

MARCH
30
1935

Beginning with Next Issue RADIO WORLD
Will Be Published Monthly — See Page 2

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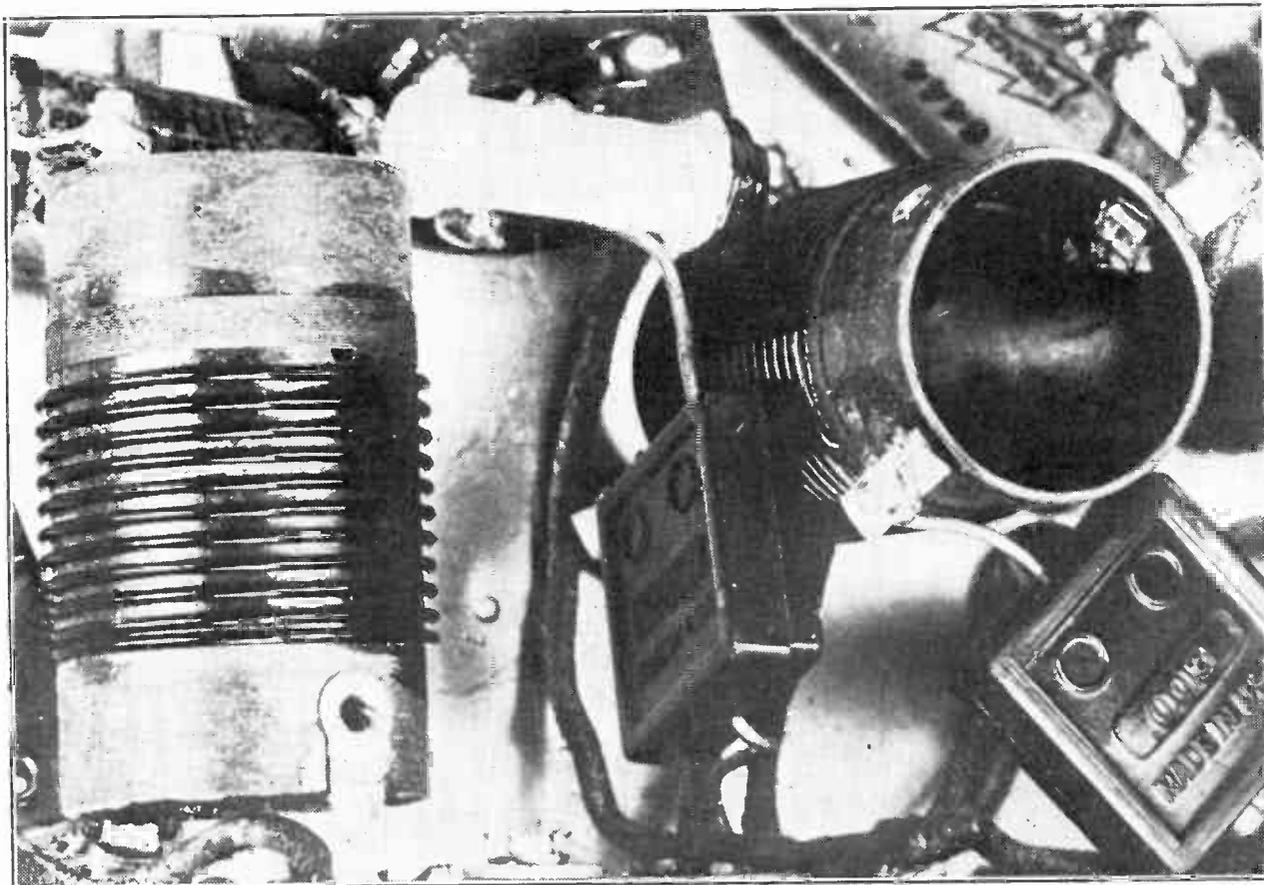
WORLD

679th Consecutive Issue — 14th Year

Canada Seeking
Cross-Continent
Television

Special Rectifiers
In Popular
Circuits

AMAZING 5-TUBE SET



Photograph by Herbert E. Hayden

The type and placement of coils have much to do with the success of a two band set designed by Jack Goldstein. See page 3.

With the Next Issue
RADIO WORLD
Will Be Published As
A Monthly Magazine

HAVING completed thirteen years as a weekly, during a period when weekly service was essential although the size and content of the magazine necessarily were restricted, RADIO WORLD with its next issue will be published on an entirely new and enlarged basis as a monthly in a new format. The issue will be dated April-May, and will be on the news-stands April 15. The following issues will be June, July, August, etc., one for each month, and all will consist of a large increase in the number of pages and illustrations and will have color on the front and back covers. Each issue will be out on the fifteenth of the month preceding the date of the issue.

The publishers announce that RADIO WORLD will publish articles of the how-to-make-it variety, and that the photographic and other illustrations will be exceedingly numerous. There will be accompanying text, but the graphic element will be stressed.

The price per copy will be 25 cents; per year (12 issues), \$2.50, postpaid in United States and Possessions; \$3.00 per year in Canada and all other foreign countries.

News-stand distribution will be maintained in the United States and Canada through The American News Company, Inc., and Branches, constituting the largest periodical distributing agency in the world.

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RADIO WORLD

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Price, 15c per Copy; \$6.00 per Year by mail. \$1.00 extra per year in foreign countries. Subscribers' change of address becomes effective two weeks after receipt of notice.

Entered as second-class matter March, 1922, at the Post Office at New York, N. Y., under Act of March 3, 1879. Title registered in U. S. Patent Office. Printed in United States of America. We do not assume responsibility for unsolicited contributions, although careful with them.

FOURTEENTH YEAR

Vol. XXVII

MARCH 30, 1935

No. 3. Whole No. 679

Published Weekly by Hennessy Radio Publications Corporation, 145 West 45th Street, New York, N. Y.

Editorial and Executive Offices: 145 West 45th Street, New York

Telephone: BRyant 9-0558

How Expert Got Most Out of Five Tubes

JACK GOLDSTEIN'S STORY OF HIS AMAZING TWO BAND SET

(Photographs by Herbert E. Hayden)

WHAT is the most obtainable from five tubes for an a.c. design?

First, one tube is the rectifier. So we have to produce receiver results on four tubes. The circuit has to be a superheterodyne. We are therefore restricted to one stage of intermediate frequency amplification. The pentagrid converter tube has to be used, so we have a second detector and some audio amplification. Using a diode detector with amplifier tube in the same envelope, we have two stages of audio, the last being a pentode power tube.

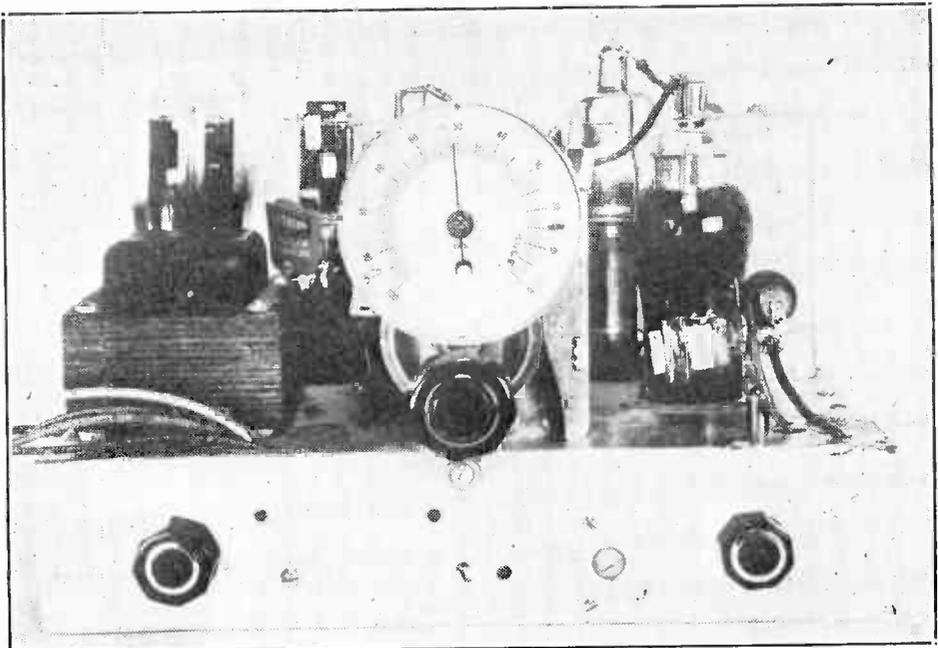
There can be some variation from this basic pattern, but not much. The problem of attaching weights to certain considerations arises. Shall there be automatic volume control? It is present in the design shown. Leave it out and you have more sensitivity, but as it is the sensitivity is high enough, a few microvolts per meter, really.

Proved by Performance

Accepting certain basic requirements, like low hum level, diode detection, automatic volume control, two-gang condenser and coil system, for such a small circuit, we have the maximum of results from the diagram as shown. This is not just a theory as the result of multiplying turns ratios by amplification factors to produce alluring mathematical products, but is the result of seven years work.

During that period the author has been in charge of production in a licensed radio set factory, and in such a place dope dreams have no standing, only results count, and much time and money are spent on solving the ever-present problem of getting more and more results with fewer and fewer parts and tubes. Not only that, but the very receiver being described, which is a two-band job, 530-1750 kc. and 5,300-17,500 kc., is on exhibition in RADIO WORLD's office, not that everybody can make trips from various points about the globe just to hear the set, but simply as proof of completion of every last convincing detail.

Looking at the diagram the reader will find little that he is not familiar with, perhaps nothing that he has not seen many times before. It is or should be encouraging to find that a diagram is standard. The other fellow's originality that precedes authentication is always expensive. However,



Front is very conventional. But read the article.

there are a few little things—big in importance—that one may overlook.

The Coils Are the Things

The trap circuit across the antenna primary winding is one feature. This is tuned approximately to the intermediate frequency, to reduce almost to nothing the voltage of carriers at or near the intermediate frequency of 456 kc. The trap consists of two windings, opposite ends open, the distributed capacity of each coil and the capacity between coils being used in connection with resonance and coupling.

