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1928

Vol-13 No-16

15
CENTS

RADIO

REG. U.S. PAT. OFF.

WORLD

The First and Only National Radio Weekly
328th Consecutive Issue—Seventh Year

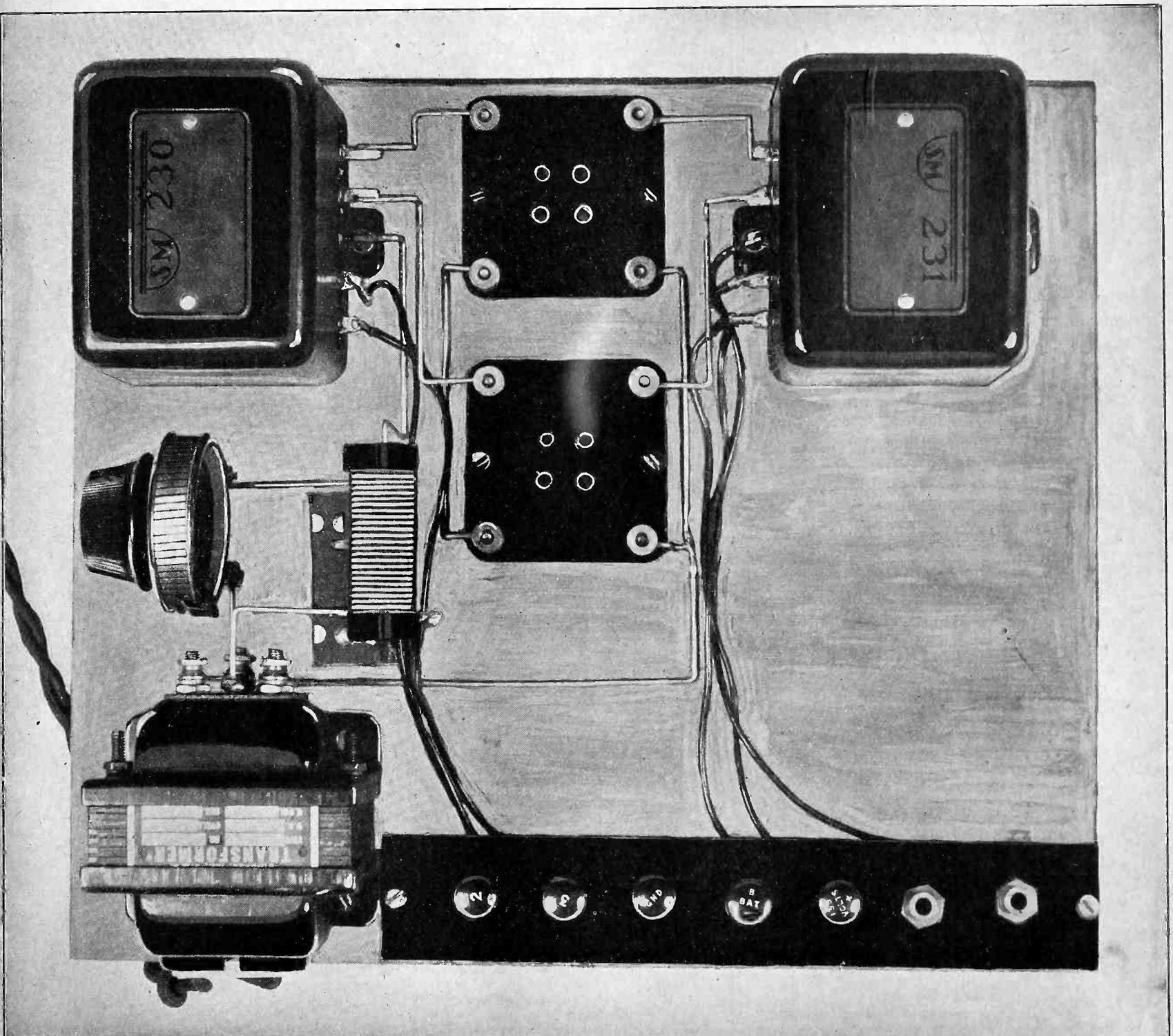
TALKING TELEVISION AND HOW IT WORKS

*One Circuit Brings in
Short and Long Waves*

HOW TO HOUSE A VACATION SET

*Double Shield Portable
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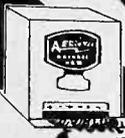
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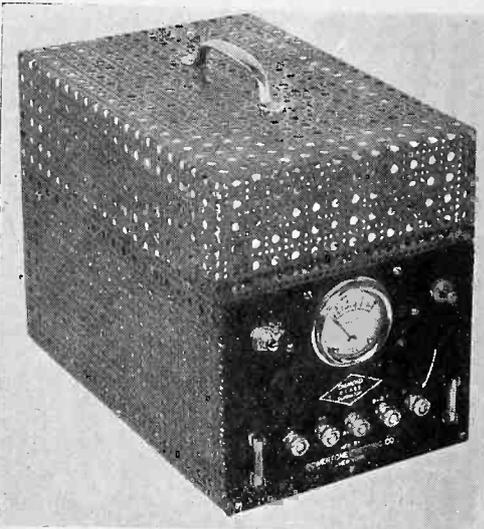
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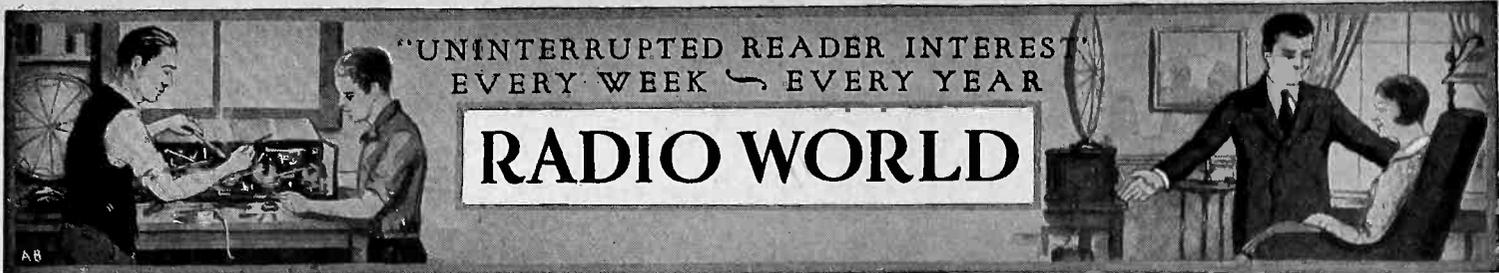
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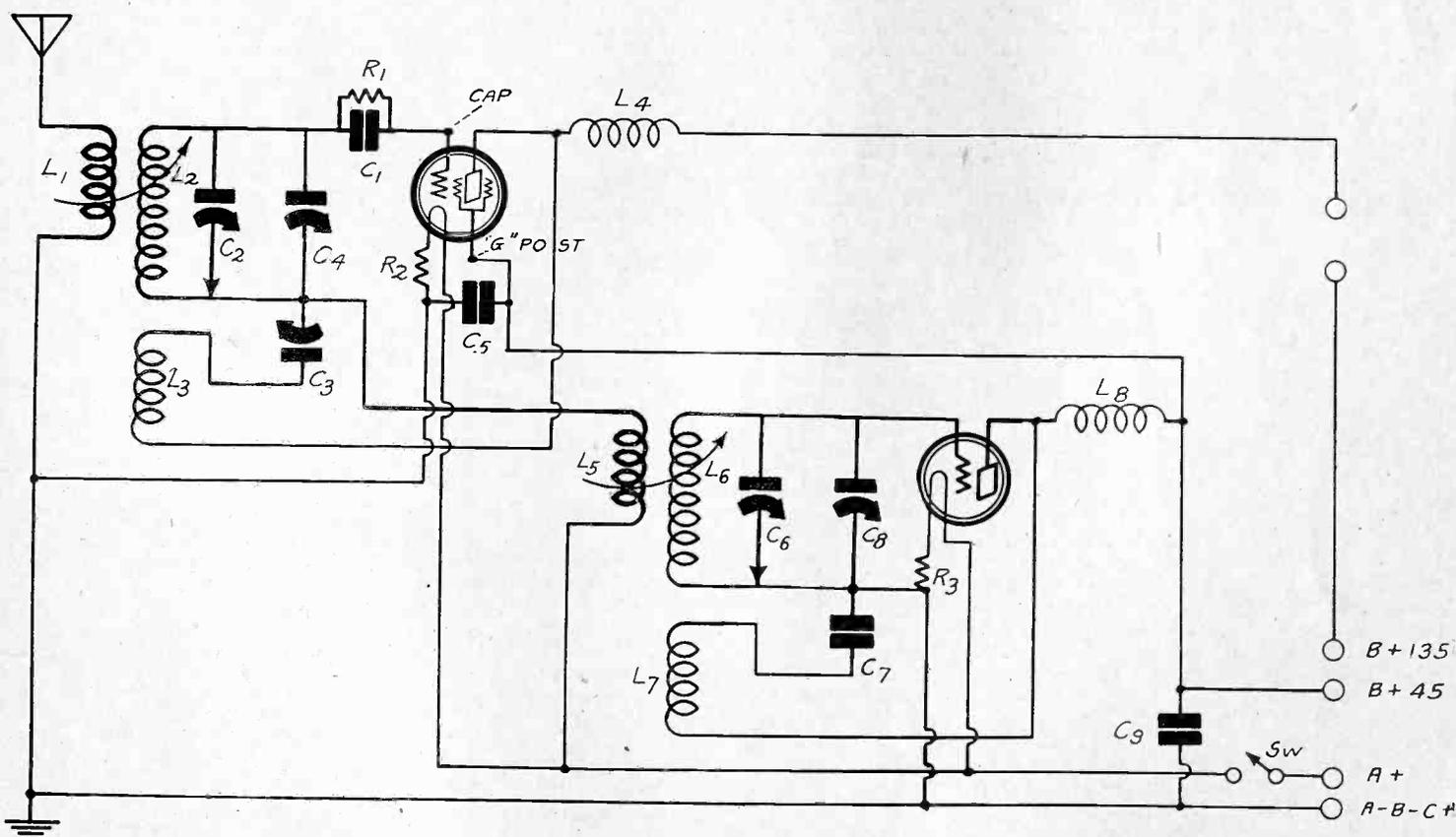
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A Short Wave Mixer

Entire Broadcast Band Also Tuned in, and This Part Without Change of Coils or Condensers—A Versatile Assembly that Fans Are Asked to Build Experimentally

By Herman Bernard



HERE IS THE FIRST SUGGESTION FOR A SUPER-HETERODYNE MIXER THAT NOT ONLY TUNES IN THE SHORT WAVES, FROM ABOUT 15 TO 135 METERS, IT BEING NECESSARY TO CHANGE COILS, BUT ALSO AFFORDS BOADCAST RANGE RECEPTION (200 TO 600 METERS) WITHOUT CHANGE OF ANY COILS, AND WITHOUT CHANGE OF CAPACITIES, EXCEPT BY TUNING. THE AUTHOR POINTS OUT THAT THE SUPER-HETERODYNE ORIGINALLY WAS DESIGNED FOR SHORT WAVE WORK, DEPLORES THAT IT HAS BEEN USED MEAGERLY IN THAT DIRECTION SINCE, AND PRESENTS HIS ORIGINAL SOLUTION OF DESIGN PROBLEMS.

THE Super-Heterodyne was born of the necessity of receiving enemy short wave transmission during the World War. Until then there was no known method of amplification at any frequency that would enable the reading of short wave code, sent on low power to defeat eavesdropping. The American Signal Corps cooperated with the French to develop a system of amplification that would build up these feeble short wave impulses.

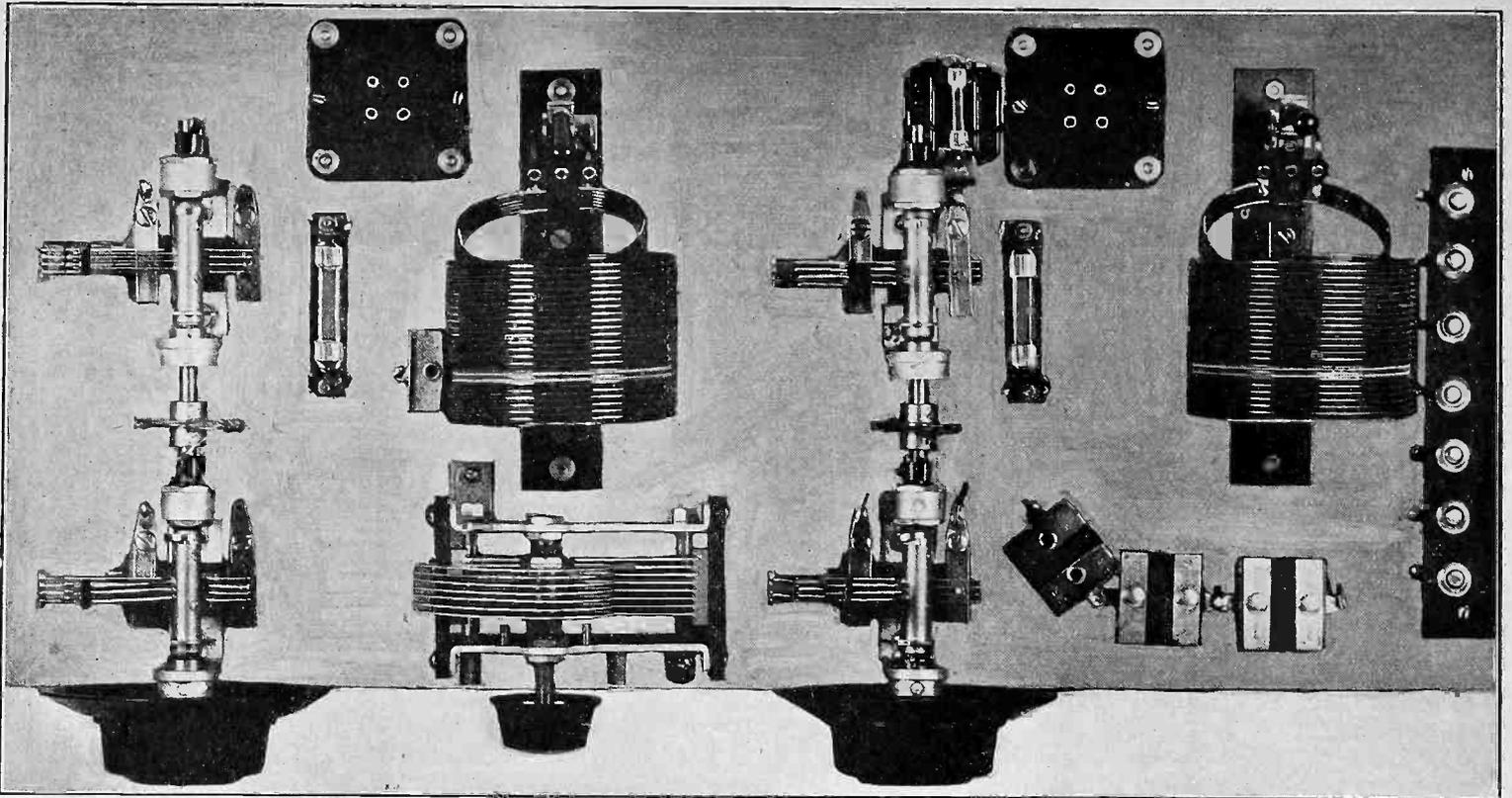
Tuned radio frequency would not do it. Neutralization had not yet become known, and besides would not have been effective at those high frequencies. The Super-Heterodyne gave the answer—and the Allies were enabled to listen in to what was not intended for their ears, but which they were not above hearing, nevertheless.

Many an infant does things at its birth that it scarcely ever is asked to repeat in

after life, with surprising omission. So with the Super-Heterodyne, born to short wave war service, and heard of little enough since then for the very purpose for which it was conceived and invented.

Tower of Strength

Now that short waves are attracting sudden interest among broadcast listeners, and appealing with new fascination (Continued on next page)



THE BREADBOARD LAYOUT USED BY THE AUTHOR IN HIS TESTS OF THE UNIVERSAL-RANGE MIXER FOR SUPER-HETERODYNES. A PAIR OF SHORT WAVE COIL KITS WAS EMPLOYED, AND TWO EXTRA COILS, ONE FOR MODULATION, ONE FOR OSCILLATION, SO PREPARED AS TO TUNE IN THE BROADCAST BAND ALONE WITHOUT CHANGE OF COILS OR CAPACITIES. IN THE BROADCAST BAND TWO .00014 MFD. CONDENSERS ARE JOINED IN PARALLEL. FOR ALL SHORT-WAVE PURPOSES .00014 MFD. ALONE IS USED IN EACH CIRCUIT.

(Continued from preceding page)

to the amateurs who are succeeding with code even on the ten-meter band and who may be trying phone there, it is well to consider the Super-Heterodyne anew for the extraordinary powers it possesses where all other receivers are weakest.

The Super-Heterodyne operates by receiving a high frequency at the intake, changing it to a lower frequency by the phenomenon of mixing the intake frequency with a different and oscillating frequency, and amplifying the offspring of this happy union. The new frequency used is lower, and sensibly so, because the low frequencies afford stability of operation, greater amplification, better selectivity.

Within the last few years, however, a few Super-Heterodynes for home construction, but none of the manufactured variety, have used extremely high intermediate frequencies, because the sum of the intake and the oscillation frequencies is amplified, instead of the difference.

The First "One Spot"

It so happens that RADIO WORLD was the first to publish the theory and construction of a sum-frequency Super-Heterodyne, in the June 21st issue, 1924. The circuit was the Metaform. The field was attractive to the point of inspiration. The article was interesting for its theory, and was splendidly presented by its gifted originator, then a senior at Lehigh University—Walt S. Thompson, Jr. His article stirred nation-wide interest. The Infradyne and others like it came a few years later.

But a lower frequency than the summation of the mixing is generally regarded as easier to work with and more productive of the results expected of a Super-Heterodyne, although a few sum-frequency circuits have given fine satisfaction, including the Infradyne, since the early troubles were removed.

When it comes to a Super-Heterodyne for short wave work, however, the lower intermediate frequency has so much to commend it that the higher must be rejected.

The intermediate frequency by the sum system is likely to coincide with some

station frequency you're trying to tune in, and in that there is plenty of mischief.

Tunes in Broadcast Spectrum

One must not regard a short wave Super-Heterodyne as something restricted only to short waves. The Super-Heterodyne is a circuit, indeed the only radio circuit, that depends for its amplification on coils tuned to a fixed frequency, so you tune otherwise to what frequency you desire to receive, and the old reliable intermediate channel is right there to back up your highest desires.

