Parts Kit does not include Panel or Cabinet.)

NEW!

120 PAGE COMPLETE INSTRUCTION BOOK!

Packed with theory and technical data. Easy-to-understand graphs, charts, pictorial and schematic diagrams, alignment data, constructional data and operating instructions for 20 new Meissner receiver kits. Also information on adapters, converters. At your Parts Jobber—or order direct. Address Dept. N-6

Meissner

MT. CARMEL, ILLINOIS

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