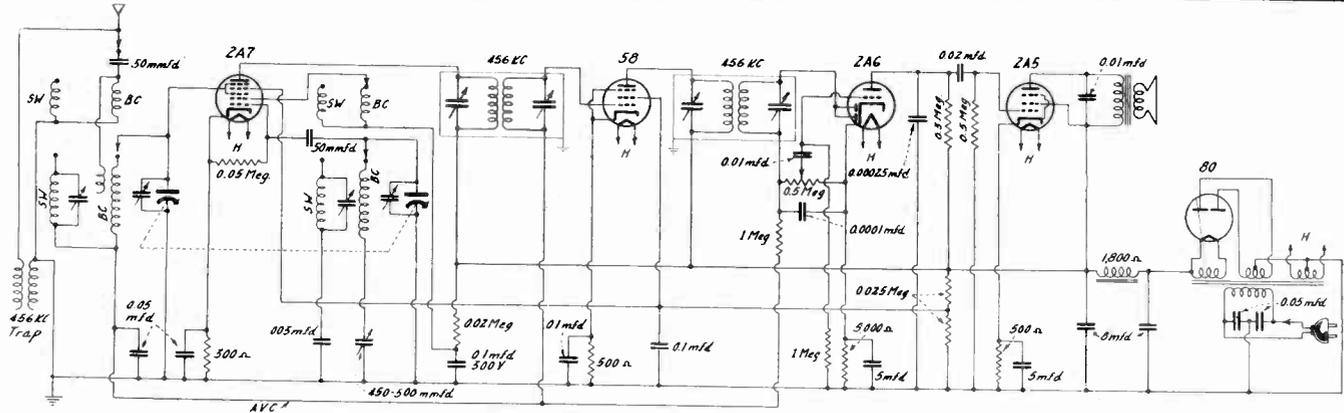
The second feature also has to do with coils. In fact, the coils are the crux of the receiver. Everything else may be right but if the coils are not just as close to perfection as human skill can make them, results will be very disappointing. It is necessary not only to have the secondary inductances correct, but also to have the primaries just

right and the coupling between primary and secondary likewise.

To take care of the tracking, since equal section tuning condensers are used, a 450-500 mmfd. compression variable serves for the broadcast band, adjusted once, say, at 600 kc., while for the short wave band a fixed condenser of 0.003 mfd. suffices. For the broadcast band the trimming for the high frequency end is done with the compression type capacity on the condensers, while for short waves independent condensers are added. The frequency ratio is not reduced for the short waves compared to the broadcast band because the additional capacity mentioned is very small and does not amount to much more than the difference in distributed capacities between the short wave and the broadcast coils.

The Antenna Treatment

One of the reasons for the keenness of
(Continued on next page)



(Continued from preceding page)

the set is that the coils are not shielded at the radio frequency level. Of course if there were a stage of t.r.f. there would have to be shielding. The sensitivity of the receiver has to be high, from antenna input on to the very speaker terminals, so that for the broadcast band in particular it will not be necessary to put much into the mixer tube from the antenna. There is a single tuned stage here, and if the input were strong, the value of off-resonant voltages that would get by to the oscillator for mixing would be too strong. If the antenna is electrically short, then there will be no trouble, provided tracking is established, and few if any "birdies" will be heard. This is due to the increased selectivity arising from loosened coupling between the receiver and the transmitters, to the same effect as adding a tuned r.f. stage.

As an actual demonstrated example, using a wire from table top to floor as aerial, all the metropolitan New York stations were brought in well, until and including WEAJ, or a range of 1500 to 660 kc., but for frequencies lower than 660 kc. the pickup was insufficient, and 610 kc. (Philadelphia) and 570 kc. were not heard, until a finger was touched to the antenna post, an illustration of antenna lengthening.

Selecting Antenna Length

It is therefore advisable to have the antenna electrically long enough to bring in these stations, say, 650 to 530 kc., but no longer. To avoid the necessity of switching physical antennas, a series condenser of 50 mmfd. is used for the broadcast band, but is not used for the short wave band, because there we must have all the pickup the system can stand, and the field intensities being less, more indeed may be stood.

The superheterodyne is a class of receiver that amplifies frequencies of a band about

equally well, say the broadcast band in its entirety, if the amplification is largely derived from the i.f. level. That derivation is true even of so small a set as this one. Yet lest there be any disfavoring of the low radio frequencies of the broadcast band, the antenna primary is made large, being of greater inductance than the secondary, but the coupling between the two windings is by means of a single turn of wire and some mutual inductance. Also in this manner does the tracking under dummy antenna conditions, as prevail in a modern factory, remain safeguarded despite the type or length of antenna used. So antennas of practically any length may be used with the receiver as diagramed. Up to 100 feet, with 38 foot elevation, was tried.

Litz Intermediates

The intermediate coils have to be of the superior type, wound with Litz wire, in pies, with rather loose coupling, to support the desired selectivity, yet not of the bandpass type, since that type requires an oscilloscope for lining up. The coils recommended, and the ones used in the set, require only an output meter for lining up. Bandpass coils, if used by the meter method, result only in selection of peak voltages, perhaps one peak or the other and therefore sacrificing selectivity when not aligned visually (oscilloscope). Any who have oscilloscopes may substitute the band-pass type coils and line up visually.

Sensitivity, as has been stated, is a few microvolts per meter, and of course depends largely on the accuracy of adjustments. Selectivity is sufficient on the broadcast band to enable blotting out a powerful local and bringing in a distant station 20 kc. removed, without any interference from the local. This result obtains with long aerials. With a short indoor aerial, the strong local does not disturb reception from a distant station

LIST OF PARTS

Coils

- One antenna coil for broadcast band (universal wound)
- One oscillator coil for broadcast band (universal wound)
- One antenna coil for short wave band
- One oscillator coil for short wave band
- One intermediate transformer to feed i.f. stage (456 kc)
- One intermediate transformer to feed second detector (456 kc)
- One power transformer

Condensers

- One two gang 0.0004 mfd. tuning condenser with trimmers
- Two 50 mmfd. fixed condensers
- One 0.0001 mfd. fixed condenser
- One 0.00025 mfd. fixed condenser
- One 450-500 mmfd. compression type condenser
- One 0.003 mfd. fixed condenser
- Two 0.01 mfd. fixed condensers
- One 0.02 mfd. fixed condenser
- Four 0.05 mfd. tubular condensers
- One 0.1 mfd. 300 volt rating
- One 0.1 mfd. (200 volt rating)
- Two 5 mfd. electrolytic condensers (35 volt rating)
- Two 8 mfd. electrolytic condensers (400 volt rating)

Resistors

- One 300 ohm resistor
- Two 500 ohm resistors
- One 20,000 ohm resistor
- One 50,000 ohm resistor
- One 0.4 0.3 meg. resistor
- One 0.5 meg. resistor
- One 0.5 meg. potentiometer with switch
- One 1 meg. resistor

Other Requirements

- Five sockets: one four hole, three six hole, one seven hole medium.
- One dynamic speaker with 1800 ohm field and output transformer
- One a.c. cable and plug
- One chassis
- Two tube shields, one four pole double throw switch, one dial, three grid clips.

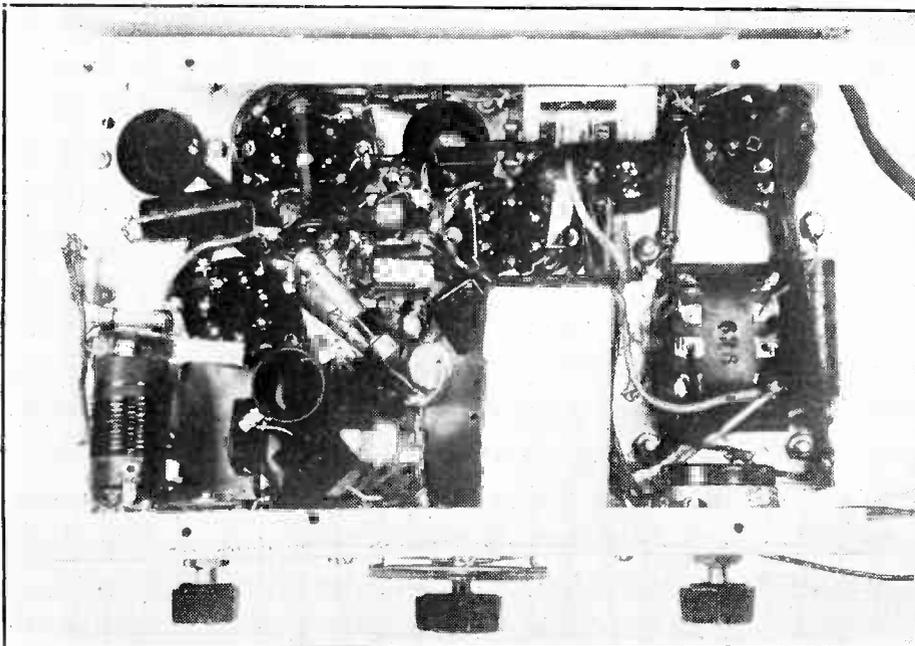
10 kc. removed, but volume is somewhat less. As for tone quality, this will depend largely on the type speaker used, the size of the speaker and baffle, and the inclusion of some damping of the high audio tones, to avoid pentode shrillness.

Other Points of Interest

This damper in the circuit is the 0.01 mfd. condenser across the primary of the output transformer. The maximum of tone quality—high fidelity reproduction—is not expected of the small receivers, where the price runs around \$10 or so, compared to \$250 to \$1,000.

There are no doubt some other points of interest in the receiver, so let us review the circuit from front end to rear end, including anything pertinent that we have omitted.

The antenna coupler consists of a separate system of primary and secondary for each



No room to spare. This is a midget.

of the two bands, with a special pickup turn for the broadcast band. The short wave primaries are of the high impedance type. Automatic volume control is applied to the converter tube, as that is where it is most effective. Also, by the way, it is included in the intermediate stage, but may be omitted from that stage if anyone desires to increase the sensitivity without affecting the a.v.c. much. The new connection would be to return the secondary of the first i.f. coil to grounded B minus instead of to the a.v.c. lead.

Small Grid Condenser

The negative bias on the first tube is made higher than usual, so that there will be no crosstalk interference, or crossmodulation, and there is no trouble from either, nor is there any modulation hum, meaning hum tuned in only with a station, no hum when there is no station.

For the grid condenser of the Grid No. 1 circuit of the 2A7 the value 50 mmfd. (0.0005 mfd.) was selected, as most appropriate with a 50,000 ohm leak, considering the wide differences in frequencies, and the practicality of having only one time constant, extra switching is introduced. Naturally, the less switching, the better.