Concretely, if you use two sets of standard short wave coils, ranged from 15 to 130 meters, let us say, when tuned by .00014 mfd., you have all the requirements for a short wave mixer. By tuning either modulator or oscillator to a frequency differing from each other by the intermediate frequency, you obtain the frequency to which the secondary channel responds.

That would be less than enough, however, for the constructor is interested in wavelengths higher than 130 meters. He wants to tune in the broadcast band as well, an advantage offered by some kit Supers, but there is one fact on which I am certain the builder lays stress—and to date lay stress in vain. That is the utter necessity of being able to tune in the entire broadcast band (200 to 600 meters) without changing any coils!

Never before has a circuit been suggested in current print that offered this imperative advantage while still enabling tuning in the short waves.

The situation then demands (1) a circuit that tunes in short waves, which of course requires coil changing; and (2) the tuning in of the entire broadcast spectrum without changing coils designed for that full range.

How It Is Done

There is only one practical way to do it—the one diagrammed on page 3—and it is now presented for the benefit of advanced students of the radio art, skilled in working out their own small problems, once a new path has been blazed for them, a path it has been their eager purpose to follow, if given the opportunity.

Anybody who has worked with the high frequencies respects them as if they were Bishops, and takes no liberties. He works carefully and slowly, knowing that his labors are concentrated on a workable subject, one that has the lure of short wave possibilities scarcely before enjoyed.

With an abundance of stations sending out short wave programs that are re-modulation of their broadcast frequency transmission, with foreign stations in much easier range than by any other known system or in any other possible wave spectrum, and with television looming as a short wave possibility, temptation runs high, and there is every reason to attempt the perfection of a circuit that promises to establish a dynasty of the air!

There is surely a trait of the unusual in the diagram, though the mixing process is the second most familiar one of the dozen or more available. The outstanding air of strangeness surrounds the paired and unpaired tuning condensers, C2 and C4 in the modulation circuit, C6 and C8 in the oscillator circuit. To them indeed we owe the versatility of the circuit—the range of from, say, 15 meters to 600 meters, lower and higher wavelengths, also, if desired, and remember that the entire broadcast band is tuned in without change of coils and, it may as well be added now, without molesting the condenser connections, either.

Big Attraction

You tune in just as you would with any other receiver of any kind, for broadcast waves, but still you have the fascinating field of the high frequencies or short waves, right there, at your command, with amplification incredibly higher than with the short wave adapters and like circuits more commonly used.

Each pair of condensers consists of two .00014 mfd. for tuning, the same capacities used generally in short wave work. By a switching arrangement, acting in double pole, double throw fashion, one of each pair is used singly, or both are used in parallel. The single condenser performs independent of any effect from the disengaged other. When the two are in parallel the capacity doubles. That is

why you can tune in the entire broadcast band, although you will have to prepare your own plug-in coil to do so. You have .00028 mfd. to tune with, and the inductance must be provided accordingly.

Two Alike—Almost!

The same operation takes place in modulator and oscillator alike, for when you cut out one of the pair of condensers in one you do so in the other, as the two circuits must tune only a little apart to give you a frequency that the intermediate channel can amplify.

Assuming an intermediate frequency of about 70,000 cycles, which is a good one indeed, the condenser settings must differ in capacity sufficiently that one tuned circuit is 70,000 cycles "off," compared with the other.

As either one or the other may be tuned to the higher capacity, you may obtain any station at two different settings of the oscillator. This is the repeat tuning, nearly always mistakenly called "second harmonic," a subject with which it has absolutely nothing whatever to do.

The condenser changeover is simple indeed. A jack switch on a front panel, or on the baseboard of an experimental setup, will take care of this nicely.

First Detector Regenerative

The mixing circuit will be observed to be regenerative in the modulator component, C3 being the condenser used to control feedback. It is advisable to regenerate here for interference elimination. The small choke coil L4 aids regenerative action, as does the plate winding L3, which is the regulation coil built into popular short wave plug-in coils of the day. L4, if used, should not have more than 5 millihenrys inductance. A high inductance would dampen the crest of the modulation—the high audio notes, so-called, although at this stage there is no audio frequency.

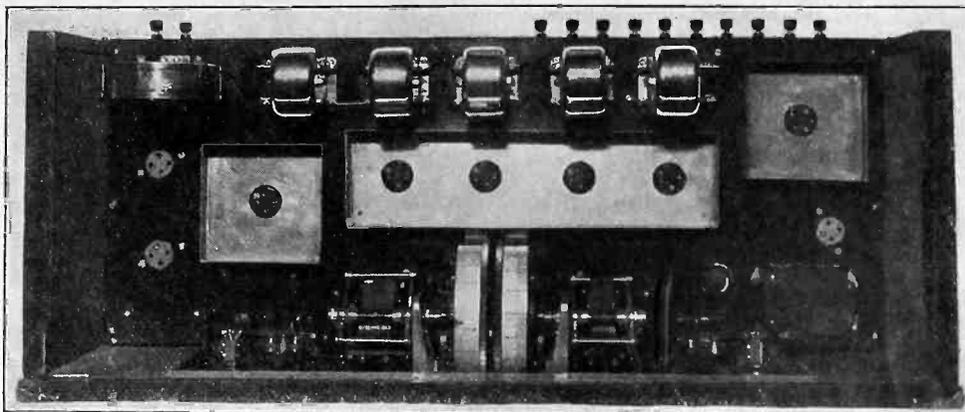
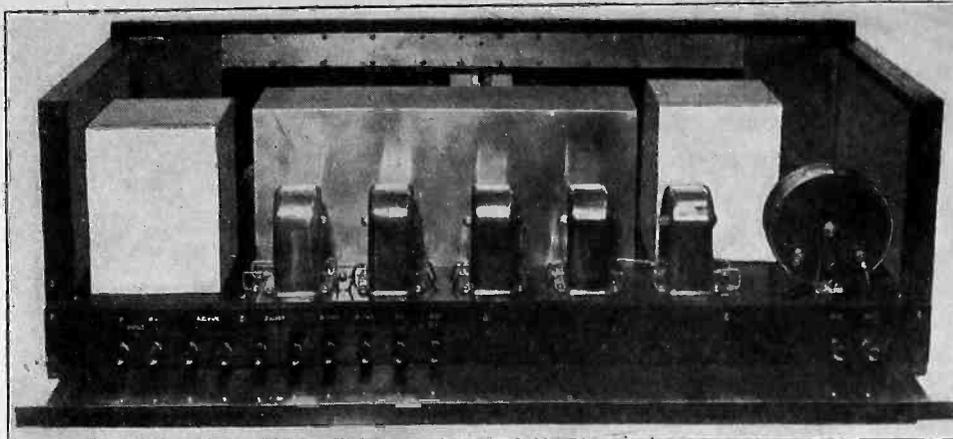
The first detector of a Super-Heterodyne detects in a sense not generally understood. It does not rectify radio and deliver audio at all. If you put in one frequency and take out a different one you have rectification. While ordinarily the different frequency taken out is audio, in the first detector of a Super-Heterodyne it is radio—nothing more or less than the intermediate frequency. If 70,000 cycles is audio frequency, let the man who can hear that frequency deplore his fate! For the adult ear, 10,000 cycles is "top," although a canary may hear to 20,000 cycles and beyond!

It behooves Super-Heterodyne fans, therefore, to investigate any first detector, if for no other reason than to determine if the grid leak and condenser are absolutely necessary. The leak in particular may be a damper on the circuit, although if condenser is retained the leak should stay with it. The leaky condenser is shown in the hookup, but no guarantee is given as to its necessity. By force of habit it has found its place there, and it may be hard to dislodge the combination from its position of honor, if not usefulness.

Screen Grid Tube

The tube used as the first detector is a screen grid tube, because the primary impedance of the first intermediate frequency coupler, even at 70,000, will be fairly high, although for best results the plate impedance should be higher than that commonly found. This suggests that the primary and the secondary be nearly alike, and that the intermediate frequency be established in the primary with the aid of small capacity across the winding, while the secondary may have a greater inductance, without external capacity across it, thus affording step-up ratio.

This is the first suggestion ever made in wide print that voltage step-up be obtained through coils used with screen grid tuned plate, since nothing better



A MAN BUILDS HIMSELF A SUPER-HETERODYNE, LIKE THE ONE SHOWN IN TWO VIEWS ABOVE, AND TUNES IN ONLY THE BROADCAST BAND, WHEREAS THE CIRCUIT PROPERLY SHOULD BE DESIGNED FOR SHORT WAVES AS WELL, SAYS THE AUTHOR, HOLDING THAT NO CIRCUIT EVEN APPROACHES THE SUPER-HETERODYNE FOR SHORT WAVE RECEPTION. THIS IS BECAUSE THE AMPLIFICATION IS LARGELY AT A LOWER FREQUENCY, WITH ATTENDANT STABILITY.

than one-to-one ratio, by transformation, or stepdown, by shunt leak, has been advocated where the plate load was high.

The modulator has been analyzed except for the remaining detail of the coils. L1 is an adjustable primary, not controlled from the front panel in short wave coil kits, but being pushed back or forth, and held in any desired position by friction. The adjustment need be changed only for short wave reception, and then principally because of the reciprocal effect of antenna coupling and regeneration control.

Coupling Effect

The looser the coupling, the freer the circuit is to oscillate, and on particularly low waves it is sometimes not so easy to obtain regeneration as on higher but still short waves.

The primary is built into the base of the coil receptacle. The secondary L2 and the plate coil L3 are on the coil jack frame. Automatically you plug in both. The windings are the usual ones for tuning with a .00014 mfd. condenser and regenerating with a .00025 mfd. condenser. L4 has a unique inductance, one not purchasable, so wind 150 turns of No. 38 or 40 wire on a diameter of about one inch.

The oscillator circuit is much the same as the other, except for the omission of the grid leak and condenser, the grid return connection to A minus instead of to A plus, and the use of a fixed capacity, C7, instead of a variable one, for feedback.

Do Like Our Oscillation

Naturally, you want the oscillator to oscillate all the time, hence no control is required. A mica condenser of .00025 mfd. should be tried. About the only point of difficulty in the operation of the entire circuit—both tubes—is to be sure of oscillation on some of the very high frequencies.

The same fixed feedback capacity is used, but the degrees of coupling must

be different for different ranges. A difference is provided by the plate windings of the plug-in coils—L7 is smaller as the higher frequencies are to be selected—but the combination may not work out smoothly, so try a different fixed capacity, preferably putting a small extra condenser, say, .0001 mfd. in parallel with C7. This wrinkle can be smoothed out satisfactorily after some experimenting.

The adjustable primary for the oscillator is used as a pickup coil, for you will notice that the grid return of L2 is completed through this winding.

As the position of the oscillator's pickup coil determines the degree of coupling in the mixing process, it should not be necessary to molest the pickup coil, once a good average setting is found. The choke coil L8 may be 85 millihenrys here, while C9, an important bypass condenser, should be 1 mfd. or more.

The oscillator tube may be a 112.

Constructional Suggestions

The circuit was fitted out on a breadboard and tested well. The changeover switch, represented by two arrows in the diagram, one in the modulator grid circuit, the other in the oscillator grid circuit, would be at high radio frequency potential if the rotors of the mechanically ganged condensers were not insulated. This would not be objectionable, except for possible body capacity effects. However, since it is safer by far to use the low potential, which is at or near the potential of your hand, the two condensers are joined by a flexible insulated coupling device, so that rotors may be joined and disjoined, instead of stators which are at grid potential.

[Follow the author's trail-blazing with this absorbing circuit from week to week in RADIO WORLD. Another fine instalment will be published next week. Constants will be published next week. Constants will be suggested and operating reports rendered.]

Talking Television and

By J. E.
Technician

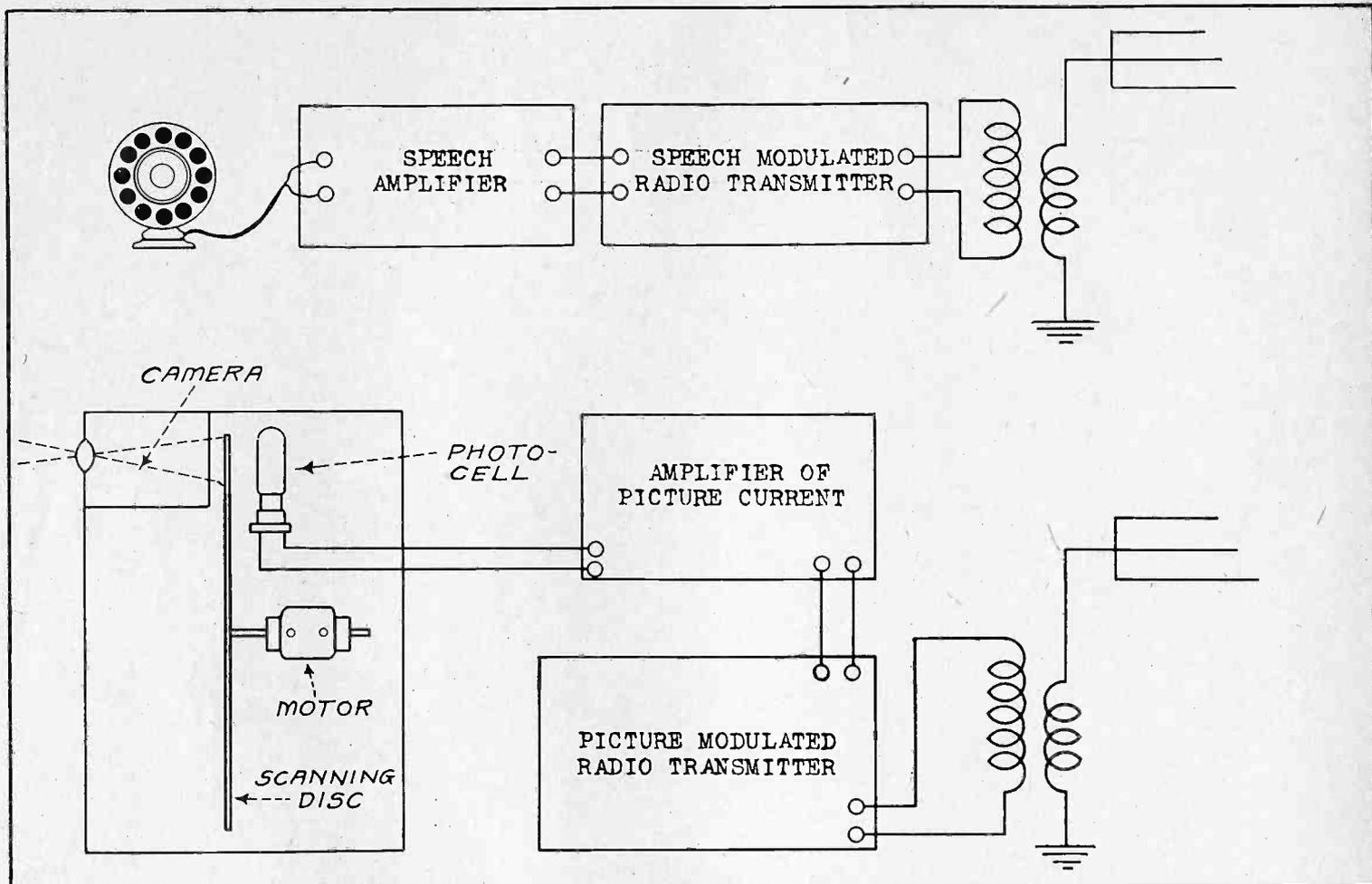


FIG. 1

SCHEMATIC DIAGRAM OF AN ARRANGEMENT FOR TRANSMITTING SPEECH AND VISION SIMULTANEOUSLY.

Two in Jersey Get Television from WGY

New Jersey seems to be a good field for television experiments on the WGY transmissions. Reports of gratifying reception have been received from several independent sources.

A radio engineer of the General Electric Co. stationed in New Jersey has succeeded in picking up television images broadcast by WGY, Schenectady, N. Y., on its regular broadcast wave of 380 meters. This engineer stated that the images received were clear and about one inch square. According to this engineer television now seems a matter of weeks, not months.

Small Attachment

He said:

"The entire television attachment to the standard radio set, which made it possible to receive a practically perfect picture, was small enough to be held in the two cupped hands. It was made possible by one of the latest neon television lamps, which will operate from the output of a broadcast receiver, as only small currents are needed for its operation."

WGY broadcasts television regularly

now on Tuesday, Thursday and Friday between 1:30 and 2 P. M. Eastern Daylight Saving Time.

Radio Shop Gets Television

The engineers of the Roe Radio and Electric Shop of Roselle Park, N. J., have reported successful reception of WGY a number of times. According to them, the television signals come in over the loudspeaker as a drone not unlike that characteristic of a passing airplane. When this signal is impressed on the television receiver in place of the loudspeaker, and when the scanning disc is synchronized with the disc of the transmitter in Schenectady, the peculiar signals resolve themselves into an animated picture.

The success achieved in the Roe Radio laboratory followed much experimentation covering a period of ten days. Experimental work will be augmented by the installation of a short wave receiver to pick up the signals from WLEX at Lexington, Mass., the only other station at present sending television in this country

TALKING television is the latest fascination in broadcasting. A tiny animated image of the person before the microphone now appears on the viewing screen of the combined television and radio receiver, but that tiny image appears to speak with a stentorian voice.

The union of television and sound broadcasting was a natural development just as the union of the phonograph and the movies.

At first experimenters with television were elated when they could see a little wisp of smoke from a cigarette curl upward, and a slight movement of the lips or of the eyes of the person televised. The novelty of that has ceased for the pioneers in television, and now they are not satisfied unless the images speak and sing audibly as well as visibly.

Transmitting Speaking Images

For the transmission of talking television images it is necessary to employ two separate radio transmitters, one for the visual portion and another for the audible portion. The necessity for using two separate channels is obvious when the composition of each signal is realized.

The speech transmission requires a channel about 20 kc wide, 10 kc on each side of the carrier. If any other signal were impressed on the same wave there would be direct interference and the sound transmitted could not be received distinctly.

The television transmission requires an

How It Is Worked

Anderson
Editor

even broader channel, and it requires an exclusive channel, for if anything else were carried by the same carrier frequency the picture values would be affected by it and the received image would not be equivalent to that transmitted.

If the speech and vision signals were impressed on the same carrier frequency, the visual signal would be heard with the speech signal and the audible signal would be seen with the image, and neither signal would be clear.

Two Channels Necessary

Hence for clear speaking images it is necessary to use two independent channels having common terminals.

The speech channel does not differ from the ordinary broadcast or phone radio channel. It starts with a microphone. The voice currents generated by this instrument are impressed on the radio frequency current generated by the oscillator and then the modulated radio frequency signal is radiated into space in the usual manner.

The reception of this portion of the signal is identical with the reception of a radio program and it is done with the same receiver, provided that the frequency of the carrier falls within the tuning range of that receiver.

How Image Is Transmitted

The method of transmitting the image of the person speaking before the microphone is not so familiar to broadcast fans, except to those who have followed all the developments in television during the last year.

The person before the microphone is brightly illuminated so that a camera focused on him forms a bright image on the ground glass, or directly on the scanning element in the television transmitter.

A photo-electric cell is put on the dark side of the scanning element ready to catch every ray of light that may get through the scanning holes. The light that does get through the disc or other scanning element varies in intensity according to the lights and shadows on the person before the camera and the microphone.

The electric current through the photo-electric cell is directly proportional to the amount of light that enters it, and hence it is proportional to the light that comes from the picture transmitted.

Radio Frequency Picture-Modulated

The current through the photo-electric cell is amplified to an enormous extent and finally is impressed on a radio frequency carrier. This carrier has a frequency different from that of the speech carrier, as was stated above, and it must differ by more than the sum of the widths of a television and a speech sideband.

For the reception of the television signals a separate receiver is necessary. It is tuned to the carrier of the image signals, detected and amplified at low frequency. The requirements of the television receiver are somewhat greater than those of the speech receiver, as was pointed out in the June 30 issue of RADIO WORLD.

Neon Lamp Flickers

In place of the loudspeaker a Kino-lamp is connected to the last tube of the television low frequency amplifier. As the television signal fluctuates in intensity the plate current in the output tube fluctu-

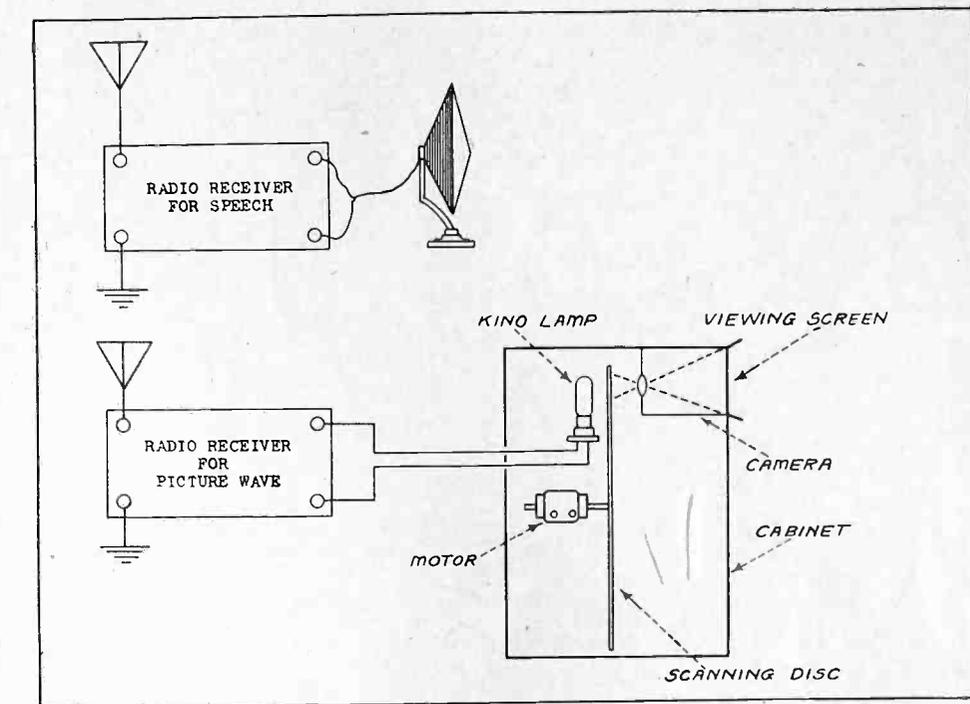


FIG. 2
SCHEMATIC DIAGRAM OF AN ARRANGEMENT FOR RECEIVING TELEVISION AND ACCOMPANYING SOUNDS SIMULTANEOUSLY.

ates, and this causes the light in the Kino-lamp to flicker.

When a scanning hole in the transmitter passes over a dark area of the image of the picture transmitter, the neon lamp is dark. When a hole in the disc passes over a light area, the receiver neon lamp is bright.

It remains to scan the neon lamp, or Kino-lamp, in the same manner as the original image was scanned, and to do it synchronously. The scanning of the neon lamp must be done with a scanning element which is similar in every way to the scanning element used at the transmitter, although it need not be of the same size.

Exact Synchronism Necessary

The two scanning elements must be in exact synchronism at all times if the received picture is to be clear. This means that not only must the two scanning elements run at exactly the same speed but that they must be in phase. For example, when a given scanning hole is over a certain point on the object the corresponding scanning hole in the receiver should be over the corresponding point in the image.

If it is not the picture point would be found somewhere else, that is, it would be displaced from its proper position. So would every other point in the image, and the whole image therefore would be out of place. Now if the speed of the two scanning elements was not exactly the same the displacement of the picture points would vary and the image would be distorted.

Image Enlarged

The image formed by the scanning process is too small for convenient observation, and therefore it is enlarged by a lens system, or by a single lens like that used in a camera. The enlarged image is then viewed on the ground glass or some other suitable screen.

In Fig. 1 is shown a schematic of the

speech and television transmitters. The speech transmitter is at the top of the picture and the television transmitter below. The principal elements of the two transmitters are shown.

Fig. 2 shows the schematics of the speech and television receivers. At top is the familiar radio receiver with its loud speaker. Below is another radio receiver the output of which is connected to the television attachment. This attachment is essentially the same as the television prefix to the picture transmitter, except that a neon or Kino-lamp takes the place of the photo-electric cell.

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There is no such problem in talking television. Both the sound and the television signals travel at the same speed through the radio and the electrical circuits and the effect on the observer of the received signals would be the same as if he were located at the microphone, provided that the loudspeaker and the television screen were close together.

If the loudspeaker and the viewing screen are close together the synchronization of sound and motion would be better than if the observer saw and heard the original from the rear end of the transmitting room.

Talking Television and

By J. E.
Technician

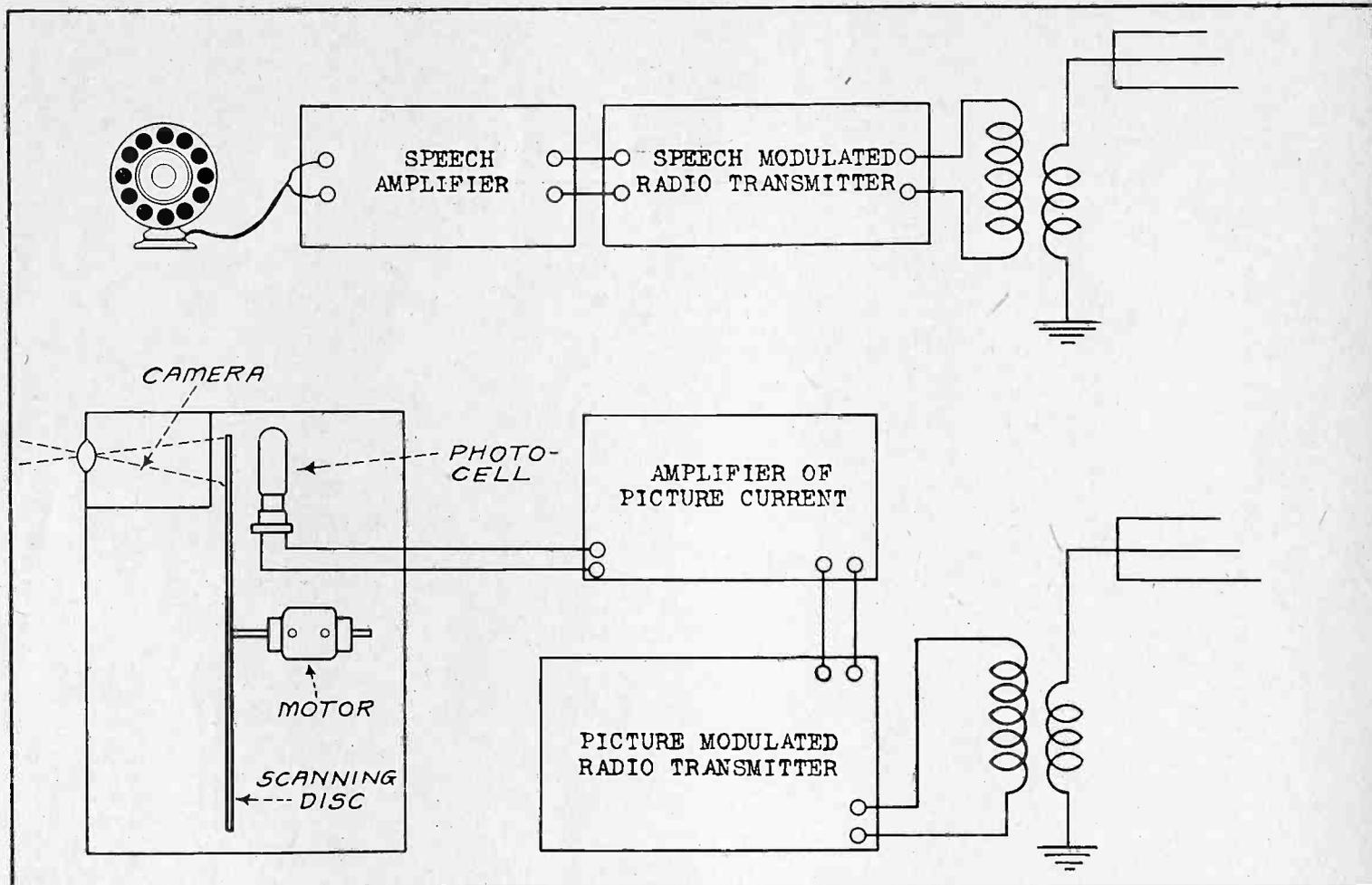


FIG. 1

SCHEMATIC DIAGRAM OF AN ARRANGEMENT FOR TRANSMITTING SPEECH AND VISION SIMULTANEOUSLY.

Two in Jersey Get Television from WGY

New Jersey seems to be a good field for television experiments on the WGY transmissions. Reports of gratifying reception have been received from several independent sources.

A radio engineer of the General Electric Co. stationed in New Jersey has succeeded in picking up television images broadcast by WGY, Schenectady, N. Y., on its regular broadcast wave of 380 meters. This engineer stated that the images received were clear and about one inch square. According to this engineer television now seems a matter of weeks, not months.

Small Attachment

He said:

"The entire television attachment to the standard radio set, which made it possible to receive a practically perfect picture, was small enough to be held in the two cupped hands. It was made possible by one of the latest neon television lamps, which will operate from the output of a broadcast receiver, as only small currents are needed for its operation."

WGY broadcasts television regularly

now on Tuesday, Thursday and Friday between 1:30 and 2 P. M. Eastern Daylight Saving Time.

Radio Shop Gets Television

The engineers of the Roe Radio and Electric Shop of Roselle Park, N. J., have reported successful reception of WGY a number of times. According to them, the television signals come in over the loudspeaker as a drone not unlike that characteristic of a passing airplane. When this signal is impressed on the television receiver in place of the loudspeaker, and when the scanning disc is synchronized with the disc of the transmitter in Schenectady, the peculiar signals resolve themselves into an animated picture.

The success achieved in the Roe Radio laboratory followed much experimentation covering a period of ten days. Experimental work will be augmented by the installation of a short wave receiver to pick up the signals from WLEX at Lexington, Mass., the only other station at present sending television in this country

TALKING television is the latest fascination in broadcasting. A tiny animated image of the person before the microphone now appears on the viewing screen of the combined television and radio receiver, but that tiny image appears to speak with a stentorian voice.

The union of television and sound broadcasting was a natural development just as the union of the phonograph and the movies.

At first experimenters with television were elated when they could see a little wisp of smoke from a cigarette curl upward, and a slight movement of the lips or of the eyes of the person televised. The novelty of that has ceased for the pioneers in television, and now they are not satisfied unless the images speak and sing audibly as well as visibly.

Transmitting Speaking Images

For the transmission of talking television images it is necessary to employ two separate radio transmitters, one for the visual portion and another for the audible portion. The necessity for using two separate channels is obvious when the composition of each signal is realized.

The speech transmission requires a channel about 20 kc wide, 10 kc on each side of the carrier. If any other signal were impressed on the same wave there would be direct interference and the sound transmitted could not be received distinctly.

The television transmission requires an

How It Is Worked

Anderson
Editor

even broader channel, and it requires an exclusive channel, for if anything else were carried by the same carrier frequency the picture values would be affected by it and the received image would not be equivalent to that transmitted.

If the speech and vision signals were impressed on the same carrier frequency, the visual signal would be heard with the speech signal and the audible signal would be seen with the image, and neither signal would be clear.

Two Channels Necessary

Hence for clear speaking images it is necessary to use two independent channels having common terminals.

The speech channel does not differ from the ordinary broadcast or phone radio channel. It starts with a microphone. The voice currents generated by this instrument are impressed on the radio frequency current generated by the oscillator and then the modulated radio frequency signal is radiated into space in the usual manner.

The reception of this portion of the signal is identical with the reception of a radio program and it is done with the same receiver, provided that the frequency of the carrier falls within the tuning range of that receiver.

How Image Is Transmitted

The method of transmitting the image of the person speaking before the microphone is not so familiar to broadcast fans, except to those who have followed all the developments in television during the last year.

The person before the microphone is brightly illuminated so that a camera focused on him forms a bright image on the ground glass, or directly on the scanning element in the television transmitter.

A photo-electric cell is put on the dark side of the scanning element ready to catch every ray of light that may get through the scanning holes. The light that does get through the disc or other scanning element varies in intensity according to the lights and shadows on the person before the camera and the microphone.

The electric current through the photo-electric cell is directly proportional to the amount of light that enters it, and hence it is proportional to the light that comes from the picture transmitted.

Radio Frequency Picture-Modulated

The current through the photo-electric cell is amplified to an enormous extent and finally is impressed on a radio frequency carrier. This carrier has a frequency different from that of the speech carrier, as was stated above, and it must differ by more than the sum of the widths of a television and a speech sideband.

For the reception of the television signals a separate receiver is necessary. It is tuned to the carrier of the image signals, detected and amplified at low frequency. The requirements of the television receiver are somewhat greater than those of the speech receiver, as was pointed out in the June 30 issue of RADIO WORLD.

Neon Lamp Flickers

In place of the loudspeaker a Kino-lamp is connected to the last tube of the television low frequency amplifier. As the television signal fluctuates in intensity the plate current in the output tube fluctu-

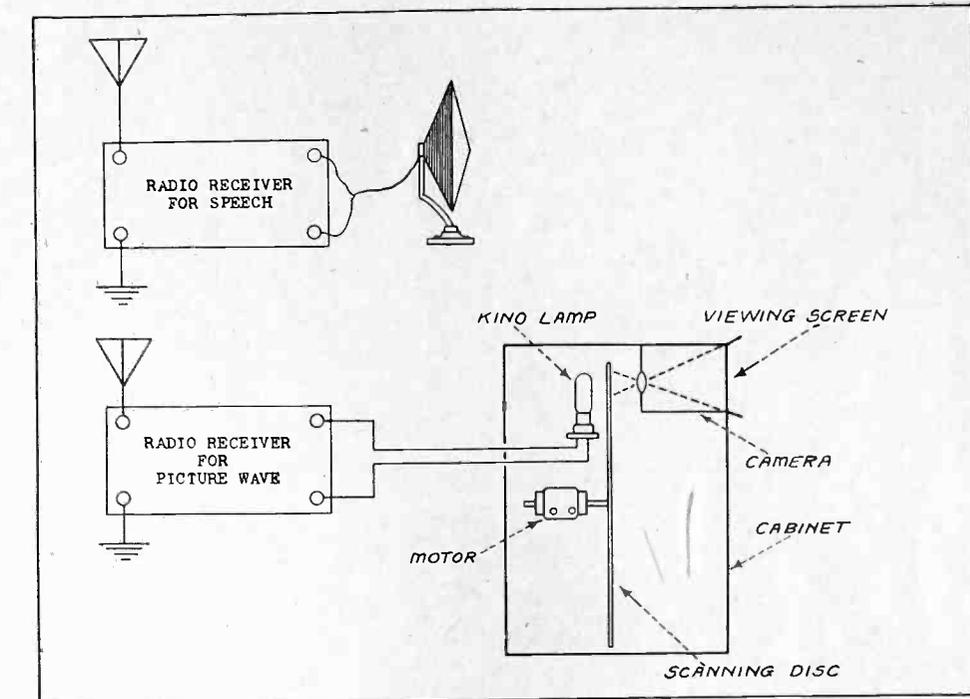


FIG. 2
SCHEMATIC DIAGRAM OF AN ARRANGEMENT FOR RECEIVING TELEVISION AND ACCOMPANYING SOUNDS SIMULTANEOUSLY.

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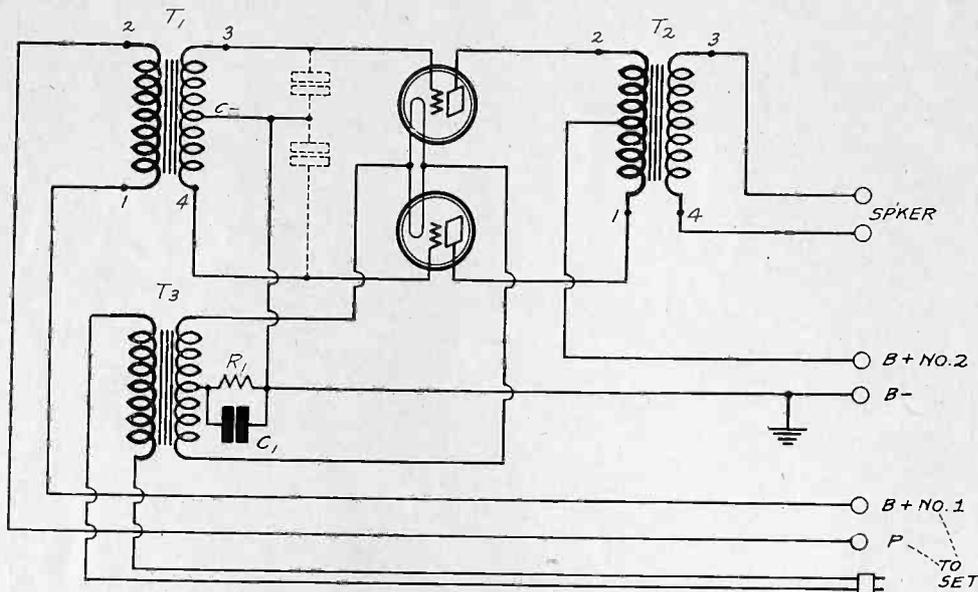
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A Push-Pull

By Capt. Peter

Contributing



THE CIRCUIT DIAGRAM OF A PUSH-PULL VOLUME BOOSTER WHICH MAY BE CONNECTED BETWEEN ANY LOW POWER SET AND THE LOUD SPEAKER

THERE are in use thousands of receivers which do not have sufficient power handling capacity to operate properly a loudspeaker. That is, they become overloaded long before the operators feel satisfied with the volume of sound obtained.