The output of the converter tube has a relatively large capacity across it, due to the tuning of the plate circuit, so for the short waves the high carrier frequencies are well bypassed, which is important, and indeed even for broadcasts the attenuation is adequate.

For bands the padding is done with the condenser in series at the low end, resulting in a division of the oscillation voltage, practically halving it for the broadcast band. Whatever can be put into a tube at radio frequencies will depend on the voltage drop across the coil, for that voltage is the only voltage there is. If the coil alone were in the grid to cathode circuit, then the full voltage would be put in. In this instance the tuning condenser is not across the coil but across the series circuit consisting of coil and tuning condenser.

Short Wave Padding

In other words, the condensers, padding and tuning, are themselves in series across the coil. Since the two capacities are approximately equal, the oscillation intensity is approximately half. This is done purposely, so that the oscillation amplitude will not be such as to overtax the modulator on weak signals when the a.v.c. is of small effect.

On the short wave band there is some padding, also, but here the voltage drop across the padding capacity is only about one tenth of the drop across the tuning condenser, in other words, nearly full oscillation intensity is utilized. And short wave results are sky high.

It facilitates construction to have these padders grounded. A small increase in the sensitivity will arise from the relocation of these padders, between stator of tuning condenser and coil, but that would mean extra switching operations, and the less switching the better.

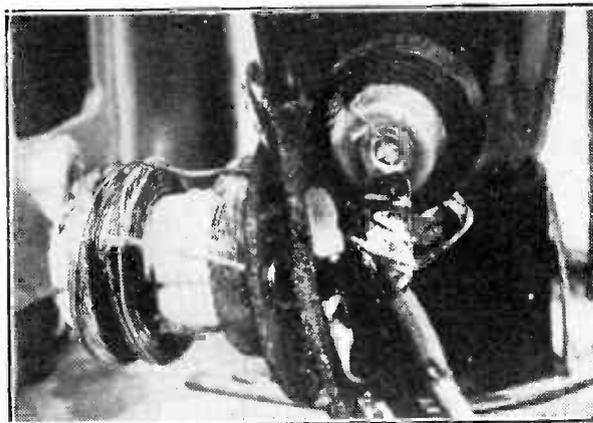
The oscillator plate voltage is limited, and the stability improved, by the 20,000 ohm series resistor, but notice that the 0.1 mfd. condenser across to ground must be of 300 volts minimum rating. A condenser of 200 volts rating will not stand up.

Some delay voltage is used in the second detector circuit from which the a.v.c. is derived. This is the drop in the 5,000 ohm biasing resistor. That is, not until the a.c. signal put into diode exceeds the value of this voltage does the tube rectify. This introduces a threshold value of voltage that has to be attained before anything is heard, and thus there is less noise.

Speaker Field

The two diode plates are connected together externally and the 500,000 ohm diode load resistor is used as a potentiometer to put so much of the rectified voltage into the audio amplifier as desired. The first audio amplifier tube is of course in the same envelope as the diode and consists of a high

The broadcast antenna coil is atop the chassis. The short wave coils are below.



mu triode. The second and last audio stage is the pentode tube.

In the rectifier the choke is the field coil of the speaker, usually 1800 ohms, while the output transformer also is built into the speaker. The 8 mfd. electrolytic condensers are sufficient to keep the hum level below 5 per cent.

The maximum B voltage, after the filter, is 225 volts, the screen voltage is around 100 volts, and under these conditions even a small power transformer "runs cool." Those desiring to use 6.3 volt tubes may do so simply by using a transformer with 6.3 volt secondary, and having the tubes the 6A7, 6D6, 6A6, 42, with the 80 retained.

Three G. E. Publications

Three publications on theoretical and experimental electronics and electron-tube applications, originally published for educational institutions have now been made available to the public, at a nominal charge, by the General Electric Company, Schenectady, N. Y.

"Electronics and Electron Tubes," by E. D. McArthur, gives in easily understood language the fundamentals underlying the vacuum tube, and including simple experiments.

Universal Microphone Co., Inglewood, Cal., has made a change in its current model combination pick-up and recorder. A new adjustable arm length will be standard on all its pick-ups and recording equipment. The 12-inch record, to be played properly, should have an arm of 18 inch length, while the 16 inch record requires one of 24 inches.

The adjustment allows maximum length in any installation and also makes it possible to change the length of the arm after the installation is made.

Biggest Mica Condensers

An order for the largest sized mica dielectric fixed capacitors ever made has been successfully filled by the Cornell-Dubilier Corporation, condenser manufacturers, of 4377 Bronx Boulevard, Bronx, N. Y. City. Standing three feet high and twenty inches in diameter in their oil-filled aluminum cases and weighing 300 pounds each, these units are capable of carrying 150 amperes of radio frequency current, or continuous operating voltages up to 15,000 volts, according to their designer, William Dubilier, vice-president of the company.

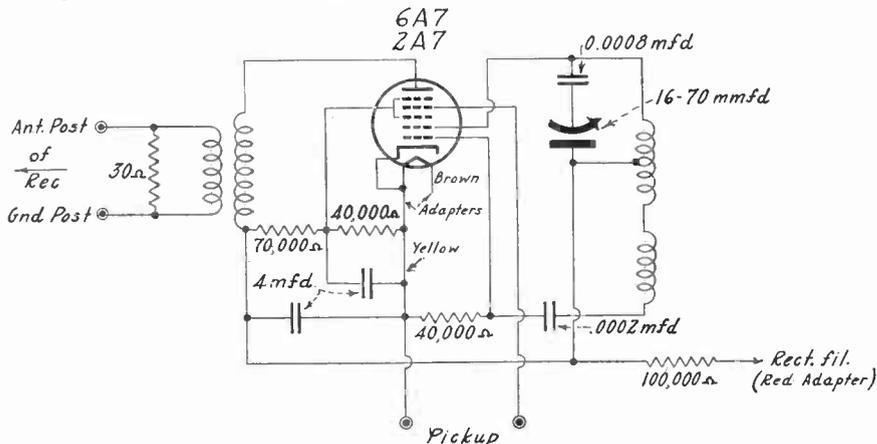
This unusual power-handling capacity is made possible by a unique wheel-like construction. The capacitors consist of four rings of condenser units, each ring having six stacks of specially tested and impregnated condensers arranged radially around a central suspension shaft like the spokes of a wheel. The spokes are staggered to allow free circulation of the cooling oil. The actual capacitance is .02 mfd., and the power factor only .008 per cent.

PHONOGRAPH OSCILLATOR HINTS

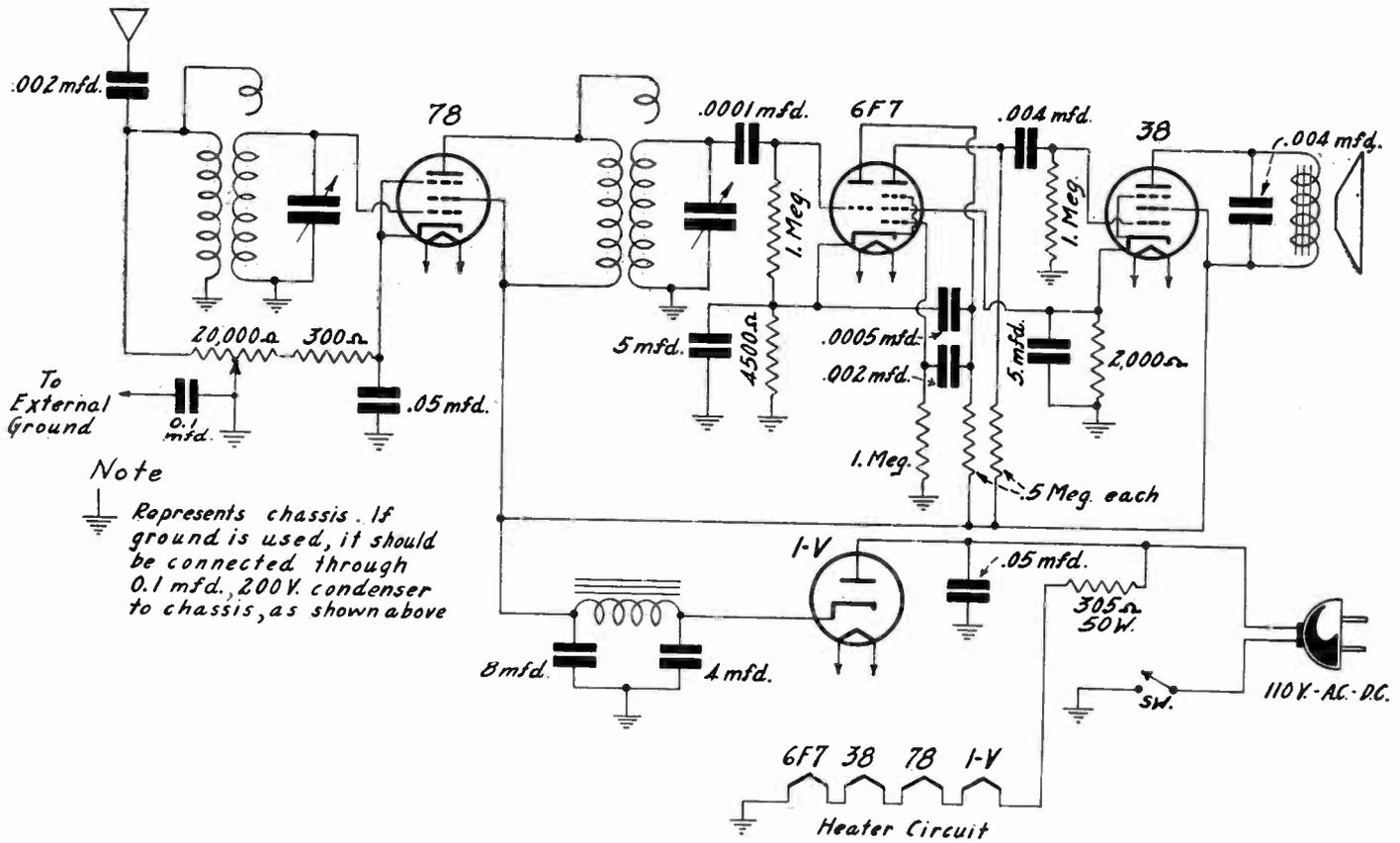
In the construction of a phonograph oscillator, to permit connection of the pickup to the oscillator, output of which connects to the receiver for full amplification at radio and audio frequencies, care should be exercised so that the pickup does not connect to a.c. line. If it does, there is danger of a short if contact is made to grounded chassis by one pickup outlet, where the pickup side is "hot".