But that does not prevent many owners from forcing the sets to deliver loud noises. It is this lack of power handling capacity, together with the desire on the part of the operators to have plenty of volume, which accounts for the terribly mutilated sound and music which may be heard everywhere.

Most operators of such receivers realize the deficiency of the receivers and they are anxious to do something about it. Volume alone does not satisfy them any

longer. They want quality and realism in radio programs as well.

New Receiver Unnecessary

Probably the principal reason why so many fans do not correct the trouble with their receivers is that they are under the impression that a completely new installation is necessary. That is not so. All that is necessary, if the receiver is otherwise satisfactory, is a stage of power amplification which can be connected between the loudspeaker and the output of the old set.

Regardless of the type of receiver used this volume booster can be used with good effect and it can be built for a moderate cost. The diagram shows such a booster employing two tubes in push-pull.

Mixing Panel Idea Blends Two Speakers

Those possessing a present-day cone speaker and an old-style high-pitched horn might well borrow the mixing panel idea from the broadcasters. This is simply a means of blending two acoustic effects until the desired ensemble is obtained. In the case of the broadcasters, the respective microphone pick-ups are blended, while in the case of the listener-in, the output of two widely different loudspeakers may be blended.

The general idea of a mixing panel for the home radio rendition is to obtain the desired degree of mellowness, depth or "bass note" effect with just the desired degree of sharpness or high-pitched component for pleasing detail, especially in the case of speech and distant reception.

For good results, a horn-type loudspeaker of exceptionally high pitch should be employed, together with a cone speaker

of exceptionally deep or mellow tone. Both loudspeakers are connected in series across the output of the amplifier or radio set, and each is shunted with a variable high resistance. Each variable resistance should have a range of from 0 to several hundred thousand ohms at least, for a sufficient means of control.

The simplest arrangement comprises a duplex Clarostat, or two variable resistors in one compact unit. Either resistance value may be set independently, by means of a screwdriver, and then left as a permanent resistance until a different acoustic blend is desired. The device may be readily mounted on a baseboard or on a panel with the adjustment screws exposed. Connect plate to one side of the Clarostat and to one cord of one speaker, join one cord of each speaker to the duplex Clarostat's midpoint and two open leads to the speaker return.

LIST OF PARTS

T1—One Silver-Marshall No. 230 push-pull input transformer.

T2—One Silver-Marshall No. 231 push-pull output transformer.

T3—One Thordarson filament transformer (5 or 7½-volt winding).

R1—One Electrad Truvolt, 1,000 or 1,500 ohms.

C1—One Tobe (No. 304) 4 mfd. by-pass condenser.

Six binding posts, with strip.

Two Silver-Marshall standard X type sockets.

One baseboard.

The filaments of these two tubes are heated with AC and therefore the use of this particular booster is limited to sections where alternating current is available.

Push-pull Volume Booster

The best volume booster is one which is built on the push-pull principle. It is capable of delivering a purer output for a given volume than a single-sided circuit and it will also give a greater volume for a given amount of harmonic distortion than any other circuit, assuming that the same type of tubes and the same voltages are used.

A good push-pull volume booster can be built with almost any two receiving tubes—99s, 120s, -01As, 112As, -71As, -26s, -27s, -10s and -50s. The size of tubes to use would depend on the volume that is desired, the A and B voltages that are available, and on the receiver already in use. The use of 99s is of doubtful advantage because even in push-pull the maximum undistorted output is small and may be insufficient for satisfactory loudspeaker operation. But if the last tube in the set used is a -99 the push-pull stage with the same type of tubes will boost the volume to about four times that obtainable with a single tube before the relative distortion is the same.

Two 120s in push-pull following a -99 would improve immensely, the volume and quality of any small receiver. Considerably improved results may be obtained with a couple of -01A or a couple of 112A tubes. Filament transformers are available for these tubes. Also the push-pull output transformer designed for -10s may be used with good effect.

Output Tubes Preferred

Of the so-called battery tubes the -71A is the best for a volume booster for home use and in connection with most receivers in use. One push-pull stage employing these tubes when the plate voltage is 180 volts will give a maximum undistorted output of 2.8 watts. A greater output is rarely required in a home.

The maximum output of this stage will not be undistorted if the tube preceding it is overloading and delivers a distorted output to the push-pull stage. But the tube preceding will not be overloaded if the grid bias on that tube is 4½ volts and if the plate voltage on it is high enough to permit this bias. This applies if the tube is a -99. This is the least favorable tube so that when one of the larger tubes is used the distortion in the signal delivered to the push-pull stage will be less.

Volume Booster

T. O'Rourke

Editor

The advantages of using a pair of -71As are that filament transformers giving the required voltage are available and that the plate voltage delivered by most B battery eliminators is adequate to power the push-pull stage. Thus a new power plant is not necessary when building such a volume booster.

A pair of -10s in a push-pull receiver will give even more undistorted output than a pair of -71As, provided that the required plate voltage is used. This should be about 425 volts. The grid bias for this amplifier with 425 volts on the plates should be 35 volts. This requires a new power plant in most cases, for if such high voltages are available it would be because a high power output already has been provided.

Most push-pull output transformers have been designed for use with -10 tubes. Filament transformers are also available.

Quality and Volume De Luxe

When great volume and unexcelled quality are desired there is nothing better than a pair of -50s in push-pull, provided that the necessary filament, plate and grid voltages are employed. A single -50 tube will deliver a maximum undistorted output of nearly 5 watts. That means that a push-pull stage of these tubes will deliver an output power of about 20 watts without introducing appreciable harmonic distortion. That is many times more than is needed to fill a large room with sonorous volume when using loudspeakers of ordinary sensitivity.

But this reserve power is a requirement for first class quality. If the amplifier is operated at only 1/20 of the maximum there will still be plenty of volume, and then the harmonic distortion contained in the signal will be only about 1/400 of the percentage that would be present if the amplifier were operated at maximum.

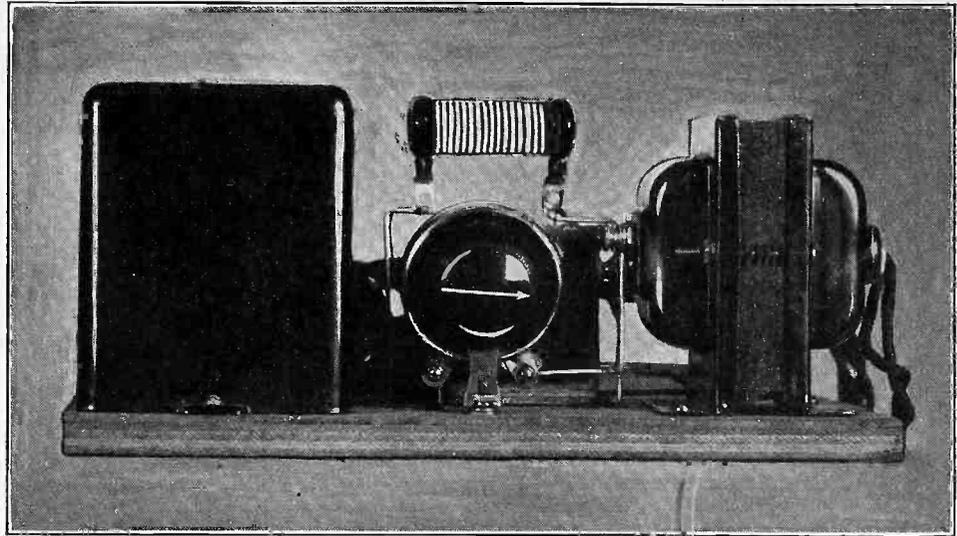
Speaker Distortion Suppressed

There is another possibility for quality improvement when a great reserve power is available. It is well known that loudspeakers have many resonance peaks at which the volume will be many times greater than normally. These peaks appear as unpleasant blasting. The reason for the presence of these peaks is that the sounding unit and sounding diaphragm are not adequately damped.

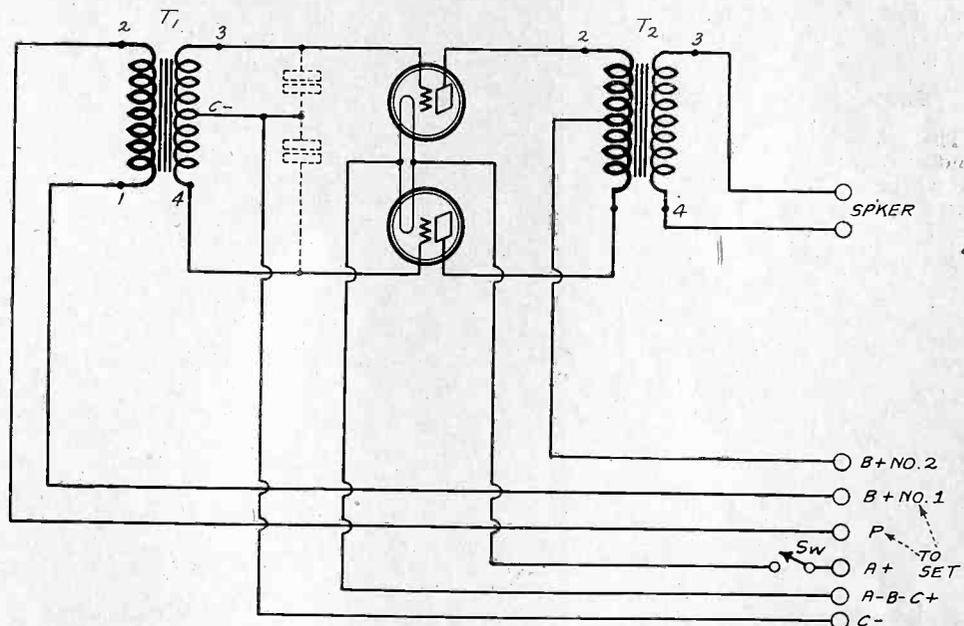
It is easy enough to damp the vibrating parts. Why is it not done in all speakers when it improves the quality? Because the damping "kills" the speaker. It lowers the response of the speaker for a given input. Hence the speakers are not damped in order that they may seem to be sensitive.

Now if 10 or 20 times as much power as necessary is available the speaker can be damped and there will be enough sound radiated to satisfy even persons of defective hearing. And the damping will level all the response peaks. It will stop the blasting. It will make the output of the speaker sound natural.

There is serious drawback to the use of two -50s in push-pull, and that is the difficulty of getting an undistorted input voltage anywhere near that which would give maximum undistorted output. This holds for a single tube and the case is



A SIDE VIEW OF THE AC MODEL EXTRA PUSH-PULL STAGE.



THE EXTRA PUSH-PULL STAGE ARRANGED FOR DC FILAMENT SUPPLY. THE STEPDOWN TRANSFORMER IS OMITTED AND THE GRID BIAS IS SUPPLIED BY A BATTERY.

about four times as difficult in a push-pull stage.

The grid bias required for one -50 is 84 volts. Thus a peak signal voltage of 84 may be applied to the tube. If the amplifier is push-pull the input voltage for maximum output will be at least 168 volts. Suppose the ratio of the input transformer is 1-to-3, the secondary voltage being divided equally. The voltage across the primary will then have to be 56 volts. If the tube and the transformer are matched the voltage in the plate circuit of the tube will have to be 112 volts, peak value.

Now we may assume that the mu of the tube is 8. Then the peak input voltage to the tube preceding the push-pull will have to be 14 volts. The grid bias on the tube should be about 15 volts. Thus it will be necessary to use either a 112A or a -10 tube.

If the tube and the transformer be matched at a sufficiently low frequency it may be possible to use a 112A, tube since the voltage transfer from the tube to the transformer primary will be a little more favorable over the essential

audio range.

The transformer ratio also may be increased so that a 112A or a -01A tube may be used without overloading the tube seriously when the push-pull stage gets an input to give its maximum undistorted output.

But even if the transformer ratio be increased to the value ordinarily used and if the matching be done at a low frequency all the tubes with the exception of -10 are worked perilously close to the overloading point. There is no object of providing an output stage which will deliver a high undistorted output when the tube preceding it will introduce a high percentage of harmonic distortion.

If the -71A tube be used preceding the push-pull stage the difficulty is simply moved forward a stage. The distortion will then be introduced in the detector or in the first audio stage assuming that the push-pull stage is the third.

It would seem that the best tube to use in a push-pull volume booster for home use is the -71A. Hence the list of parts for the push-pull volume booster calls for this tube.

Country - Wide Greetings the Double

By H. G.

THE harness design for the Doubled Shield Portable, the circuit described in the June 23d and 30th issues, is published this week for the first time, and aids materially any who want to build a good portable, although their knowledge of radio may be slight.

First of all, it is important to lay out the parts exactly right, and this may be done from the half-scale diagram reprinted herewith so that the coincidence of harness and actual parts to which it connects is made perfectly plain.

Next you want to wire as conveniently as the designer himself, and in this regard the harness covers a multitude of desires—not sins!

Blueprint Helps a Lot

The official blueprint, giving a condensed schematic diagram of the wiring, list of parts, full-sized parts assembly plan and full-sized harness template, is available to the public, and anybody desiring to play doubly safe, and of being sure to get immediate results though knowledge of radio may not be as perfect as desired, had better have the assistance of the blueprint, too.

The harness as diagrammed herewith was prepared from the official blueprint. Every precaution was taken to get everything exactly right and perfectly clear, so that immense satisfaction would ensue.

The Draughting

For instance, the receiver as originally designed and built was turned over to an expert draughtsman, who measured every part, every hole. In pencil, on tracing cloth, he drew the ruled and other lines, then went over these in ink. This work took him 17 hours. Everything was full-sized.

The results of his labors are condensed in the half-scale diagrams herewith.

It goes to prove that every advantage was taken in favor of the constructor, so that he would see things plainly, understand fully and succeed immensely.

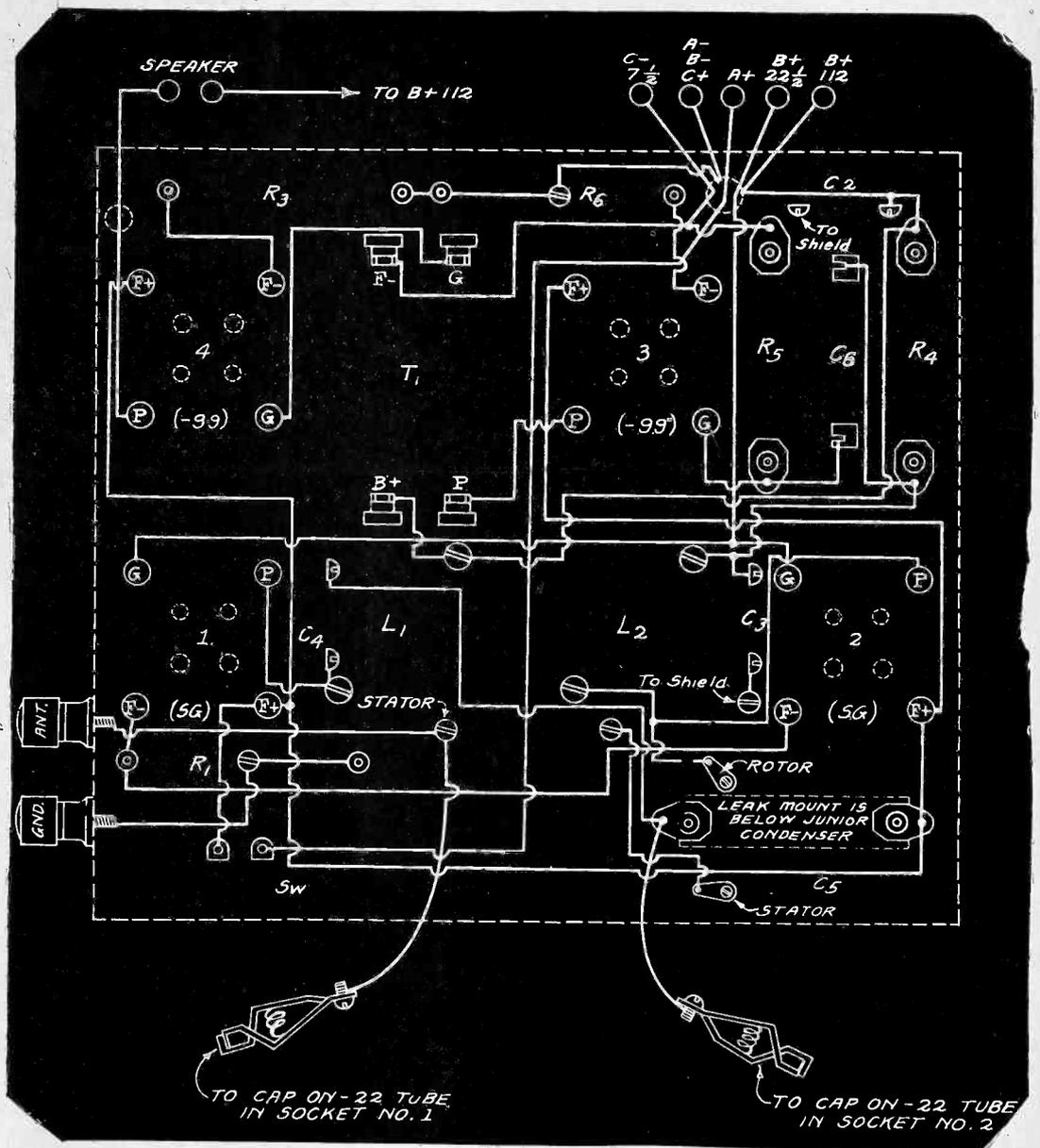
Success Proved

And such success, fortunately, has come to pass.

Among those who built the receiver portion of the portable were many who wanted a fitting circuit to place behind the dashboard of their automobile.

It will be remembered that the first instalment of the constructional article pointed out the suitability of this portable for automobile installation.

Moreover, it is easy to put the entire receiver behind the dashboard, so that no needed room is displaced. The battery of the car itself may be used to light the



HERE IS THE WIRING PLAN OF THE DOUBLE SHIELD PORTABLE, DRAWN TO ONE-HALF SCALE, AND COINCIDING WITH THE TOP PLAN PRINTED ON THE OPPOSITE PAGE. BY USING THIS METHOD OF WIRING INSTRUCTION ALL CONNECTION PROBLEMS ARE AUTOMATICALLY SOLVED. IN ADDITION, BLUEPRINTS ARE AVAILABLE.

tubes, while B supply must be furnished by batteries, not necessarily the small ones recommended if the power for A and B purposes was to be put in a second shield, but large B batteries, for longer life, if you have a roomy car.

The tube arrangement might well be different for automobiles, since you have a six-volt source, the car battery. Use screen grid tubes in the tuner (socket 1 and 2), and -01A for the first audio and a 112A for the final audio. Do not use a -71 and -71A tube in the last stage.

Different Amperites

For a 6-volt source the filament resistor for the tuner tubes should be a 120 Amperite, while the filament resistors for the two audio tubes should be 1A Amperites. If the car's storage battery is 12 volts,

instead of six, use a 20-ohm resistor for the tuner tube filaments and an eight-ohm resistor for each of the audio filaments.

Of course, when you have the set in an automobile you have a ground handy—the frame of the car. The rubber shoes and tubes on the wheels act as insulation, aided by the air with which they are filled, and a condenser effect of considerable capacity exists between the car's frame and Mother Earth.

This is your ground, then, and it is well indeed to connect the low potential end of the loop to the frame of the car.

Can Use Outside Aerial

Or, if you don't want to turn a loop, place one permanently in the car somewhere, and have a wire running along the top, as an aerial. Connect this to grid,

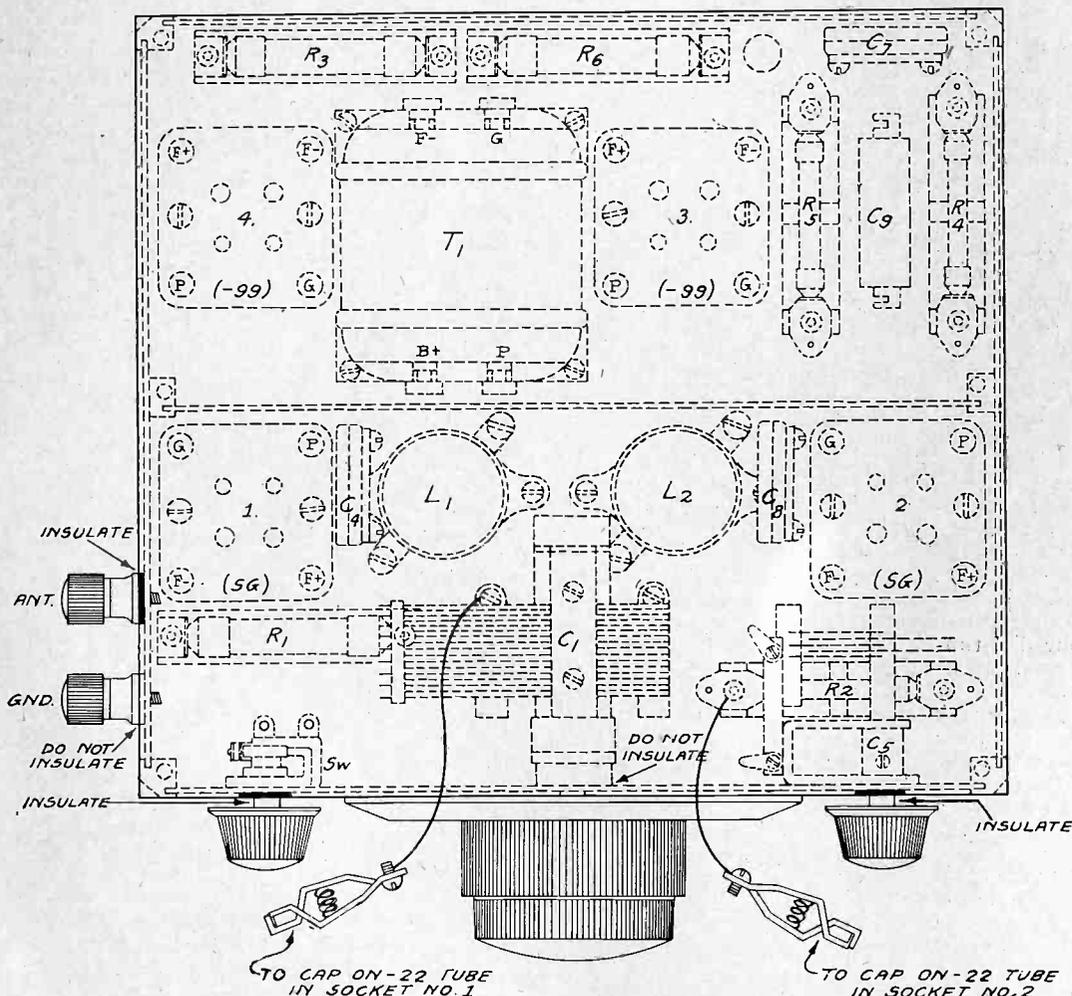
Enthusiasm Shield Portable

Cisin

leaving the loop in circuit all the time, also.

Your selectivity will drop considerably when you resort to this outside aerial plan, but in the country, or anywhere else far removed from stations, or even near some

impending vacation, but visitors to RADIO WORLD's office had showed such delight at observing the original model, even though it was partly dissembled to obtain blueprint dimensions, that the set stayed right where it was. Regrets



THE TOP VIEW SHOWS THE LAYOUT OF PARTS WITHOUT WIRING. THIS IS TO BE READ IN CONJUNCTION WITH THE WIRING SCHEME SHOWN ON THE OPPOSITE PAGE. BOTH DRAWINGS ARE HALF SCALE. THE SHIELD IS ACTUALLY 8-11/16 INCHES WIDE BY 7 7/8 INCHES DEEP.

stations, but in points of poor receptivity, you won't need any more selectivity than this system affords.

Others who built the set used it on the Hudson River steamboats, on week-end trips; on the Mississippi River, in the Rocky Mountains and in the woods of Maine, and beaches of Florida, as well as in their homes. They reported good results. Some of them encouraged friends to build the set, and this encouragement was felt in retail stores, so that the stores ordered extra copies of the issues containing the circuit. One of these retail stores was the largest one in America, in point of business volume, and is located on Cortlandt Street, New York City. Walthal's is the name.

Another interesting point was that the associate technical editor of a radio publication took such fancy to this portable that he tried to borrow it for his

were expressed, and they were more than formal, but the status quo was preserved.

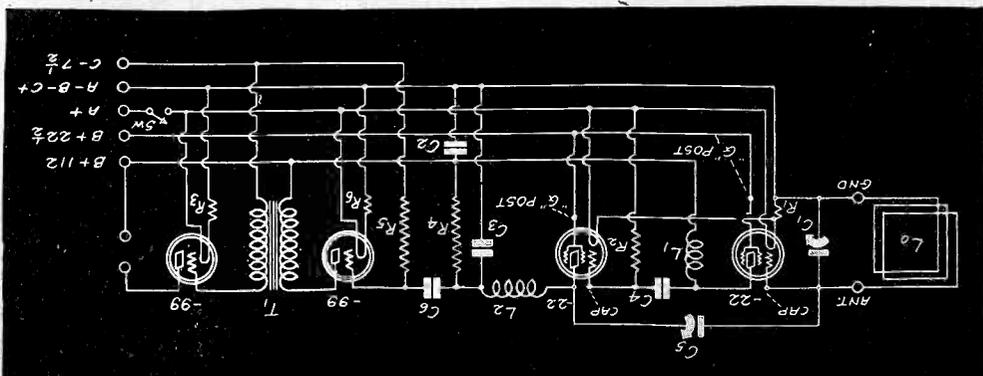
LIST OF PARTS

- Lo—One loop.
- L1, L2—Two Hammarlund 85 millihenry RF choke coils.
- C1—One Hammarlund .00035 mfd. Midline tuning condenser.
- C2, C3—Aerovox fixed condensers of .001 mfd. each.
- C4—One .00025 mfd. Aerovox fixed condenser.
- C5—One Hammarlund junior condenser (5 plates).
- R1—One 1A Amperite.
- R6, R3—Two 4v-199 Amperites.
- R2—One Lynch 2 meg. metallized grid leak.
- R4—One Lynch 100,000 ohm metallized resistor.
- R5—One Lynch 5 to 10 meg. metallized grid leak.
- T1—One Karas Harmonik audio frequency transformer.
- C6—One .5 mfd. Aerovox by-pass condenser.
- SW—One Yaxley No. 10 switch.
- One Hammarlund QS Aluminum shield.
- Four Frost sockets.
- Two binding posts (Ant. and gnd.)
- Two output (speaker) posts.
- One Karas Micrometric dial.

So you can see that this portable has an appeal, especially as it may be operated at home, using only a loop, and affords enough selectivity and sensitivity to get the locals well, while "on the road" it may be assisted by a ground or an antenna wire or both. Under these aided conditions it is not selective but it need not be.

The schematic diagram is republished in a form to coincide with the designations and constants as shown in the above list of parts.

[Some experiences with this portable will be related next week.]



CIRCUIT DIAGRAM OF THE DOUBLE SHIELD PORTABLE.

Fibre Pick-Up Needle Eliminates the Scratch

Anyone who has done experimenting in radio receivers, amplifiers or allied fields, realizes that there is always a chance to improve some detail, no matter how slight. Regardless of how near-perfect the original design may be, additional experience over a period of months generally brings out some feature which can be improved so that the results will be just a bit finer. Nothing was wrong with the original attempt, but a slight change here or there immediately marks the second version of the same product or circuit as a worthwhile advance.

Since the first radio vacuum tube saw the light of day it has taken more than twenty years for the development of the semi-power and power tubes, such as the 112 and —71 types. Rome wasn't made in a day, and neither is worthwhile progress in radio.

Another outstanding example lies in the AC tubes, long-awaited, and which, since their successful introduction last year, have been generally acclaimed one of the greatest single advances in the radio art.

For more than a score of years resourceful experimenters, tube experts and engineers throughout the world have been working towards the design of an AC tube, the final models of which appeared on the market in 1927.

Single Tuning Control

Yet another interesting case is that of one-control tuning. Ever since the great public acceptance of radio as the home entertainer, it has been obvious that the most acceptable set for general, all-around home use would be one with a single dial to bring in station after station, as desired. But only during the past three years has practical, efficient one-dial tuning made its appearance in actual working models of commercial sets.

In the field of magnetic phonograph pick-ups, used to play records through the audio amplifier of the radio receiver, the final features of design have likewise been the result of slow progress and long experimentation. The principle of the magnetic pick-up dates back as far as fifteen years, but only during the past year has it been presented in a simple efficient form, practical, satisfactory and so easily handled that anyone can get splendid results with it. The model 105-A Patent Phonovox exemplifies recent advances.

The problems involved in the design of an improved magnetic pick-up are interesting. The ways and means the laboratory engineers found of solving these same problems are yet more interesting, for they show radio and its essential accessories, be they old or new, are ever forging ahead, ever becoming simpler and at the same time better.

That Scratch

Those who have listened to a good magnetic pick-up playing records through the radio receiver have undoubtedly found just one bit of frank criticism, that is, a slight amount of needle scratch. Not enough to be objectionable or really bothersome, but enough to make the listener say:

"That would be perfect if it weren't for the needle scratch!"

"Needle scratch" is exactly the right term. The trouble lies in the metal needle and not in the pick-up. So the men who designed the original Patent Phonovox

decided that needle scratch should be done away with. The solution rested in shifting from the conventionally accepted metal needle and in designing a needle holder which would take the triangular form of fibre needle. It is worthy of note in this connection that practically no loss in volume results from the use of the fibre needle, when properly employed in a magnetic pick-up.

To get the same volume from the speaker as with a full-tone metal needle, a type of short fibre needle, a cut-down of the usual type used for softness with records, is employed. The use of the short type of fibre needle results in more initial energy being delivered by the pick-up than with the long one, and this energy will be fully equal to that set up by a standard full-tone metal needle.

Kills Off Nearly All Scratch

The fibre needle eliminates practically every vestige of needle scratch in the final reproduction from the loudspeaker.

The man on the street may or may not realize the fact that the weight of a pick-up unit is a highly important feature. Too much weight tends to shorten the life of records by its harsh cutting action. Too little weight invariably means that the full quality and tone range of the record are lacking. This is particularly true on the bass side of the frequency range.

By running "life tests" with various weights of pick-ups, it was found that one exact weight preserved the full useful life of the record. An ounce or two or more were found to shorten life materially, while lighter weights gave reproduction from the speaker which was lacking in depth and range.

With a properly balanced tone arm, the new design places exactly the correct weight on the record. To build the pick-up unit with no more than this complete weight was no small task in itself. Only by the most careful and judicious attention to details of design and construction were all the necessary features incorporated in the final compact form of the exact weight needed.

Results After 15 Years

The design evolved by engineers in the new Phonovox is really the culmination of fifteen years' endeavor by experimenters and engineers who foresaw that as soon as amplifiers and tubes developed to the point where a radio set was a true musical instrument, the public would demand a simple device to ally radio and phonograph.

Today a fine radio set is used by thousands of people as a double entertainer. Primarily they regard it as a radio set for bringing in programs from near and far. But there are times when we want to hear the music of great artists who have appeared before the microphone at one time or another. Through the medium of our set, a record and a magnetic pick-up, radio and phonograph work hand and hand to satisfy the desire for music and entertainment which radio, at the moment can't give, simply because it's not on the air.

The pick-up requires only a turntable, since tone arm, audio amplifier, speaker and volume control are at hand. However, the pick-up may be obtained without tone arm, and attached to the arm of a complete phonograph, the sound chamber of which is not used then.

Still Pictures Sent by New "Fultograph" Vienna to London

Wireless broadcasting of pictures took place between Vienna and London for the first time recently. Photographs and facsimiles of messages were received in London by means of the "Fultograph" and a three tube radio receiver. The messages were easily readable and the photographs were recognizable, but reception was far from perfect.

The Fultograph, which is the invention of Captain Otho Fulton, is being manufactured in France. It is cheap in comparison with similar other inventions and has been adopted by several continental stations, which intend to begin picture broadcasting in October as a part of their regular service. The transmission of each picture required 3½ minutes and it was received simultaneously in Paris and Berlin.

Radiophone Service Proposed for Ferries

Radio telephone service is proposed for the international ferries plying between Denmark and Germany, Vice Consul E. A. Johnson, Copenhagen, stated in a report made public by the Department of Commerce.

Installation of the radio telephone equipment is looked for in the near future. Experiments with such equipment are reported to have proven quite successful according to the report.

Furniture Care

Art, whether dainty or bold, in manufactured products, from any industry for any home, is spurting forward, and now even the smallest or least expensive item for the home is available in a variety of appearances and patterns. It costs little more, sometimes even less, to put the artistic touch on the product, and lift it from a rather commonplace though dignified level, to heights of stimulating and fetching effects.

Some of the futuristic or less embellished modernism is bound to show itself in radio furniture, and the coming season will prove this in custom made receivers while no doubt factory-made sets for 1919 will not look so much alike as pieces of furniture, but will be distinguished from one another by modernistic touches, with color in command.

A flair for color is sweeping the Western Hemisphere for everything in which we live, walk or ride. The striking color scheme, a trifle exotic perhaps, a bolder than a church warden would approve on his seventieth birthday, has come to stay, to grow, to thrive, and it will strike radio.

A suggestion of its entrance was made at the radio trade show held recently in Chicago, where unconventional two-tone shades adorned the furniture of one set manufacturer—colors, though modest ones. The more adventurous eye will look for sparkle, brilliancy, and will get it, in radio, at an early date.

France Prepares to Copy System of Farm Talks

The example of the United States Department of Agriculture—conceded to be the world's largest user of radio for educational and informational purposes—is being followed by Old World ministries of agriculture.

For two years Czechoslovakia has carried on an agricultural radio program inspired by the United States Department of Agriculture's pioneer work in broadcasting weather reports, market news, and farm educational programs.

Now French governmental authorities are developing plans for a farm broadcast schedule from government-controlled stations in Paris. Prof. Bernard Trouvelot, of the National School of Horticulture at Versailles, recently conferred with Morse Salisbury, chief of radio service in the Department of Agriculture, on methods of organizing and presenting educational radio programs for farmers and home makers.

It is probable, Professor Trouvelot said, that the French farm broadcasting service will provide reception facilities for farmer listeners as well as prepare the talks and do the broadcasting. Because of the present small number of radio receivers in rural France the government probably will set up receivers at central points in the villages so that the peasants may gather in groups to hear the farm broadcasts.

The great good that resulted to farmers in the United States, due to Federal broadcasts, made a deep impression on Prof. Trouvelot.

Colors of Colors

The home adorned with a Chinese rug of many colors and unique pattern, with solid ultramarine field, amber border, a golden branch, with leaves of lifelike green and flowers of purple, yellow and lavender shooting strongly out of the four corners of the rug; the home with anjo clock, on the hinged little low-lying floor of which is a marine scene in rich blue and golden brown and crimson of the sun's last visible adieu; the home with crocheted doilies running the length of the table, threaded with real gold and woven into seductively colored arabesques; the home with its woodland-scene shades or wall bracket electroliers and its pregeous array of colorful spectacle for the artistic umbrella that is the shade of the living room upright lamp; the home with the ornamented kitchen chairs andaucy cretonne pillows; the home with the pale green screens with lake, swans and peeds embroidered thereon in reflecting silver; this home, within the means of a \$3,500 income, is not long to retain the radio furniture of stock, orthodox conventional, time-honored brand and style. The period of the period is about to be over, or, if you will, the modernistic in it is going to develop its own period.

Color makes life more enjoyable. Color drives off drabness. Color captivates, fascinates. Burl walnut, solid mahogany—even tame Chinese model consoles, the last unprogressive example of radio furniture—will have to abdicate.—H. B.

"Gyp" Called Worst Menace to Business

Chicago, Saying that the predatory price-cutter of standard guaranteed merchandise is one of the greatest enemies of the public and manufacturer alike, Representative Clyde Kelley, of Pennsylvania, co-sponsor of Capper Kelley Fair Trade Act, told the Radio Division of National Electrical Manufacturers Association at the final session of their annual meeting that "the Radio business is especially vulnerable to price cutting."

He added: "It is a new and highly technical business and the public cannot know the quality of products except through identified goods which have the backing of the manufacturer of high quality at a fair price. When 'gyp' merchandise is substituted by predatory price cutters, the public suffers. Cut-throat competition drives the independent out of business. Consolidations follow and the cycle is complete."

Two Sources of Complaint

Two outstanding facts face American business today, he said; they are profitless prosperity and consolidation.

"It is my belief that this is not what the Radio Commission wants and certainly not what the listeners want.

"It is estimated that the conventions' radio audience attained the staggering total of 50,000,000, or not quite half of our entire population, listening in on the proceedings through some 12,000,000 receivers," he said.

"Less than one-fourth of one percent of the corporations of this country make sixty-five percent of the profits. Consolidated organizations such as chain stores, mail order houses and department stores, do thirty-one percent of a ll retailing business. These two facts are due largely to cut-throat competition which has been encouraged by unjustified application of anti-trust laws."