If a phonograph oscillator is to be used with a set, the B voltage may be taken from the receiver rectifier, as shown, and then the screen, suppressor or grid may be used for modulation. In the illustration the amplifier control grid is used. Ground is picked up automatically from the receiver without peril because the receiver heater circuit is grounded.

It is necessary to use a high impedance type of pickup with a phonograph oscillator, otherwise to connect a transformer between pickup and oscillator, with low impedance matching to pickup and high impedance secondary to the input of oscillator.

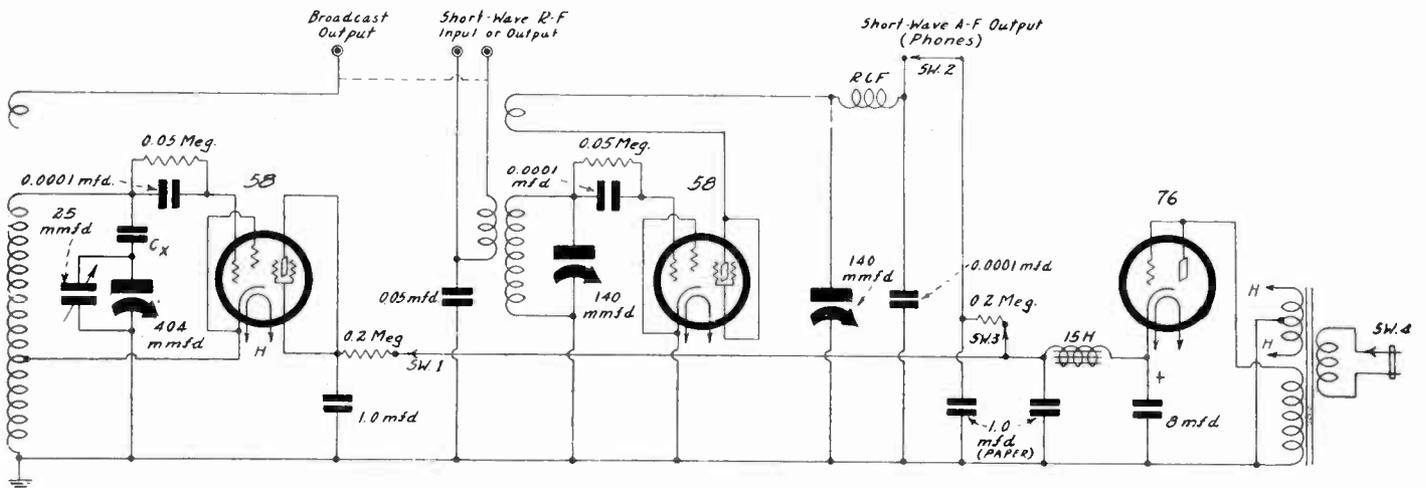


Circuits With Special Rectifiers



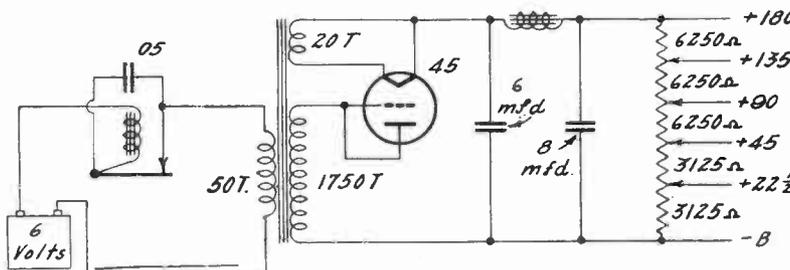
Note
 Represents chassis. If ground is used, it should be connected through 0.1 mfd., 200V. condenser to chassis, as shown above

The 1-V is a half-wave rectifier, useful in universal sets particularly, especially when the current drain is not high enough to warrant the use of the 25Z5, although even that is not to be considered a high current type rectifier by any means. The circuit is one of the simplest four tube t.r.f. midgets.



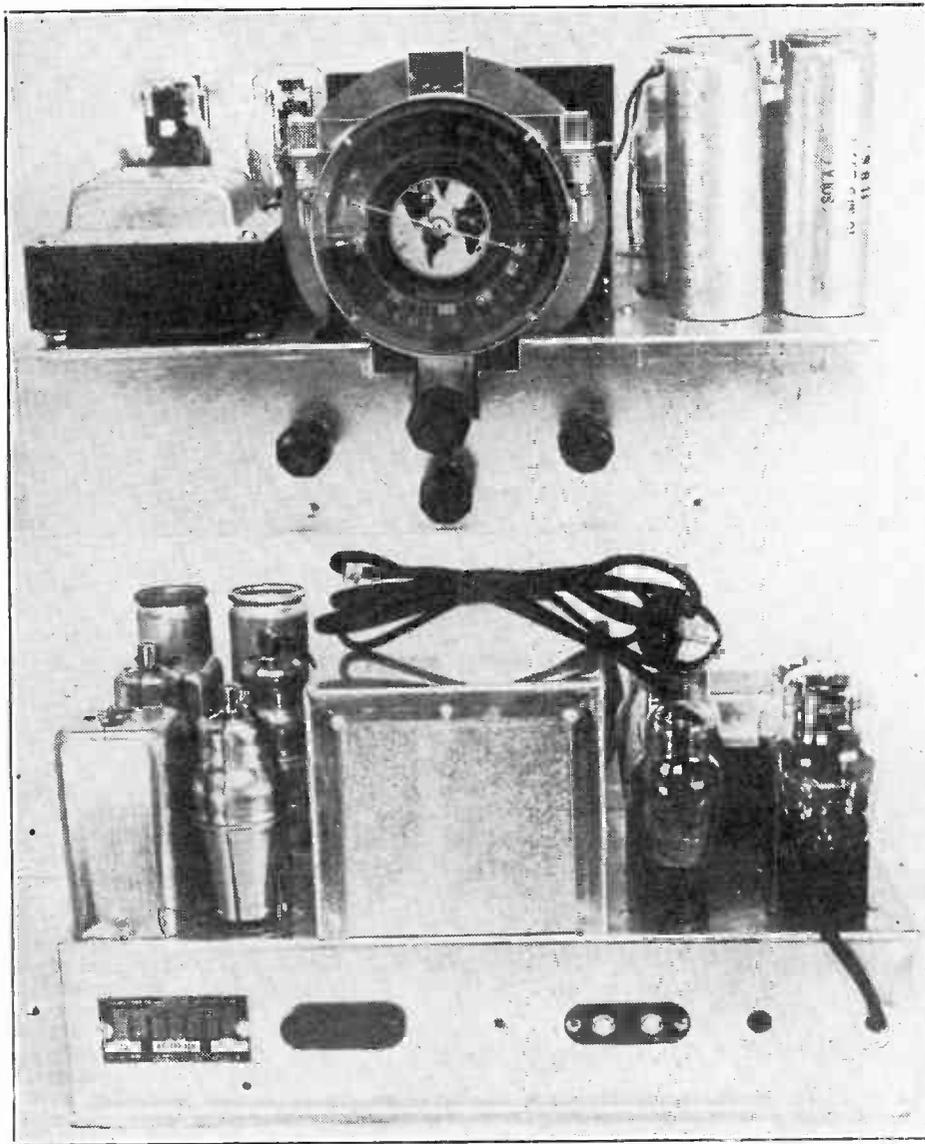
The triode is used as a rectifier sometimes, when the current drain is even smaller than that considered above. Thus, in the diagram above, two 58 tubes are served by a 76 used as diode, with grid tied to plate, the preferable way for a.c. line rectification, because of the limited capabilities of grid alone as to current. A broadcast oscillator at left, with short wave set in center for reception or transmission.

Different types of tubes may be used as the rectifier for the vibrator, the principle being represented by the 45 tube herewith, although in auto sets out tubes are used, such as the 84.

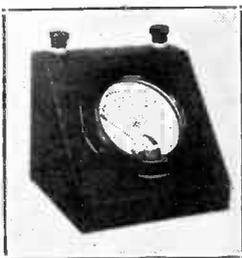


Even with a vibrator is used the voltages taken off may be anything from maximum to intermediate values, by the voltage divider method as applied to other rectifier systems. An example is cited at right.

Place for Tone Control

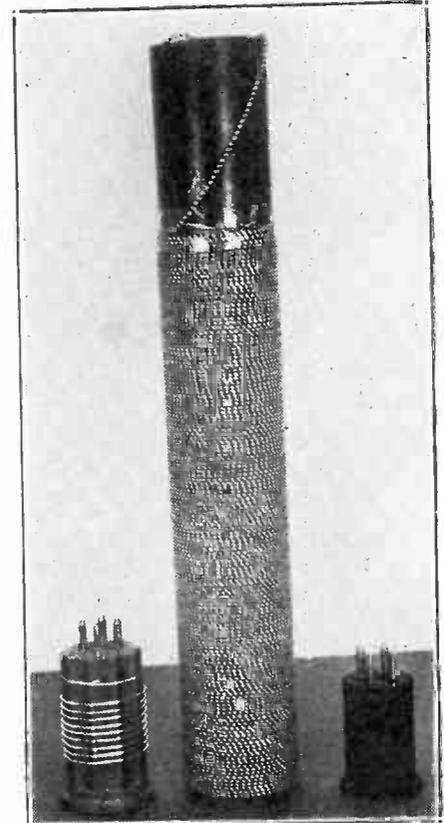


Close quarters for controls sometimes are unavoidable, especially where there is limited space at the console opening. Therefore with a band switch, volume control and tuning knob, if a tone control is to be added it may be put under the tuning knob, as in this Air-King receiver. A-c cable projecting from rear should be protected by grommet or eyelet.

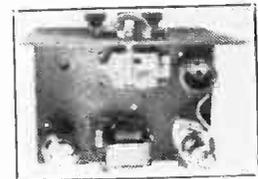


Meters are put in cases as shown, for convenience and protection. This meter is of the single range variety.

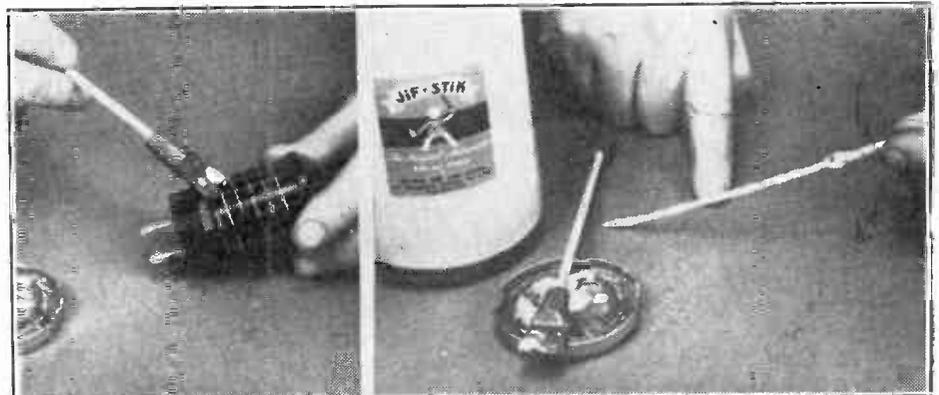
So Big



At center is not the Solenoid Sphinx of Egypt, bodyguarded by Hammarlund coil and form, but simply a 2-inch diameter wound with all the No. 18 (bell) wire directed to be put on for constituting the inductance for a power line r.f. filter. Expert who recommended the number of turns reports slide rule slipped.



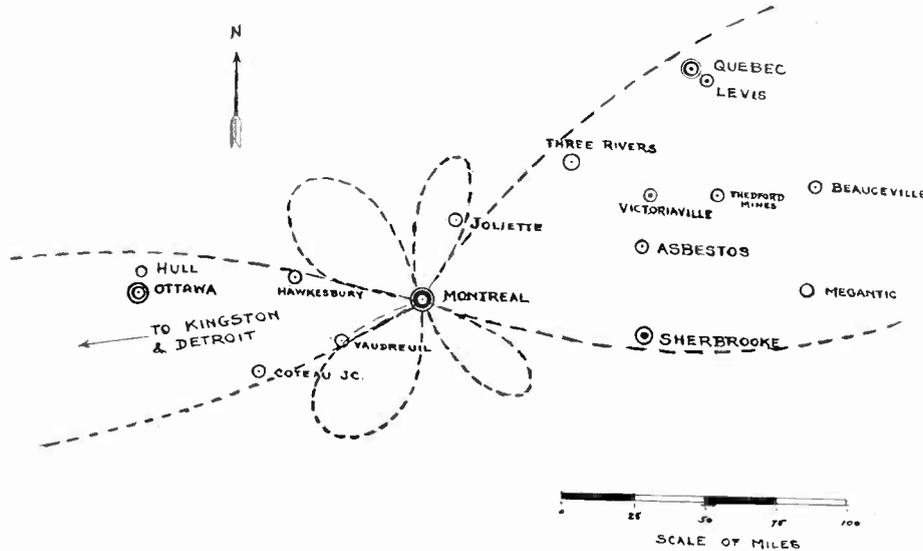
If a coil can be as great as that can a receiver be as compact as this and bring in Europe? Yes, say fans who built 2-tube Thor set.



A rubber base for an adhesive has numerous radio uses. One is the making a coil winding stick to the form ribs, another is to cast bared wire with the cement, then dip in strong vinegar to form rugged insulation.

COAST-TO-COAST IS CANADIAN OBJECTIVE — FIRST STAGE

By J. Lawrence



The directive array servicing the Quebec section (right) has been designed to be broad, as 200-mile coverage is all that need be expected, while the beam towards Ottawa (left) has been made for as high a power gain as possible, so that long distances to Toronto, Windsor, Detroit and Chicago eventually can be covered.

WHEN radio sets were tuned with three dials and long distance reception was the order of the day, test after test to obtain the best in long distance radio transmitters and receivers was run off. Many a happy hour resulted for many a proud owner of what at that time was a battery operated set. We all remember the nights when long distance

signals were so strong that hour after hour of precious slumber was lost. This was something then unexplained. Something that even we could not comprehend but night after night we were there at our dials.

Outposts became only fractions of a second from the great cities where the cream of entertainment was ready for a

waiting world. In many cases this entertainment was not what we were looking for, because we were wrapped up only with the idea that receivers that we had constructed ourselves, tuned with an expertness that we did not know we possessed, brought in distant stations in cities and towns we had never visited, some that we never even hoped to visit. So we find the coming television DX tests to be radiated from Montreal, starting early next month, a brand new order of long distance signals that will bring many a happy hour in the areas to be covered by the transmitter on seven meters.

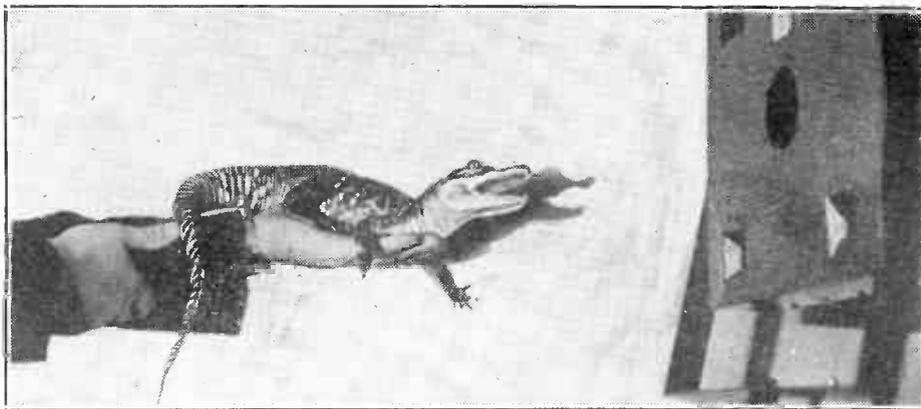
Yardstick Transmitter

Because of the geography of the Canadian territory around Ottawa, Montreal and Quebec, William Hoyt Peck of the Peck Television of Canada has decided to use a transmitter in Montreal as a yard stick to govern his plans for a Canadian coast to coast hookup in the near future.

With directive beam antennas such as the ones used at WOR, Cartaret, N. J., it is entirely possible to direct a great percentage of the energy from a radio transmitter in the areas that will cover the greatest number of people. This for the common good. At a wave length such as that used by WOR this becomes a very sizeable radio and mechanical engineering enterprise but at seven meters it needs only the vast audiences of listeners to report signal strength.

Mr. Peck will direct the use of a radio receiver with a meter that will measure field or signal strengths, so that at each city along the beam measurements will be

Fun For Children



This is a sample of one of the attractions to be sent from the British television station. While adults are to be patronized, children are not to be forgotten, and close-ups of animals will be one of the baits for them in the beginning. What to do when the children get tired of seeing just the handtame animals is one of the problems in juvenile life that the British will have to solve. The alligator is shown close to the four-photo-cell pickup of the television system.

Will Television

Depress

By Arthur Pudlin

Stanley S. Neal, vice president in charge of sales at the Revelation Films, Ltd. of London, England, points out the possibility of restored prosperity based on the promotion of wired television in the United States.

As far as his country, England, is concerned, the government has made several tests from wireless television transmission over B.B.C. which proved very successful. However, in England there can be no commercial programs while in the States were they to adopt the English system of television, they would be prepared to transmit pictures through a new

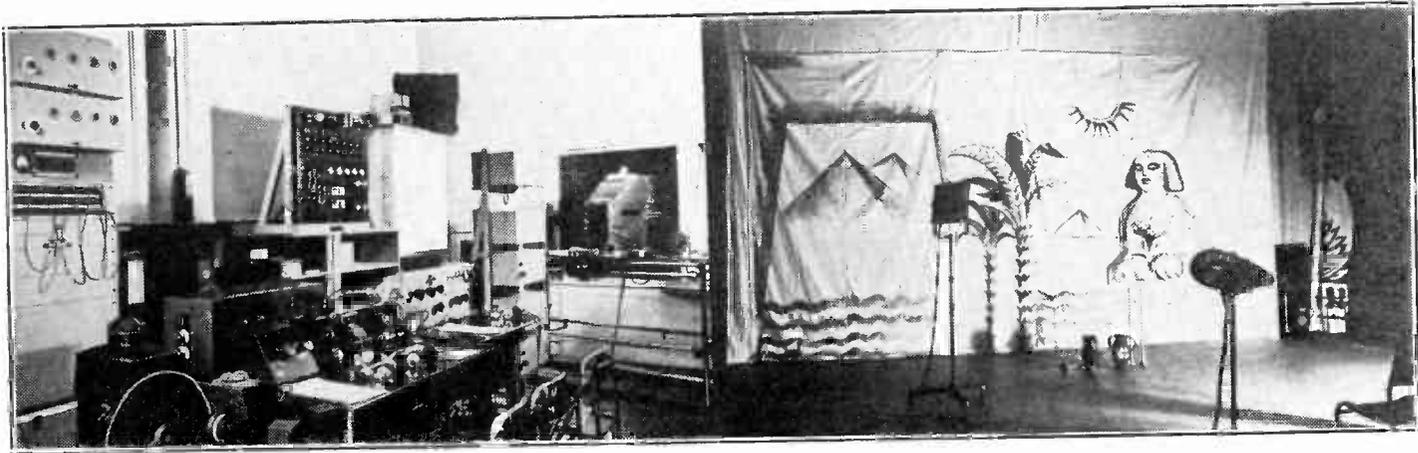


ARTHUR PUDLIN

ST TELEVISION

ION WITH BEAM OPENS NEXT MONTH

nce Cassell



Photographs copyright, Fox Photos, Ltd.

At left is the television studio of the British Broadcasting Corporation, Broadcasting House, London. At right is a studio set up for Egyptian "atmosphere," with sound microphone in the right foreground and picture pickup device to the left.

made. After the beam has been checked for angle then it is up to the DX fans to give their country every bit of confirming data received on seven meter signals, as this new means of conveying intelligence is of utmost military value. The commercial value can only be roughly estimated, because whoever dreamed the first few phonograph records broadcast from KDKA at the inception of radio telephony would have wound up in such a marvelous system as today is giving the major industry a run for front positions?