Representative Kelley stated that it was a widely held delusion that any contract expressed or implied between an independent manufacturer of a standard product and his distributors as to resale price is restraint of trade, a violation of the Sherman Anti-trust Law and an injury to the public.

"The truth is" said representative Kelley, "that such a contract tends to emancipate trade, to discourage monopoly and to benefit the public.

Makes up on Gyp Goods

"The predatory price cutter of standard guaranteed goods is the real offender. His unfair practices injure the honest

manufacturer, the honest dealer and the public. He is the 'gyp' business man who builds on fraud and reception.

"His system is to bring customers into the store through ruinous cut prices on well-known merchandise and then profit by excessive prices on unknown, unidentified goods."

"Such price cutting as this," continued Representative Kelley, "is jungle warfare. It destroys the good will of worthy manufacturers who have invested work, money and character in their goods. These makers of quality goods under present conditions are helpless to protect themselves from business pirates of unscrupulous methods.

"The public in the end always loses by unfair competition and pays for the wastes and losses. First they are deluded by spider-web bargains, and when competition is eliminated, they are devoured by extortion."

Contending that this issue is the greatest involved in American business today, Representative Kelley contended that the Fair trade Act, sponsored by himself and Senator Capper, is designed to permit the manufacturer of an identified product to contract as to its resale price. The Bill (H. R. 11) has been favorably reported by a sub-committee of the House and is up for consideration in the December session.

St. Lawrence Patrol Maintains Service

Washington.

An ice patrol will be maintained in the Gulf of St. Lawrence from Cape Ray to Bird Rocks, to Heath Point and back to Bird Rocks until the navigation route is completely clear of ice, according to an announcement made public by the Radio Division, Department of Commerce.

A message embodying ice conditions from Cape Race to Quebec and recommendations as to the route to be followed is made up by the ice patrol every 24 hours and kept on file for immediate transmission by radio to ships upon request, the announcement stated.

This information is broadcast four times daily and will be repeated by coast stations at North Sydney and Grindstone Island upon request. Ships requiring the latest information concerning the Gulf of St. Lawrence route should communicate direct with the ice patrol vessel (VCQ) on 600 meters, spark, according to the announcement.

Continuity Program Proves Most Popular

Los Angeles.

With the continuity type of programs becoming more and more popular, radio fans can now look forward to many such programs in the near future, according to Carl Haverlin, commercial manager at KFI.

"By the continuity program," continues Mr. Haverlin, "we mean a program where a thread of a story carries the background for music and entertainment. KFI and the California Network recently broadcast

an Hawaiian Nights series for the Matson Navigation Company, and, as a check to ascertain the value of such programs, offered a booklet describing the Hawaiian Islands to any listeners in who would write for one.

"The studio at KFI and the Matson Company's office were flooded with requests and letters of appreciation, proving that the continuity program met with the approval of the radio public in great style."

Trust Charge by U. and Others

Dismissal of Complaint Is Asked by counsel for corporations, on ground of "reasonable restraint of trade"—government counsel fights motion, charges combine with "libel and slander" and with fixing "outrageous prices."

Washington.

Holding that existing contracts for the interchange and licensing of radio patents are not in "restraint of trade" but are legal under patent statutes, counsel for eight corporations appeared before the Federal Trade Commission and moved for dismissal of the Commission's complaint of January 26, 1924, Docket No. 1115, lodged under Section No. 5 (cease and desist section) of the Federal Trade Commission Act.

The Commission, it was announced, will not reach an immediate decision regarding the motion to dismiss the complaint.

The full text of the Commission's statement follows:

"No action will be taken for the time being by the Federal Trade Commission on the motion made by attorneys for the General Electric Company, Radio Corporation of America and others, asking that the Commission's complaint against them be dismissed.

"The Commission today granted its counsel in the case 20 days in which to file a brief and the respondents will be given 20 days from the time the Commission counsel files in which to file any briefs they care to present."

Monopoly Charge

Edward L. Smith, counsel for the Commission, restated the Commission's position as set forth in 1924 to the effect that the interchange of patents tends to perpetuate the control of the field by the corporations and to monopolize "the various means of radio communications and broadcasting beyond the time covered by existing patents owned by them or under which they are licensed."

The corporations cited by the Commission are the Radio Corporation of America, General Electric Company, American Telephone and Telegraph Company, Western Electric Company, Inc., Westinghouse Electric & Manufacturing Company, the International Radio Telegraph Company, United Fruit Company and the Wireless Specialty Apparatus Company.

John W. Davis, counsel for the American Telephone and Telegraph Company, speaking for his company and the five contracts to which it is party in the interchange and licensing of radio patents, said:

"Everything these contracts contain is fully within the rights of a patentee under the laws of the United States.

"We submit that there is nothing in the agreement to interchange the patents for the development of radio communica-

tion and the radio industry that is in violation of the law and the complaint should be dismissed."

Mr. Davis further stated that the proposal in the complaint, which is to require the holders of the various radio patents to desist from compliance with the agreement to interchange them and license their use, would mean a return to the "chaotic condition" in 1920 before the various radio patents were coordinated.

In denying the existence of monopoly, he declared that 35 independents are making radio sets, and the Federal Radio Commission is doing everything possible to cut down the number of broadcasting stations in the United States.

Disposed of Holdings

Mr. Davis also made the statement that the American Telephone and Telegraph Company, which in the beginning owned a large block of stock in the Radio Corporation of America, had divested itself of all its holdings a year prior to the filing of the Commission's complaint in 1924, and had no representative on the Radio Corporation's Board of Directors.

Speaking for the Radio Corporation of America, J. P. Cotton acknowledged that the patent rights were the basis of the situation, and cited to the members of the Commission the decisions of the Supreme Court of the United States in the "Western Meat" and "Eastman Kodak" cases. In those decisions, Mr. Cotton stated, the Court held that the taking over of the physical assets of a company did not of itself constitute a monopoly.

The part taken by the Federal Government in the formation and development of the Radio Corporation of America at

the time that the late Admiral W. H. Bullard was the representative of the Government on the Corporation's Board of Directors, Mr. Cotton asserted, goes to show that the developments in the situation were encouraged by the Government.

U. S. Approval Cited

The cross-license proposal, counsel said, had the approval of the Attorney General of the United States and the arrangements entered into regarding foreign communications had the approval of the Department of State and of the Department of the Navy.

"What action was taken," said Mr. Cotton, "was clearly the result of the investigation and encouragement of the Government and certainly there was no intention of violating the law.

"If there is any restraint of trade, then, under the circumstances it is 'reasonable' restraint of trade and not 'unreasonable.' One might also say that if there is restraint of trade it is 'legal' restraint of trade."

Both Mr. Cotton and Thurlow M. Gordon, also representing the Radio Corporation, gave details regarding the development of the radio immediately after the war.

Made Radio What It Is

They declared that confusion and difficulties were presented by the fact that various individuals and companies held various patents, including all of which were essential for radio development. They added that without the patent and licensing agreement, radio could not have become what it now is.

Mr. Gordon said there were nearly 40 patents involved in a radio tube, and 52 patents in a receiving set. As far as com-

Recorded Programs to Go Out on One Wave

Washington.

The Federal Radio Commission has expressed willingness to cooperate in the testing of a plan to operate a large number of stations simultaneously on a single wavelength without mutual interference, according to a statement by Paul M. Titus of 2 Rector Street, New York, originator of the new system and former owner of WOKT, Rochester, N. Y.

Commissioner O. H. Caldwell, when in New York recently, said that the Commission had agreed to grant permission to one 500 watt station to change its frequency to that of another of equal wattage to permit Mr. Titus and his associates to test the system on stations with good power before permission would be granted to other stations to operate on the same frequency.

Six-hour tests would be arranged every night for a month at hours when no interference would result to listeners, according to Mr. Titus.

The plan is to control the frequencies of a large number of stations from a centrally located "frequency factory" and to supply the programs to all the stations in the chain in the form of phonograph rec-

ords from a recording laboratory to be located in New York, where most of the talent is available.

"We have perfected a means," Mr. Titus said, "of controlling the frequencies of a plurality of stations in such a manner that it is now possible to hold any given number of them to their assignment within five or six cycles.

In practice we find our method to be not only practical, but to offer a solution to the present air condition. The plan was presented before the Radio Commission and the members expressed a desire to cooperate in the demonstration of the system and to extend every courtesy.

"For the practical application of the system we are now engaged in preliminary negotiations toward the assembly of a nation-wide chain of 100 stations placed so that listeners will be best served."

The programs for such a chain would be prepared in a central studio and sent to the subscribing station in much the same manner that syndicated articles are now sent out to country newspapers, or as moving picture films are sent out to theatres for release on a certain day.

S. Against R.C.A. Reaches Crisis

petition was concerned, Mr. Gordon asserted, competitors of the Radio Corporation manufactured more sets than the corporation did.

J. Harry Covington, counsel for the United Fruit Company, said the interests of the Fruit Company were due to the patents it held as the result of early developments carried on by the company in an effort to find means of communication to protect its ships from tropical storms.

Opposes Dismissal

Edward M. Smith, counsel for the Commission, argued that the record in the case including the testimony of specialists on patents would warrant the Commission in making a finding of facts and entering an appropriate order.

"The testimony," said Mr. Smith, "shows that there is no present patent on a radio vacuum tube which need concern any manufacturer of tubes."

Referring to the development of the radio as outlined by the counsel for the Radio Corporation, Mr. Smith stated that only a part of the story had been told.

One corporation, Mr. Smith insisted, has divided the field with the Radio Corporation as the selling organization.

"This corporation, according to the testimony given the Commission," continued Mr. Smith, "has resorted to libel and slander in connection with its competitors, it has charged outrageous prices for its products and put its competitors out of business by buying their capital stock. In one instance in a court in Delaware it was found guilty of contempt of court. It has been sued for \$60,000,000 in connection with infringement of patents."

Not Approved by Palmer

Mr. Smith referred to the statement that the Federal Government had encouraged the formation of the Radio Corporation of America as being propaganda.

He said that the connection of the Department of the Navy was due to the late Admiral Bullard and that the arrangement never was approved by the then Attorney General, A. Mitchell Palmer.

The record of the case, Mr. Smith contended, showed conclusively that all groups of reception and transmission were represented in the arrangement by the corporations.

The facts were, continued Mr. Smith, that the basic patents have expired and many of the patents that were included in the license agreement are competing patents.

Complains of Patent Law

In rebuttal, Mr. Davis denied Mr. Smith's statement that fundamental patents had expired before the cross-license patent contracts were made. He said that the DeForest patent, for example, did not expire until 1925.

"What Mr. Smith is complaining of," said Mr. Davis, "is really the United States patent law, and maybe the law ought to be changed. But there is no more danger in these patents if they are cross-licenses than if they were entirely in the hands of an individual or company."

Summary of Complaint

The official summary of the complaint of the Commission follows:

"By reason of the facts and acts of the respondents set forth in the preceding paragraphs numbered 8 to 29, inclusive,

All tube patents have expired, yet RF licenses are made to depend on purchase of trust tubes, says government counsel—John W. Davis, for A. T. & T., and J. P. Cotton, for R.C.A., make spirited arguments.

the respondents have combined and conspired for the purpose and with the effect of restraining competition and creating a monopoly in the manufacture, purchase and sale, in interstate commerce, of radio devices and apparatus, and other electrical devices and apparatus, and in domestic and trans-oceanic radio communication and broadcasting by the following means:

- 1** Acquiring collectively, directly and indirectly, patents and patent-rights covering all devices and apparatus known to and used in any and all branches of the practice of the art of radio, and combining and pooling, by assignment and licensing, rights thereunder to manufacture and use and (or) sell devices and apparatus, competing and non-competing, and allotting certain of such rights exclusively to certain respondents;
- 2** Granting to the Radio Corporation of America the exclusive right to sell such devices and apparatus manufactured under said patents and patent rights and restricting purchases by the Radio Corporation of America of devices and apparatus useful in the art of radio to certain respondents and apportioning such purchases among them;
- 3** Restricting the competition of certain respondents in the respective fields of manufacture and commerce of other respondents;
- 4** Attempting to restrict and restricting the use for radio communication and (or) broadcasting of articles manufactured and sold under said patents and patents rights;
- 5** Acquiring the equipment heretofore existing in this country essential for trans-oceanic radio communication and refusing to supply to others apparatus and devices necessary for the equipment and operation of such service;
- 6** Entering into exclusive contracts referential agreements for the handling of trans-oceanic radio traffic, and the transmission of radio messages in this country, thereby excluding others from the necessary facilities for the transmission of radio traffic.
- 7** Agreeing and contracting among themselves to cooperate in the development of new inventions relating to radio and to exchange patents covering the results of the research and experiment of their employees in the art of radio, including patents on inventions and devices which they may obtain in the future, seeking thereby to perpetuate their control and monopoly of the various means of radio communication and broadcasting beyond the time covered by existing patents owned by them or under which they are licensed."

Cheers on New Records Enliven Old Fights

Cincinnati.

Ford Billings, director of the Crosley Radio stations, discovered recently that a crowd in a studio doesn't pass for a crowd when the sound finally is transmitted to the radio audience. The discovery was made during the rehearsal for the WLW broadcast of a blow-by-blow description of the Sullivan-Corbett championship fight as it was fought at New Orleans in 1872.

The station's staff had been called in to furnish the roar of the crowd whenever the continuity indicated that "excitement ran high" at the actual prize fight. The staff cheered and howled and disported themselves with appropriately gleeful abandon.

The test amplifier in the control room indicated, strangely enough, that the radio audience would hear the familiar voices of its radio announcers sounding very much like a meeting of the Ladies' Aid society.

Then Billings had an inspiration. From the phonograph record cabinet he pulled recordings of New York's reception to

Lindbergh, and of the reception at Washington with a speech by President Coolidge. He played the records until he could determine the places at which the cheering was loudest and most prolonged.

Then he marked off these spaces on the records with white ink so that the phonograph needle could be shifted back to the beginning of the cheering whenever the space had been covered.

When the fight was broadcast, the phonograph with its electrical pickup wired directly into the WLW amplifier, as in all recorded broadcasting, furnished a continuous background of crowd noises. Separate microphones were used by Robert Burdette as the fight announcer, William Stoess, as radio reporter, and Ralph Haburton as station announcer. The same procedure was used on June 23 for the broadcast of the Corbett-Fitzsimmons fight description.

"It sounded like thousands of people," listeners said. And it was. None of them seemed to notice the several times that the voice of the President intruded a few words in his familiar fashion.

Local Stations Unite to Fight for Lives

Chicago.

Independent broadcasters have formed a national organization to protect the right of communities to retain their local broadcasting facilities under the new radio law. The battle will be waged before the Federal Radio Commission under the name of the Independent Broadcasters' Association, with headquarters in Chicago. The officers and directors of the association follow:

Clinton R. White, WCRW, Chicago, president; M. Mayer, WPEP, Waukegan, Ill., first vice-president; Charles Messter, WCBS, Springfield, Ill., second vice-president; D. H. Harrell, WHBL, Sheboygan, Wis., secretary; Ben Sanders, WKBB, Joliet, Ill., treasurer; Hersh Miller, WCLSM, WCLS, Muncie, Ind., Charles Middleton, WRAF, LaPorte, Ind.; Noble B. Watson, WKBF, Indianapolis, Ind.; C. L. White WJAK, Kokomo, Ind.; C. L. Beardsley, WHBF, Rock Island, Ill.; C. W. Wermich, WKBI, Chicago; C. L. Carrell, WHBM, Chicago.

Platform Slated

The platform of the Independent Broadcasters' Association follows:

"The right of communities to have local broadcasting stations, as they have local newspapers, is at stake. No one would suggest that fifty smaller newspapers should be destroyed to make room for a single national magazine. Yet the Federal Radio Commission has announced that 162 radio stations must be taken off the air, and that several hundred more must be destroyed later, to make room for the larger broadcasting stations which the commission believes should be given exclusive rights.

"According to the Commission's plans, fifty of these smaller broadcasters would have to be wiped out to make room for a single high powered station."

"The Commission, it has been announced, intends to allot only four wavelengths for local broadcasting. On these, it proposes to put 200 of the smaller stations, then to take those that are left off the air. At the same time, the Commission plans to allot eighty-five channels to 150 favored stations. In other words, less than 5 per cent of the air is to be given to community broadcasting, and 95 per cent to the larger stations.

Charges Violation of Law

"This proposal violates the law which created the Radio Commission, Senator Dill, one of its authors, said on the floor of the Senate: 'It is not the intent of this law to crowd off the air a great number of independents and smaller stations. If that kind of an interpretation is persisted in, there are two remedies—one in the courts and the other by impeachment and conviction of the commissioners.'

"Senator Walsh of Massachusetts foretold the same evil, when he said:

"We are up against the old problem, that the big monopolies, gradually through governmental aid and commissions, eliminate the smaller stations and the smaller operators."

"This conflict is not new. It is the old struggle of a centralized national government against state's rights and local self-government. Since the first days of the Republic, we have had this question of Federalization versus decentralization.

Like Newspaper Right

"In radio, this local right means the right of every community to use this newest means of communication as part of its daily existence, just as that need is now being served by its local newspaper. Radio

surely should not be allowed to become a national monopoly, to be used only for national needs and national entertainment. Radio is also a local institution, designed most admirably to meet local needs, to inspire local pride, to arouse local ambition, to be—as no other means of expression or communication can be—the voice of the city, town, or village for which it speaks.

"Within the great expanse of these United States, there is an infinite variety of culture—social, political, economic and esthetic. Geography and racial antecedents play a part. Within each community, again, there is an infinite variety of activities—religious, educational, business, social and political. In all of these, local broadcasting has come to play a vital part. To the American people, those matters which revolve immediately around the home and the home community have al-

ways been of first importance. Surely, if radio is to perform its greatest usefulness, it must not be eliminated from that field.

"This is not to deny that grand scale broadcasting—chain broadcasting—is indispensable to the radio art. But that all, or even a major portion, of our broadcasting facilities should be allotted to such grand scale broadcasting is neither necessary nor consistent with the best interests of the United States.

Local Stations Essential

"No matter how important national programs may be, it is still essential to the life of a community that the local singer, violinist, editor, preacher, mayor, Congressman or business man should have the right to be heard by this miraculous new medium of expression.

"Any allocation of broadcasting facilities, to be permanent, must recognize this fundamental American doctrine.

"The Independent Broadcasters' Association asks a decent recognition of the rights of communities to their fair share of this great new means of communication. We protest against the pretense that this need can be met by allotting to local stations less than 5 per cent of the nation's radio channels."

'Execution' of Stations Attacked by Sen. King

Washington.

Equal division of radio broadcasting channels between those serving national interests and those serving local needs was proposed by Senator King (Dem.), of Utah, in a statement, warning the Federal Radio Commission against monopoly.