Because of the tremendous strides that radio broadcasting has made in the comparatively short time that it has been with us it seems very funny that the radio dealers at large are so much against television. When we stop to think of the great fortunes that have been made in the rapidly growing radio industry we wonder where business acumen has gone that made possible this clever building up of a vast business predicated on the buying power of a thrill seeking public.

Networks and stations costing literally millions and millions of dollars, investments, even if receiving the highest rate of amortization, will be used for many, many years. Radio sets for the present broadcast band will be made better and better. Higher fidelity, greater sensitivity and the entire research will be toward making the sound channels as good as the television link.

Quick Action

It must be said in behalf of the radio dealers that they are as ignorant of what is actually going on as the waiting public. One glance at the headlines in the March 23d issue of RADIO WORLD, reproduced from London dailies, should bring home the fact that "television is here." It might be common sense for the radio dealers to spend a few pennies for publications dealing in any way, even casually, with television and short waves, and find out something about this thorn in their side, as they style it, instead of paying good money to send telegrams to radio stations to take off the air well wishers who are trying to form television clubs.

"TELEVISION IS HERE" will be true in Canada in the form of television transmitter early next month.

The five week program of the Peck Television of Canada and not the five year program of one large American company will make a tremendous market for radio dealers in receivers that can pick up the television signals which will be broadcast from Montreal. Every Canadian amateur

and short wave fan, every night owl or dyed-in-the-wool DX fan within range, is invited to participate in this latest attempt to break down the boundaries of the new realm, the seven meter television channel.

Those fans that are well versed in short wave and ultra short wave reception need no further data than the actual time of broadcast to build converters for standard radio broadcast receivers to bring in the sound part, but for the benefit of beginners a converter of seven meter waves is under construction for description in these columns.

Signals Stop, Ham Found Ill by Posse

Regularly, three times each day, on schedule, the signals from the remote amateur radio station of John Buckner, 50, owner of a ranch in the Mount Hamilton district near San Jose, Calif., had come through to many Pacific Coast amateur operators.

Recently the messages stopped. In his office in San Jose, Sheriff George W. Lyle received messages from Buckner's unseen friends of the ether expressing concern. A posse was organized.

Jock Buckner was found ill. He was removed to a neighboring ranch for treatment.

Ham, 73, Works Her Son

At 73 Mrs. Madeline Boeder of New York chats weekly with her son Arthur, of Feeding Hills, Mass., by amateur radio. She mastered the international Morse code years ago to keep in touch with her son, then a ship operator. Her interest has been maintained and now, reports the American Radio Relay League, both she and Arthur talk frequently with each other and with a host of friends made via the ether waves.

Lift Us Out of ssion?

Pudlin

camera process which automatically takes, develops and transmits a picture in two seconds, thereby being able to photograph any current event and retelevis it direct to the home by wire within two seconds after the actual happening.

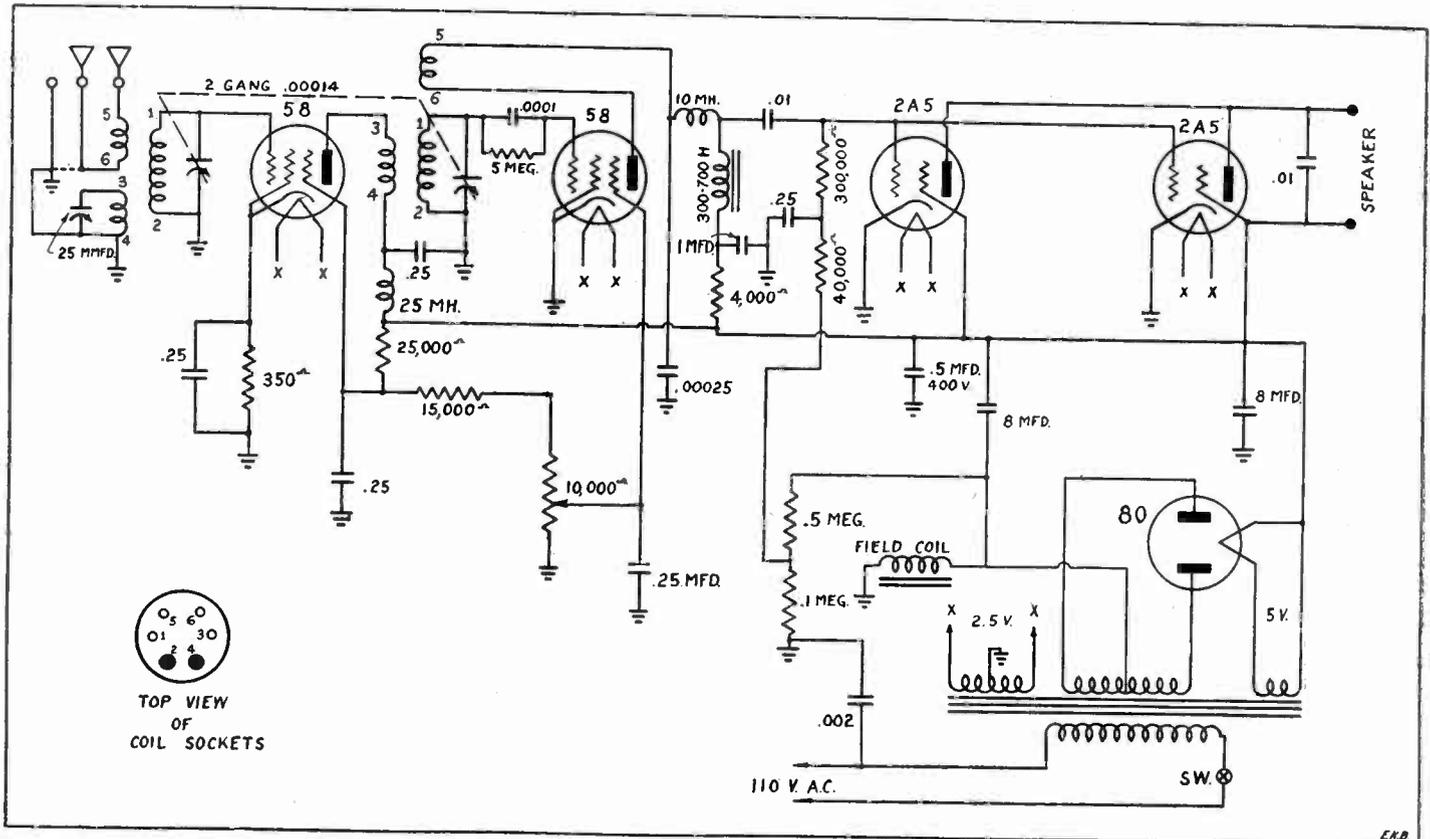
As we all know, in 1921 it was radio that pulled the United States out of what threatened to be a depression. Now in 1935, with television breaking into the American market, the field being so tremendous, economic experts deem it feasible for a depression to be ended by a new industry.

Mr. Neal further stated that his company was prepared to enter the American market with portable television apparatus which will be no larger than the midget radio of today's make and would retail at around \$50.

Charles A. Cochrane, executive director of Revelation Films, is expected in this country next month to promote the welfare of his company's endeavors in the television field.

The RGH-5 Two Ways

Circuit Wiring on This Page, Pictorial on Next



The circuit connections shown above are those of the pictorial diagram of the RGH-5 shown on opposite page.

MANY persons appreciate the aid of a pictorial diagram for wiring a receiver. Others are confused by such a diagram and want the circuit wiring as above shown so as to be legible at a glance. It is a fact that the picture diagram does not reveal what kind of a circuit it is, while the bird's eye view instinct is satisfied by the circuiting above.

But by the pictorial method the point to point connections and the locations are made safe and clear. Therefore it is undoubtedly preferable to have both forms of diagrams, where possible. It is believed that nobody would have any difficulty in following the circuit wiring and of the RGH-5, shown on these two pages in the contrasting forms, and since the

circuit is standard, results should be superb. As can be seen from either diagram, there is hardly anything to the wiring, and simplicity makes for success on short waves. This, by the way, is an all wave receiver, standard broadcast and short waves, and was described in detail in last week's issue, to which those interested in the circuit theory and related factors are referred.

Editor, RADIO WORLD:

My attention has been called to an article in the issue of RADIO WORLD of February 2 entitled "The Weston Photronic Cell," of which my name is given as author. I wish hereby to disclaim authorship of the article as printed or any knowledge whatever of it or its contents previous to its publication, and in no way did I authorize its publication.

Most of the article, obviously was copied from a Weston trade bulletin entitled "Technical Data on the Weston Photronic Cell," signed by me, but the material was rearranged and additions were made, editorially or otherwise, which contained inaccurate statements not based on facts and consequently misleading.

No credit is given to the bulletin from which most of the article was copied, and by inference a reader would assume it to be an original article.

The following are examples of additions to the material in the Weston trade bulletin: The first paragraph of the article pur-

Additions Made To Weston Article On Cell Set Forth

porting to give the construction of the cell has been added and is erroneous, not including the obvious typographical error.

Part of the third paragraph in the section headed "Safe Temperature Limit" on page 4 referring to "dark current" and "Becquerel type or photovoltaic type" as a result of moisture was added. No such statement appears in the original bulletin or was any such statement ever made by me.

You might have been justified in reprinting the contents of the Weston bulletin, if no alterations or additions were made in it and if proper credit had been given to the bulletin as well as to the author, but there

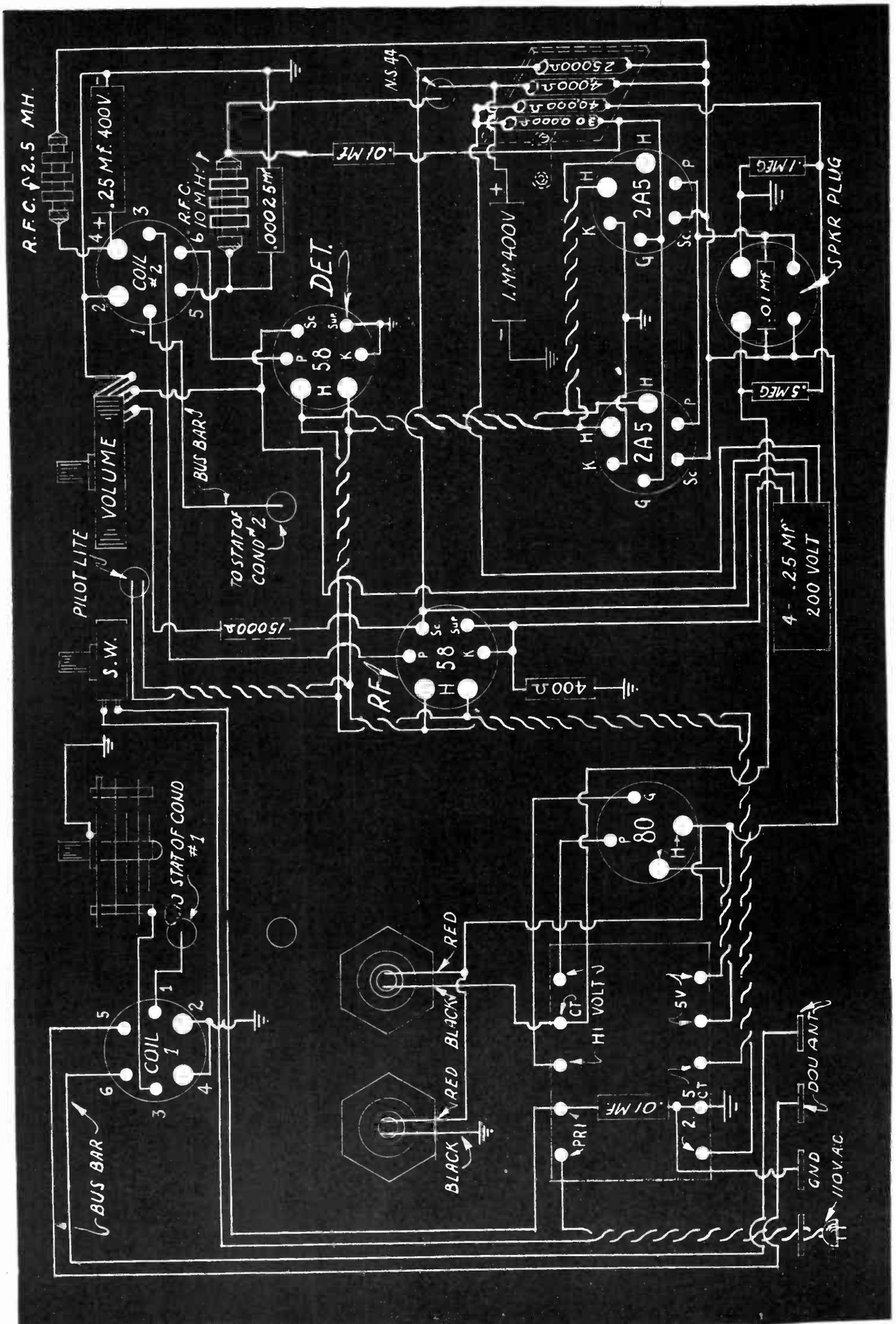
appears to be no justification whatever for re-arranging and making additions or permitting additions to be made without my knowledge and publishing it under my name in a form to look like an original article.

I ask you, therefore, to fully explain this, giving credit to the Weston bulletin and retracting the additions including those referred to above.

Very truly yours,
W. N. GOODWIN, JR.,
Chief Engineer,
Weston Electrical Instrument Corporation.

SCHEDULE OF LKJ

LKJ, Oslo, is broadcasting the national Norwegian program from about 10 to 13 G.M.T. on 9572 kc (earlier 9540 kc) and from about 16 to about 23 G.M.T. on 6130 kc. The antenna power is 1 kw and the antenna is a dipole.



Picture diagram of the R & H-5 all wave set.

Radio University

Questions answered weekly. From the great number of questions submitted by many readers only those deemed of wide interest are published in these columns, with answers. Readers desiring individual question and answer service by mail may obtain it by subscribing for RADIO WORLD for one year.

RADIO WORLD, 145 West 45th Street, New York, N. Y.

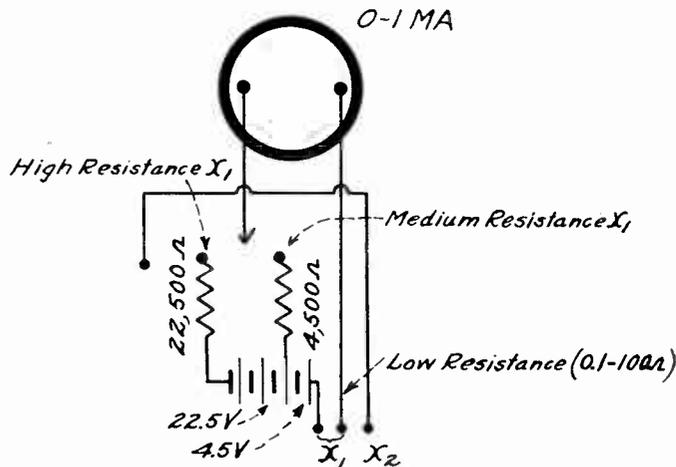
Diode Second Detector

WHEN A BEAT note oscillator is used in a superheterodyne at the second detector, why may the frequency of this oscillator be fixed? Please explain the action that takes place in the intermediate amplifier and especially in the second detector. Please give an inkling of the operation taking place when the 6B7 (or 2B7) tube is used.—L. M.

Since the beat frequency that results from the mixing process in the mixer tube represents a constant carrier frequency that is equipped with the original sound modulation and which does not vary for any position of the tuning dial, it can be introduced into a circuit that does not need to be tuned, once it has been adjusted in the initial construction of the receiver.

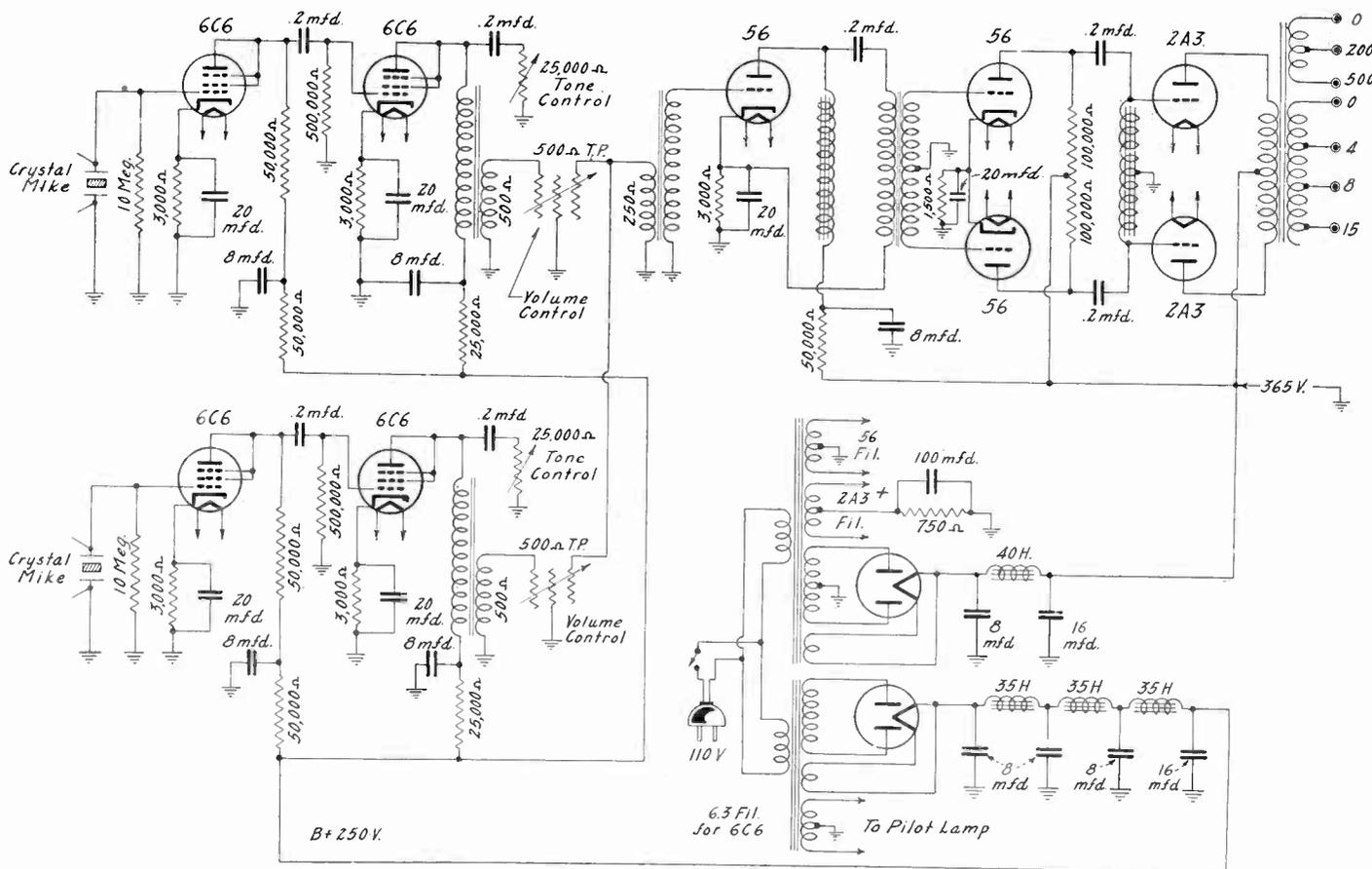
Accordingly, the signal that has now been converted to an intermediate frequency is fed into a fixed amplifier that is resonant to the intermediate frequency. This constant carrier frequency is then fed to the second detector where the rectification process denudes the constant intermediate frequency of its ensconced audio modulations. In addition, this second detector tube may be required to act as the means for securing automatic volume control within the one tube as well

A 0-1 milliammeter is used as a resistance meter. The 4,500 ohm limiting resistor and a 4.5 volt battery result in low resistance readings being taken, while the higher series resistance and voltage enable the measurement of high resistances



as the first stage of audio amplification. The detection process can be achieved by means of the diode section of the 6B7 while the first grid controls the automatic volume control functions and the

plate of the tube will form the audio frequency amplifier end. This amplified output then is fed to tubes where the audio amplification takes place in a class A, B, AB, etc.



The 750 ohm power tube biasing resistor has 100 mfd. across it.