Referring to proposals to discontinue many stations as a "wholesale execution" he said there should be the most searching investigation before such action and that cancellation of licenses should be avoided unless public interest demands and incontrovertible reasons exist.

The full text of his statement follows: Though the radio question has been before Congress for several years and has received considerable attention throughout the country, unfortunately no adequate solution has been found to meet the perplexing problems connected therewith.

It was believed by some that the legislation enacted by Congress would effectively deal with the subject of radio and radio communication and prevent a continuation of the injustices which were obvious, and the development of a powerful radio trust which would prove a serious injury to radio development and harmful to the interests of the American people.

Question Not Settled

The measure passed by Congress a short time ago has not settled the question, and the Radio Commission, if current reports are to be believed, is not adopting a policy that will meet the situation and answer the just demands of the people.

Radio is still in its infancy and every reasonable plan should be adopted to give to it the greatest possible utility, and to all the people the greatest possible benefits.

In this age of mergers, trusts and giant corporations, all struggling for monopolistic control of the fields of business and commerce, indeed of human endeavor, it would be a crime if the forces of nature should be the subject of monopoly, and a radio trust developed, and permitted a monopoly of what in common parlance is called "the radio industry."

Evidence is not lacking to show the

existence not only of an incipient, but of a potential, radio monopoly. It controls patents, licenses and cross-licenses, and has entered the field as a dominant factor in the manufacture and distribution of the physical and material instrumentalities essential in the utilization of the air for radio transmission.

Too Much to Great Groups

Recently Congress extended the life of the Federal Radio Commission, although there was a strong feeling that it had failed to meet the situation, and to protect the interests of the people.

It was realized that favoritism had not been absent in the allocation of licenses and that a group of high-powered stations affiliated with the so-called radio trust, had obtained, if not a monopolistic share, at least too large a portion of the Nation's broadcasting facilities. Accordingly in the new law a provision known as the "reallocation clause" was inserted, which was expressly designed to prevent the continuation of favoritism or monopoly.

It was believed that in this clause the advantages and privileges enjoyed by certain of the stations would be curtailed. But my information is that the Commission has taken no action looking to that end. Indeed, as I understand the situation, it is being urged that even greater power and additional privileges are to be given to the stations affiliated with the so-called radio trust.

Not Within Law's Spirit

My information also is that no step has been taken by the Commission to curb the domination of the radio trust, or to investigate the complaints and charges that companies operating these so-called highpowered stations have entered into agreements among themselves to control and monopolize the radio industry in the United States.

My information is that the Commission has sent notices to 162 of the smallest stations appearing on the radio map, announcing that they will be denied the rights they are now enjoying to the use of the air unless they can show cause at an early date why they should be permitted.

(Continued on next page)

BOARD SPLIT ON CHANNELS TO BE CLEARED

Washington.

The Federal Radio Commission met its first stumbling block in reallocating broadcasting stations under the new law at a recent session, at which the new plan was considered at some length. Considerable difference in opinion among the members on the question of cleared channels developed.

A report by Captain Guy Hill of the Army Signal Corps, who has been working on the reallocation plan for the Commission, recommended 40 cleared channels. Some of the Commissioners favored this report. The plan submitted by the Institute of Radio Engineers recently recommended 50 cleared channels, and this plan is favored by some Commissioners.

'Execution' of Stations Attacked by Sen. King

(Continued from preceding page)

ted to continue to operate. Manifestly this announcement is not designed to carry out any "reallocation program" in harmony with the understandng which Congress had in passing the provisions of the new law. Indeed, no reallocation has been made.

"Necessary Destruction"

Newspaper reports indicate that the Commission has undertaken the reduction of the number of stations upon the air, and when the 162 stations, to which I have referred, have been destroyed, a further order will be issued to cancel the licenses of other stations.

I am told that statements have been made by a member of the Commission, indicating that they regard the destruction of these minor stations as necessary to simplify the problem before the Commission.

It occurs to me that the elimination of a number of the high-powered stations would achieve the desired result. This would require the cancellation of but a few licenses, or the curtailment of the allotments of power now enjoyed by them. This would eliminate some of the inequalities now existing in the allocations among the zones, I submit that it is proper to inquire whether cancellation of these 162 minor licenses would be in the interest of the public? Obviously such a course would be injurious to the communities which they serve. It is to be hoped the Commission will make a special study of this problem of community broadcasting services, before resorting to such a drastic policy.

Rights of Rural Regions

This nation is not made up of a few large cities. The interests of the great agricultural States and of the suburban districts are of paramount importance. There should be room on the air for local stations as well as for what some have called "national stations." No one questions the benefits derived from the powerful broadcasting stations in the great cities of our country; but I repeat when I say that the great majority of the people do not live in the big cities. They are interested in their own States and communities and local affairs and must not be disregarded when the radio question is under consideration.

I am advised that the Radio Commission believes that there are now available

Higher Station Power Asked in Schedule

The Transmitter Section of the National Electrical Manufacturers Association radio division recommended that radio broadcasting stations be classified as to power thus:

0.5 kilowatts
5.0 kilowatts
50.0 kilowatts
500.0 kilowatts

"The association's rating for standard broadcasting stations," said L. B. F. Raycroft, vice-president, "is one of the most important steps in clarifying our attitude of mind as to the proper power of broadcasting stations that has ever been taken.

"This proposed rating means that, in our opinion, the smallest power possible to give good service shall not be less than one-half kilowatts, that stations designed for greater service shall then start in power at five kilowatts, then fifty and then five hundred kilowatts."

Manufacturers Interested

Pointing out that the radio manufacturer has the liveliest interest in assuring that the listener receives the best possible radio service, Mr. Raycroft said that broadcasting stations must be allowed sufficient power to deliver a good radio signal throughout their range.

"There are many misconceptions with regard to the power required by radio

stations," continued Mr. Raycroft, "but we should not forget that just as we improve the design of our receiving sets as our knowledge of the radio art increases, so must we improve our broadcasting stations.

"Good radio receivers require the best broadcasting stations. Our power ratings for broadcasting stations may be taken to mean that, consistent with normal progress, our best and most popular stations must increase their power. Thus we can provide the best programs—which experience has amply demonstrated go with the stations with the best and most modern physical equipment to the largest number of people."

Upward Revision

The association's power recommendations advise the relative increase of power in all stations, whether small or large. As the general level of power is revised upward, both the large and small station will be enabled to render better service to its clientele.

"We believe that the best way to insure that the inarticulate radio listener get better broadcasting service is to see that he gets it. Gradual increase of power, intelligently administered in accordance with the provisions of the radio act will definitely increase the satisfaction of the listener," said Mr. Raycroft.

Four Stations Plan Synchronous Sending

Synchronous operation of four stations will soon be undertaken experimentally in the hope of solving the problem of congestion in the ether lanes, said a representative of WODA, Paterson, N. J. The stations scheduled to take part in the tests with WODA are WTMJ, Milwaukee, Wis., WSYR, Syracuse, New York, and KPRC, Houston, Texas.

"The four broadcasters on the 294 meter wavelength will operate simultaneously first as a four-way chain, then as pairs, and then as individuals," said the representative. "Interstation interference will

be prevented through the use of delicate chronometers, crystal wave-meters and other apparatus now being perfected by WODA engineers. Permission to carry on the tests during the early hours of the morning has been granted by the Federal Radio Commission."

WTMJ is to begin the tests with a brief message of greeting. WSYR, WODA and KPRC will then reply in turn. After these preliminaries WTMJ will act as key station "to direct the activities of the others."

Much interest attaches to the test.

89 broadcasting channels. So far as I can learn, the only proposal made to the public by the Commission, indicated that 85 of this number are to be awarded to 150 exclusive and semi-exclusive so-called national stations. My information is that it is proposed to put 200 local stations on the remaining four channels and to cancel the licenses of 350 stations.

I hope that my information is inaccurate. If 200 local stations may be accommodated in four channels 600 could be cared for on 12.

Half and Half

But is it necessary that there should be such congestion. Could there not be an allotment of one-half of the broadcasting channels to the stations serving what have been called national interests, and the remainder to the local and community needs? I have no doubt the Commission will give this question, which is of such vital importance, the fullest consideration.

I venture to hope that before this wholesale execution of the small radio stations is finally ordered a thorough investigation will be made. It occurs to

me that the engineering problems involved in the creation of chains of local stations should be investigated; and the propriety of permitting 10 or 20 high-powered stations, each with a cleared channel but presenting the same chain program, should be fully considered before final action is taken. It has been suggested that not more than one such station should be permitted on the same chain.

It would seem to be fair and just that continue until a definite program of allotment has been made and a thorough and searching investigation of the entire matter and all factors involved has been concluded. And even then cancellation of the licenses of any of them should not be made unless the public interest demands and incontrovertible reasons are found to exist.

The radio problem as I have stated, is one difficult of solution. That very fact calls for a most searching investigation by the Commission, and the adoption of a plan which will not increase the evils of monopoly, or put into the hands of a limited few, an instrumentality which possesses unlimited power for evil.

A THOUGHT FOR THE WEEK

THIS is the best radio Summer we've had. Best programs, best air conditions, best sets and best quality of amplification. Why worry?

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The First and Only National Radio Weekly

Radio World's Slogan: "A radio set for every home."

TELEPHONES: BRYANT 0558, 0559

PUBLISHED EVERY WEDNESDAY

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Our Stand on Television

TELEVISION is a temptress. Siren-like, she bids you follow, appealing strongly to the imagination, and asking you to slight the most unimaginative element of life—experience! You may follow, as some did, and make a fruitful trip; or, you may follow, as ever so many others did, and end in disappointment, disillusionment.

Television is not an impossibility. How could any one say it was impossible, when it is being sent and received, after a fashion, even over 150 miles? But it is an improbability, at this writing, to the general run of experimenters who, if asked to follow some enthusiastic leader, were to buy all the equipment, and set up a televisor. So it must be said that the time is not yet here, but in a few months, when radioists, able to build a broadcast receiver, should be invited to attempt the duplication of an actually operating televisor.

One manufacturer privately has taken umbrage at this position. He maintains that the radio engineer of to-day was the experimenting fan of only a few years ago, and that the quicker we get a lot of constructors busy whirling scanning discs, speed-regulating their motors with vernier resistors, tinkering with neon lamps, and fishing for broadcast television, the sooner we will get practical, duplicatable television.

Meanwhile this manufacturer has a kit for sale that is to be used as part of the television receiver installation, and he sees no harm in encouraging people to buy these parts, although for them the likelihood of reception is remote. What matter if they get no pictures? They'll be experimenting and experimenting, and pictures may come in bye and bye.

Asked to give a demonstration of his own televisor in actual operation, this manufacturer felt offended at the insinuation he himself was not able to bring in WGY in New Jersey. It should not be too much to ask of any one offering for sale a television kit or completed receiver that he prove that the thing works. If he can not get it to perform, how can the outsider do so, and what code of ethics prompts him to encourage the purchase?

Those who have had some independent success with television reception have been well versed in electricity, and physics generally. First they learnt the problems, then tried to solve them. The knowledge they possessed was far in excess of the average radio knowledge of an experimenter. One of the men, for instance, was a General Electric engineer, another was the operator of a radio service shop and had engineering training. Both of these brought in WGY with some success in New Jersey towns. For the two who succeeded there were 200 who failed, and one of those to fail was the inventor of a photo-electric cell used in television transmission.

Impatience will cost the experimenter plenty of money, if he tinkers with television prematurely. He should wait until some responsible agency announces that a certain televisor has been built, has received pictures tolerably well, and that certain persons of standing in the radio realm (stating their names and connections) have seen the demonstrations and found them satisfactory. Also the successful duplication of the construction by half a dozen average radio builders should precede even any suggestion to readers to spend money on the specified equipment.

Any other course would be less than safe, not only for the readers bidden to spend their money, but for the periodical or newspaper itself, for the harm resulting from promiscuous encouragement of folly is a cumulative boomerang.

It may be taken for granted, therefore, that RADIO WORLD will continue to publish full news of television, considerable theory on the subject, together with general patterns that meet requirements imposed by

the tricky system, so that those few who have enough engineering knowledge to work the thing out for themselves, and solve problems as they arise, may do so, if they so elect, while the others will read the news and technique with impatient interest, yet await further developments before they gamble on television reception.

When either of the two televisors that RADIO WORLD's laboratories are working on is in such state of development that the tenets of publication previously outlined may be fulfilled, or even exceeded, we will be gloriously prompt with constructional articles and blueprints. But it is not in us to ask anybody to spend money for parts necessary to build a televisor, only to get such meagre results as we ourselves have obtained to date.

Perhaps better progress could be made if the General Electric Company furnished technical information about WGY broadcasts of television that was not quite so incomplete.

The situation is not black but encouraging. We hope to be out with a televisor blueprint in a few months, but not before we are ready to invite the world to see the machine in operation.

The Voice of an "Anti"

SENATOR KING of Utah has what may be termed a political solution of the problem of accomodating stations, hence it is not one for keeping the air lanes clear of interference.

He would divide the 89 broadcasting channels in half, giving 44 1/2 to national stations and 44 1/2 to local stations. His creed is that, as most persons in this country do not live in large cities, the rural population is best served by the local programs he says it likes so well. He complains that the large stations, many of which are on the same chains night after night, and giving the same programs, obtain still greater favor under the Radio Commission's plan, and clog up cleared channels unnecessarily. He says the trust, that evidence shows has established "a potential radio monopoly" by control of patents, licenses and cross-licenses, will be even more strongly entrenched in its broadcasting service if the "wholesale execution" of small stations is carried out. Hence he wants "a searching investigation" before anything is done.

The Senator is no expert on the subject. He says, for instance: "I am advised that the Radio Commission believes that there are now available 89 broadcasting channels." Somebody surely advised him about the number 89, but hardly that that the Commission "believes" there are so many channels. The Commission does not merely "believe" it but knows it to be a fact.

It also knows that its own plan is virtually the same as the one proposed by the Institute of Radio Engineers, and that, of the 162 stations scheduled by the Commission for exclusion on August 1, only one was a member of the National Broadcasters Association, of which the best stations usually are members.

In other words, whether a station should endure only to be endured is the problem. The rehabilitation of the broadcasting structure mathematically imposes a reduction of stations if any stations at all are to be given a fair chance to be heard well. When Senator King admits the superiority of the programs of large stations, and at the same time proposes a plan to decimate that group, he proves himself a radio layman who is more anti-trust than he is pro-public.

Which stations shall go and which shall stay, even under his own indefinite plan, the Senator does not say. He intimates that all should be retained, except some of the best ones. Meanwhile the "searching investigation" he demands is actually going on, in the third month of its exciting life.

Voice and Vision

Sent Out by WCFL

Chicago.

A successful transmission of voice and vision at the same time was made over WCFL of the Chicago Federation of Labor in an experiment under a special permit issued by Commissioner Samuel Pickard of the Federal Radio Commission.

The voice of E. N. Nockels, secretary of the Chicago Federation, was heard and a view of head and shoulders was seen. The process was designed by M. J. Hayes and Ulysses Sanabria. The television was not broadcast.

Radio Dramatized Politics for Nation

By Pierre Boucheron

Advertising Manager, Radio Corporation of America

Radio should no longer be considered an indoor sport to be enjoyed exclusively during Fall and Winter months. The transition from indoor radio to outdoor radio now goes on quite unnoticed.

The broadcasting service continues month after month with the same high level of efficiency. The musical programs are a matter of established routine, although with the summer months they take on a somewhat lighter vein in keeping with the public mood. If anything, Summertime brings on a greater range of program features because with the advent of fair weather the microphone goes afield in search of thrills.

What may well be termed the outstanding radio feature of the year was the broadcasting of the Republican and the Democratic National conventions.

Enter All!

The first political convention, which radio reported in 1924, revealed the enormous latent interest which the people of the United States have in politics. That interest had doubtless existed for years, but it was not until radio opened the doors of the convention hall to the public that its true scope was realized; for it must be remembered that the fabled camel, that was to pass through the eye of a needle, faced an easier task than the average citizen who formerly sought access to a national convention.

In the torrid days of June, 1924, the streets of our cities great and small were thronged with eager listeners, pressing about every available loudspeaker which, in raucous tones, brought the story of the prolonged balloting at Madison Square Garden. In our rural districts, the radio at the general store or the grange was the object of equal interest.

Thus the National Convention displaced the time-honored World's Series as the one event capable of holding the undivided interest of the American nation for an appreciable length of time.

Record "Attendance"

Broadcasters, keenly alive to the public interest in the coming political events, left

no stone unturned to make the second broadcasting masterpiece.

There is no doubt that the conventions at Kansas City and Houston were attended by the greatest invisible audience ever gathered for any single event in the history of the world.

A trained staff of radio reporters and broadcasters, as well as a competent technical staff, concentrated their full attention on the battery of microphones. Veteran political observers and analysts of nation-wide repute interpreted the proceedings so that America's vast army of radio listeners were kept in close touch with even the most trivial bits of political strategy which the convention developed.

Wide Range

A nation-wide network of more than 70 stations brought the conventions to every city and hamlet in the land. The National Broadcasting Company employed more than 10,000 miles of special telephone circuits, in addition to two transcontinental lines, in this gala broadcast feature. Shortwave transmissions from KDKA, in Pittsburgh, and WGY, in Schenectady, made the conventions available to our overseas friends in Latin America, Europe, South Africa, and the Antipodes.

A battle of fists, rather than words, will follow during July, when Gene Tunney and Tom Heeney will compete for the world's heavyweight championship in New York. Particular interest attaches to this year's heavyweight championship bout because of its international flavor, and no sport lover will want to miss this feature, whether at home or in vacation-land.

If plans now being formulated are realized, there will be one or more important late summer turf classics placed on the air, in all probability the historic Belmont Futurity, decided over the Widener chute at Belmont Park in mid-September.

Advice on Summer Service

Perhaps the more important regattas will be featured among the Summer's sport broadcasts. And of course, the Autumn baseball classic, the World's

Series, will ring down the curtain on a Summer season of outstanding broadcast features.

If we compare our radio set with the family car, it becomes evident that the radio set should be prepared for summer operation, just as the car is prepared for Winter driving. Thus the set, at the end of a long indoor season, may require fresh batteries, new radiotrons, and a general inspection and cleaning. Obsolete sets should be replaced by a modern receiver for Summer operation in terms of present-day excellence.

There are certain fixed elements of clear, reliable reception which must be adhered to more closely in Summer than in Winter. First among these is the necessity of selecting signals from a station of ample power, not too distant.

Can't Stop Fading

Furthermore, it is highly desirable that the station chosen should have a reputation for careful maintenance, and be free from the evils of faulty transmitter operation, hit-or-miss monitoring, inconsistent power, fading or shifting wavelength. Fading, however, is sometimes a condition beyond the control of the broadcaster, and may result from some atmospheric condition existing between transmitter and receiver.