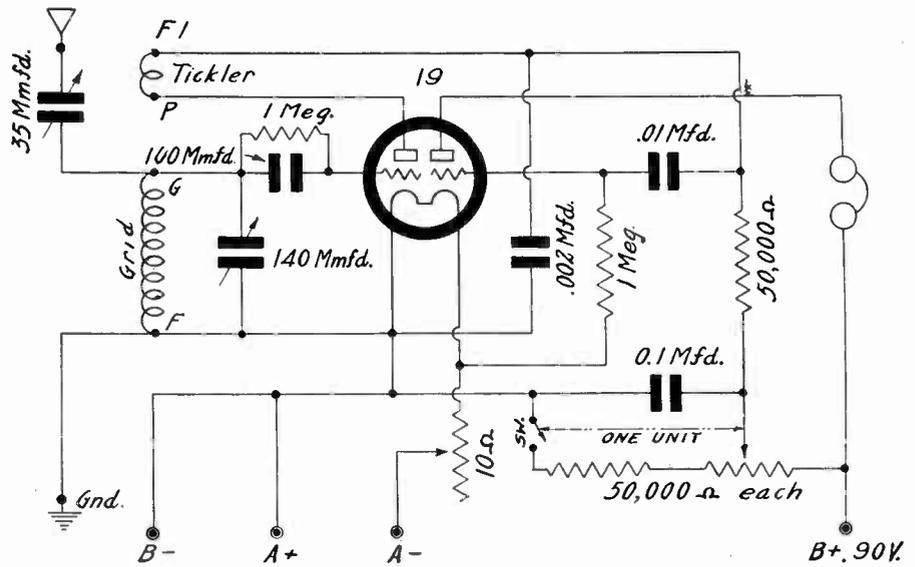
A THOUGHT FOR THE WEEK

JOSEPH BERNHART, SHOW MANAGER OF THE 1935 NATIONAL ELECTRICAL AND RADIO EXPOSITION, doesn't seem to share in any of the fears that beset pessimists of the trade. He believes that the coming exposition at the Grand Central Palace, to be held in September, is going to be well patronized by the trade and that the public will break records in attendance for affairs of this kind. Manager Bernhart does not base his conclusion on mere hope, but on the attitude of those who have signed or are expected to sign up for the September showing. Incidentally, Mr. Bernhart, who is an old hand in the exposition game, has to be shown a lot before believing a little.

Ohmmeter Circuit

I HAVE A 0-1 milliamper meter which I desire using as an ohmmeter. Please indicate the manner of doing this together with a list of parts necessary.—L.B.C.

A 0-1 milliammeter is readily converted to an ohmmeter by connecting in series with it, a battery voltage and a resistance of such value that full scale deflection occurs when the terminals of this series combination are shorted together. The sketch of such a hook-up readily shows the manner of connection. It will be seen that a three point switch allows for two ranges of ohmmeter together with ordinary use of the meter as an ordinary milliammeter. The parts that are necessary are: one 0-1 d-c milliammeter, one three point rotary switch, one 22,500 ohm resistor, one 4,500 ohm resistor, one 22.5 volt battery, and one 4.5 volt battery. When the switch is located on the first contact to the left, the meter is capable of being used as a milliammeter. The second contact allows the use of the meter as an ohmmeter for high resistances whereas the third contact permits the measurement of resistors of lower value. Suitable calibrated scales may be readily purchased to make this meter a nice looking job.



Circuit using the 19.

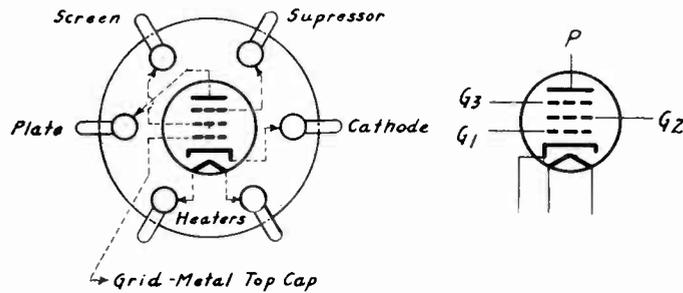
* * *

The 19 Tube

WILL YOU PLEASE tell me something about the 19. Is it two tubes in one envelope? Is there zero capacity between one and the other in the same envelope?—P.O.

The 19 is two high mu triodes in one envelope and is for battery operation. There is some capacity between the one triode and the other, enough to produce short wave coupling if one is oscillator and other modulator. The diagram shows the 19 as regenerative detector and stage of resistance audio.

* * *



The socket connections for the 57 or 6C6 are shown at left. The elements are (bottom view) identified in connection with standard numerical location of base pins. At right the elements are identified, also the grids in terms of numerical order, i.e., grid No. 1 is control grid, No. 2 is screen and No. 3 is plate.

6C6 and 6DC Connections

WHAT ARE the connections for the 6C6, with bottom view of socket giving the element identities, and a diagram showing which are the numerical grids?—L. W.

The diagram reveals the information you request. Also, below is a circuit using the 6D6, which has the same connections, although it is the super control amplifier (like the 58) whereas the 6C6 is the detector, like the 57. The diagram below is that of a signal generator with B supply.

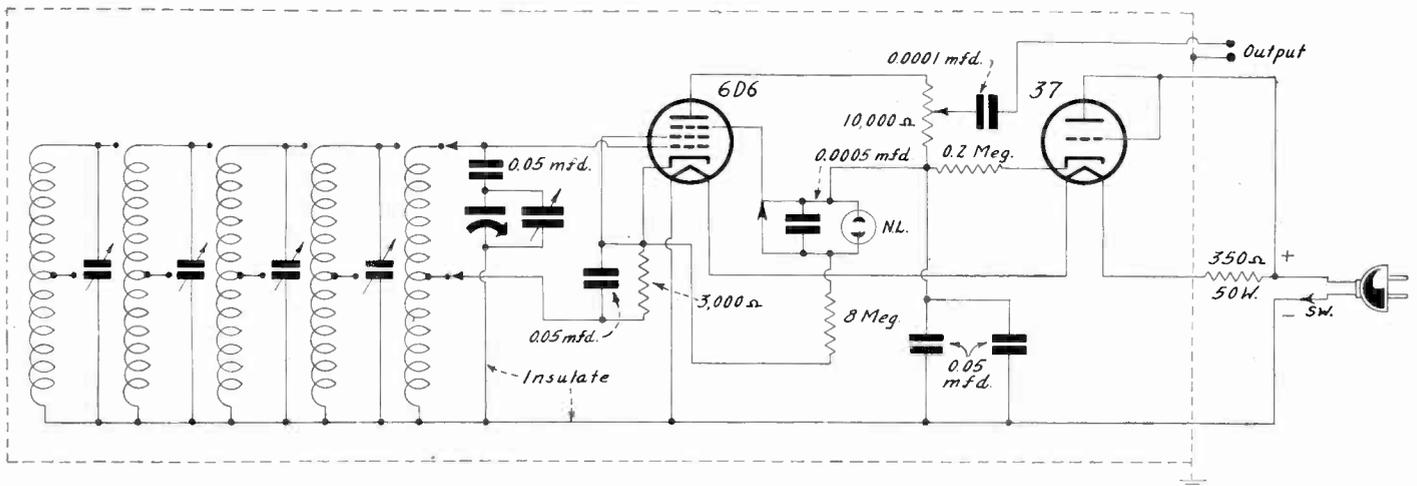
Large Condenser

WHAT IS THE OBJECT of a large condenser across the biasing resistor of a push-pull amplifier?—W. C. D.

The condenser is there because it does no harm when not needed, but if one of the output tube blows, then the other goes on, and has the bypass capacity that is vital for tone. With push-pull going, the condenser is not vital. The diagram on other page is that of Harvey's Amplifier.

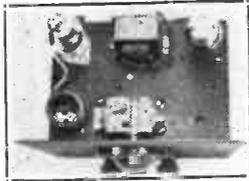
CANADIAN SALES IN DECEMBER

Canada reports sales during December 1934 of 20,770 receiving sets valued at \$2,312,000. Of these 17,783 were a-c sets, 2,771 battery sets, and 216 automobile sets. Of the a-c sets 5,823 were of console dual-wave type, 4,723 of the mantel dual-wave type, and 3,090 of the console all-wave type, with 2,324 of the mantel standard type, and 1,174 of the console standard type.



A signal generator with rectifier.

FOR THE
BEGINNER
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ALL-WAVE RADIO



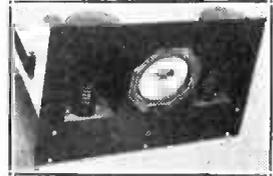
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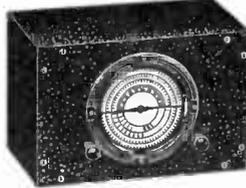
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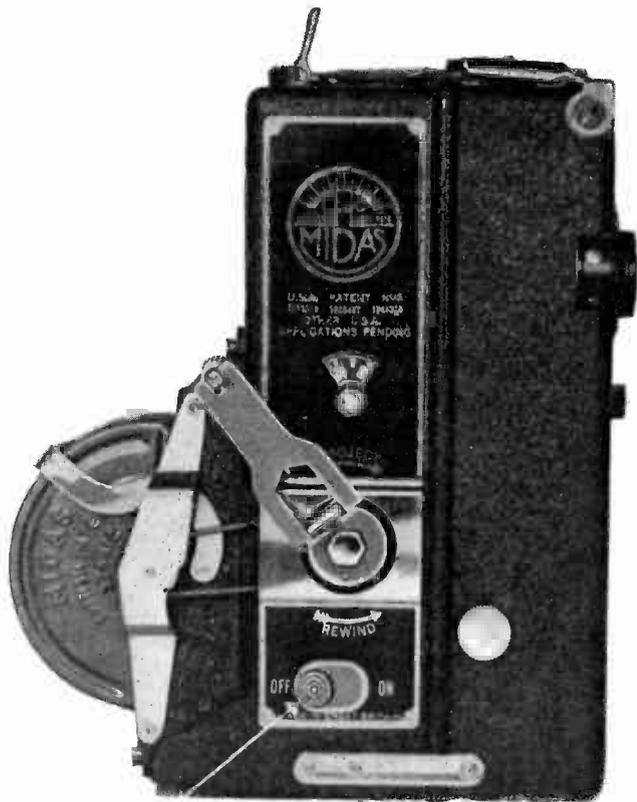
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