Secondly, there is the need of selecting programs of high quality, and particularly features with sufficient "body" to nullify such static as may be present in spite of the admittedly high signal level.

Then, too, signal level is one thing, and sound level is quite another.

Select Carefully

Thus a dance orchestra will minimize static interference much more readily than a string trio or a violin solo. Indeed, it is quite as necessary for the broadcast listener to exercise care and judgment in the selection of his program features as it is for the artist to employ various color tones to prevent undesired motifs from spoiling a canvas.

Finally, the listener will do well to content himself with a reasonable volume. The volume control of a radio receiver amplifies static as well as signals which issue from the loudspeaker, and it is only a matter of time before the extraneous noises which may be present will attain sufficient volume to become irritable. Therefore, during days of excessive static, the listener is advised to cut down his volume, for in this way he will succeed in reducing the background noise to a minimum.

RADIO WORLD FOR SEVEN WEEKS, \$1.00

4-TUBE SHIELD GRID DIAMOND OF THE AIR BLUEPRINT FREE WITH EACH SUCH SUBSCRIPTION!

At 15c per copy, each week for seven weeks, Radio World costs you \$1.05, but if you subscribe for seven weeks at \$1.00 you will also get the official blueprint of this circuit FREE! The blueprint was designed by H. B. Herman from the original laboratory receiver. Size of blueprint, 27 x 27 inches. All connections, leads, parts, etc., shown actual size. Very simple to follow.

Home constructors of radio receivers, and custom set builders, by

DISTANCE JUST ROLLS IN THOUGH SET IS EASY TO TUNE!

All you have to do is to follow the official blueprint, and lo! a new world of radio achievement is before you! Distant stations that four-tube sets otherwise miss come in, and come in strong. No tuning difficulty is occasioned by the introduction of this new, extra powerful, startling tube, but, in fact, the tuning is simplified, because the signal strength is so much greater.

The circuit consists of one shield grid stage, detector and two transformer audio stages, with 112A in the last stage.

When you work from the official wiring diagram you find everything so delightfully simple that you marvel at the speed at which you get the entire receiver masterfully finished. And then when you tune in—more marvels! 'Way, 'way up, somewhere around the clouds, instead of only roof high, will you find the amplification!

RADIO WORLD, 145 West 45th St., N. Y. City.

Enclosed please find:

\$1.00, for which enter my name on your list of mail subscribers for seven weeks and send me FREE at once one official blueprint of the Four-Tube Shielded Grid Diamond of the Air, as designed by H. B. Herman, and described by him in the February 4th, 11th and 18th issues of Radio World. No other premium this offer. 45c extra for Feb. 4th, 11th and 18th issues.

Renewal Present subscribers may renew for seven weeks under this offer. Put a cross next to word "Renewal."

NAME
ADDRESS
CITY STATE

following the blue print, can build a distance-getting and voluminous set, the parts for which list remarkably low.

The new shielded grid tube is used as the radio frequency amplifier. That is why the amplification finally is boosted forty times over and above what it would be if an -01A tube were used instead.

Such simplicity of construction marks the receiver that it can be completely wired, skillfully and painstakingly, in two and a half hours.

Great stability! No neutralization required! No shielding necessary!

You'll be overjoyed. But you should place every part in exactly the right position. Stick to the constants given, and, above all, wire according to the blueprint!

When you work from this blueprint you find that every part is shown in correct position and every wire is shown going to its correct destination by the ACTUAL ROUTE taken in the practical wiring itself. Mr. Herman's personal set was used as the model. This is a matter-of-fact blueprint, with solid black lines showing wiring that is above the subpanel, and dotted lines that show how some of the wiring is done underneath.

Everything is actual size.

EVEN A NOVICE CAN BUILD THIS CIRCUIT SUCCESSFULLY!

Not only is the actual size of the panel holes and instruments given, but the dimensions are given numerically. Besides, it is one of those delightful blueprints that novice and professional admire so much—one of those oh-so-clear and can't-go-wrong blueprints.

Be one of the first to send for this new blueprint, by all means, and build yourself this outstanding four-tube receiver, with its easy control, fine volume, tone quality, selectivity and utter economy. It gives more than you ever expected you could get on four tubes—and the parts are well within the range of anybody's purse.

Complete official list of parts given on each blueprint; also the schematic wiring diagram (besides the picture diagram of the wiring.)

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(Few Doors East of Broadway)

General Radio Loses Hiler Coupler Suit

Boston. The Federal District Court, in the case of Hiler Radio Corporation vs. General Radio Company, sustained the patent, granted to Edward E. Hiler on June 22, 1926, on the Hiler double impedance audio coupler, and declared that General Radio Company's product of like nature was an infringement.

Since the decision General Radio has become a licensee of the Hiler Corporation, and the friendliest feelings prevail, as only a legal question was at stake.

The opinion in the infringement suit was written by Judge Brewster, who said in part:

"The patent relates to a unitary device which may be used by manufacturers or amateurs in the audio stages of a radio receiving set. It is especially adapted

to provide an impedance coupling unit for connecting together or coupling successive audio amplifier vacuum tubes in the audio amplifying stages of the receiving set.

"Prior to the patent in suit, there were several well known types of audio amplifier coupling circuits which might be broadly classified as (1) Transformer coupling circuit, (2) Resistance coupling circuit and (3) The choke-coil impedance circuit.

Hiler's Later Product

"This third type of coupling circuit originally consisted of a combination of choke-coil impedance, coupling condenser, and a high resistance, the latter serving as a grid-leak.

"Later, a choke-coil impedance circuit, which Mr. Hiler claims to have independently originated in 1920, comprised two choke-coils and a condenser connected between the plate of one tube and the grid of a succeeding tube.

"This type of coupling circuit possessed advantages over the other types, in that louder signals could be amplified without distortion and the amplification obtained could be maintained uniform over substantially the entire range of audio frequencies. But three stages were required to obtain the same degree of amplification that would be produced in two stages of the transformer coupled circuit. * * *

Not Patentable, Says G. R.

"The device consists of plate and grid choke-coils and coupling condenser compactly grouped and enclosed within a casing, or can, having external binding posts which indicated proper connections between the amplifying tubes.

"This unitary device is the subject matter of the patent in suit. The double impedance circuit which Mr. Hiler worked out was found to have been anticipated in prior patents and publications. * * *

"The defendant assails the validity of the patent on the principal ground that no patentable novelty is disclosed; in other words, that the patent is for an unpatentable aggregation of well-known elements. Another minor objection is that the patent is not sufficiently definite. * * *

Hiler Did It First

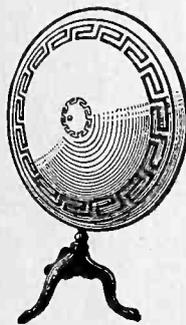
"It is reasonably clear from the evidence that Hiler was the first to assemble in a simple, compact and inexpensive unitary device, a plate and a grid choke-coil and a coupling condenser, grouped in proper relations within a casing having external binding posts indicated for proper connection between two amplifying tubes. * * *

"The real question which has to be determined from this mass of highly technical evidence adduced by the defendant is whether Hiler invented something when he assembled his patent chokecoil amplification unit." The argument advanced by the defendant is that it did not involve the exercise of inventive genius to take, for example, two of the reactors built by the Radio Corporation of America, place them in a can with a condenser and provide connections for terminals with the proper binding posts.

Old Devices Used in New Way

"It is also claimed that it did not involve the exercise of the inventive faculties to take the coils, cores and condensers from the Navy device, manufactured by the General Electric Company, and likewise place them in a can, or container, filled with a semi-plastic
(Continued on page 22)

36" GIANT CONE \$6.00 KIT

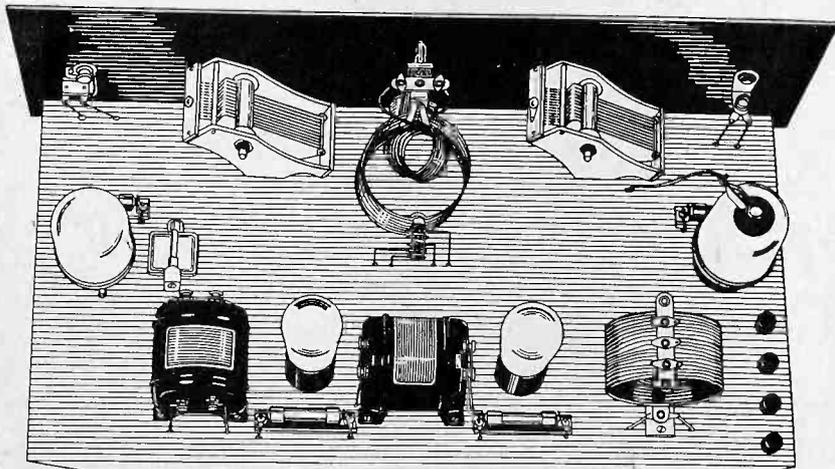


(Pedestal FREE with all orders received before June 15.)

Kit consists of one Powertone Unit, one designed front sheet of Fonotex, one plain Phonotex back sheet, two metal rings, one metal bracket, one apex, thumbscrew and chuck; one tube of cement; hardware; instruction sheet. Tri-foot pedestal. FREE if you order NOW! SEND NO MONEY! We Ship C. O. D.

GUARANTY RADIO GOODS CO.
145 West 45th Street New York, N. Y.
FIVE-DAY MONEY-BACK GUARANTY!

Bakelite Front and Aluminum Subpanel for the 4-Tube Screen Grid DIAMOND OF THE AIR - - \$5.00
Five-Day Money-Back Guaranty



View of the Completed Receiver, using Drilled Front Panel and Aluminum Subpanel

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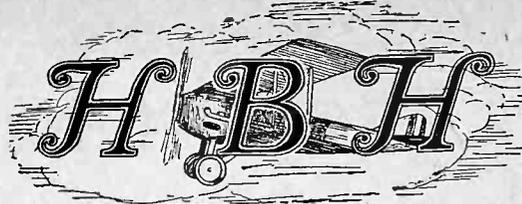
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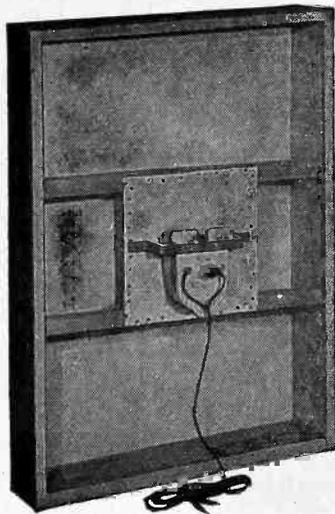


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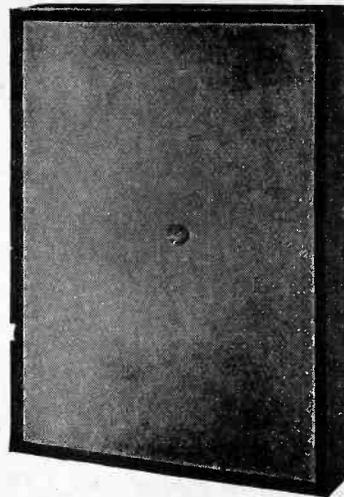
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New Use, Old Elements, Won Patent for Hiler

(Continued from page 20)

substance, with suitable connecting binding posts.

"Of course, it must be conceded that what he did was merely to bring old, well-known elements into a new association. If it produced new results, or old results in a new way, the invention was properly a subject for a patent. * * *

"I think it must be found that Hiler did produce a novel result, something that had not been known and which filled an obvious need. While he did not make a great discovery, he did contribute something to the art—enough, in my opinion, to entitle the plaintiff to the protection of the patent laws. * * *

Went Well With Trade

"Manufacturers of receiving sets and manufacturers of radio accessories have, in substantial and increasing quantities, manufactured and sold under license granted by the plaintiff. The practical value and utility of the patented article have been clearly demonstrated.

"The defendant's double impedance coupler made before the suit and those made after the suit embody all of the ele-

ments of the plaintiff's combination and bring together these elements in the same association resulting in unitary, compact, double impedance device which can be easily and readily incorporated in a radio receiving set in the same manner and with the same facility as the plaintiff's device. "In conclusion, I find and rule that the plaintiff's patent is valid and infringed."

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The Hiler Audio Corp. has headquarters at 10 Argyle Terrace, Irvington, N. J. The complete list of licensees follows:

American Specialty Mfg. Co., Bridgeport, Conn.

Ford Mica Co., 111 Blecker St., New York, N. Y.

General Radio Co., Cambridge, Mass. Kenneth Harkness, 181 Sullivan St., New York, N. Y.

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De Forest Co. on Feet After Receivership

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The president and general manager of the new organization is James W. Garside, an executive long experienced in production and merchandising activities.

Members of the Board

The board of directors is as follows: A. J. Drexel Biddle, Jr., trustee, Duke Foundation, chairman of DeForest board; Wiley R. Reynolds, chairman of board, Reynolds Spring Company; James I. Bush, vice-president, Equitable Trust Co.; Arthur B. Westervelt, vice-president, American Trust Co.; Harris Hammond, president, International Petroleum Co.; Paul L. Deutsch, president, Sonora Phonograph Co.; Victor C. Bell, of A. D. Mandes & Co., and Orlando P. Metcalf, of Metcalf, McInnes, Allen & Hubbard

An advisory board, comprising men long prominent in the radio industry and allied industries, reporting directly to and consulting with the president, will be formed.

With the possession of numerous De Forest basic patents and important patent rights, the new organization plans the early production of a complete line of perfected vacuum tubes representing the latest achievements in this highly specialized field. There will also be produced a complete line of radio receivers and accessories.

Realizing the close and growing part-

nership between phonograph and radio arts, the DeForest Radio Company will be associated with Sonora Phonograph Company in the production of radio receivers and phonographs.

The policy of the new company is to assume a leading part in the stabilization of the radio industry. The organization aims to establish the most cordial relations with the radio trade as well as the radio public.

The company, in its reorganization, emerges from the receivership that lasted two years.

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(Continued from page 20)

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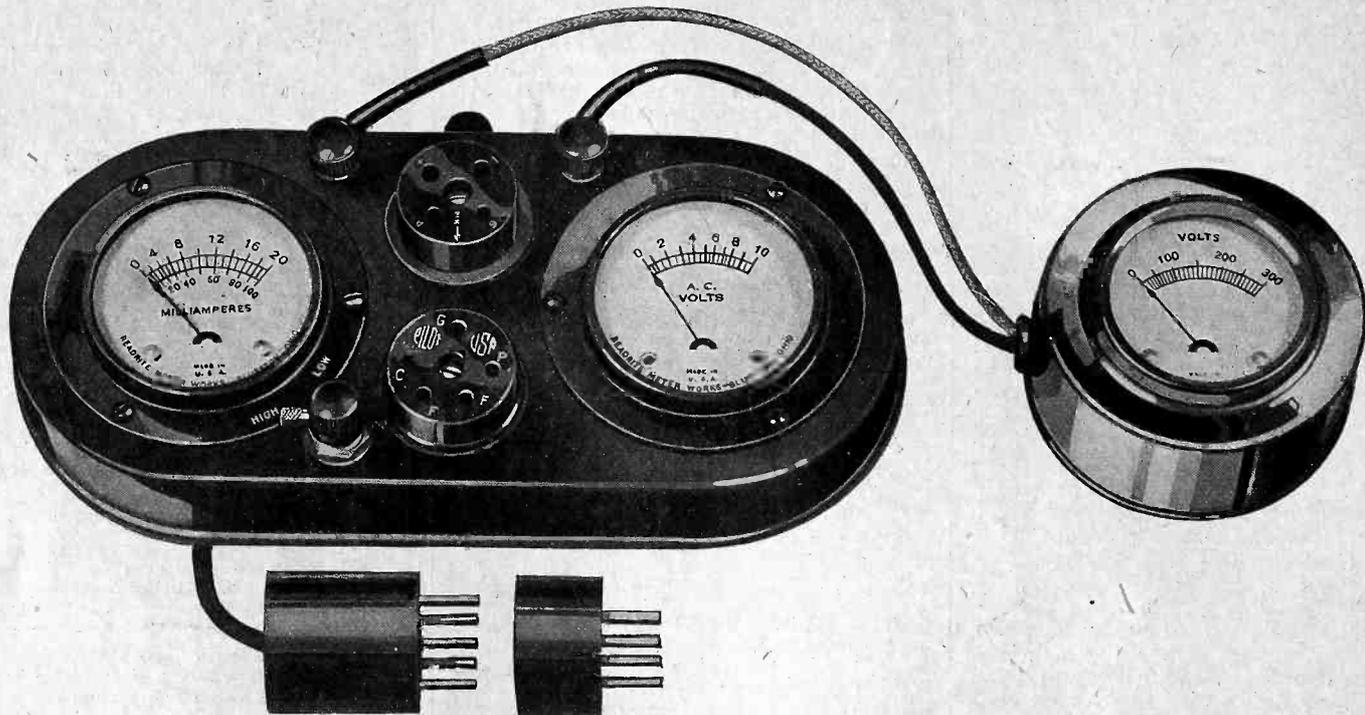
S-M SHIELDED GRID SIX with S-G Tubes—\$48.50. Vern Dawson, Elwood, Ind.

KARAS SHORT WAVE SET, three tubes, 13 to 750 meters, described in the March 31, April 7, 14, 21 and 28 issues. Send 60 cents for these five issues and get blueprint free. RADIO WORLD, 145 W. 45th St., N. Y. City.

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- (2) to measure the plate current of any one tube, including any power tube, from less than 1 milliampere up to 100 milliamperes;
- (3) to measure the total plate current of a receiver or amplifier, up to 100 milliamperes. (Hardly any set draws more). Open common A and B of set and connect to P of tester socket and to P prong under adapter plug;
- (4) to measure the B voltage applied to the plate of tube; the voltage across B batteries or B eliminators, up to 300 volts.
- (5) To determine the condition of a tube, by use of the grid bias switch.
- (6) To measure any tube's electronic emission (tester cuts in at no load, hence plate current equals filament emission).
- (7) To regulate AC line, with the aid of a power rheostat, using a 27 tube as guide, turning rheostat until filament voltage is 2.5 or 2.25 volts.
- (8) To test continuity of resistors, windings of chokes, transformers and circuits generally.
- (9) To find shorts in bypass and other condensers, as well as in inductances, resistors and circuits generally.
- (10) To read grid bias voltages, including those obtained through drops in resistors (bias read by noting plate current and voltage and consulting chart).
- (11) to determine the presence of distortion and overloading, by noting if milliammeter needle fluctuates.
- (12) to determine starting and stopping of oscillation, as milliammeter needle reads higher current for oscillation and lower for no oscillation.

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