

On the Air

A MAGAZINE OF RADIO

SEPTEMBER 1925

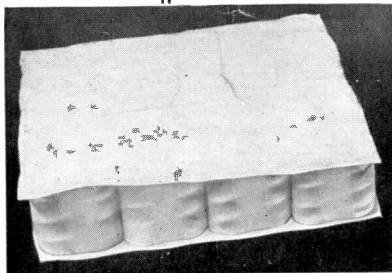
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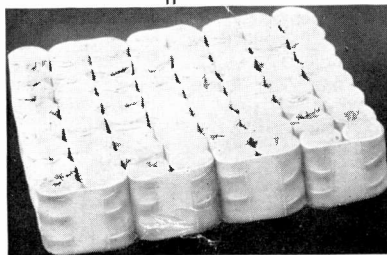
In this issue

***Fairy Tales Come True in Radio
Short Waves at KDKA - New Radio Sets***

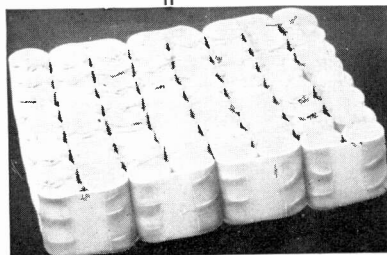
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A MAGAZINE OF RADIO

Contents for September, 1925

- What Do You Know About Short Wave Broadcasting? 3
Forbes W. Fairbairn discusses remarkable progress made by Station KDKA in its high frequency experiments.
- The Technical Editor's Set..... 5
Unusual feats of engineering skill are incorporated in Felix Anderson's latest radio hookup.
- The Browning-Drake Receiver 7
Radio frequency and reaction successfully combined in product of Harvard research experts.
- Fairy Tales Come True in Radio..... 9
A true story of the Kaiser and the singing stoker, by James Bradbury.
- Enter the Super-Autodyne..... 10
McMurdo Silver gives details of new six-tube receiver.
- Willie, Tommy, Annie, Sammy and Herbie..... 12
The new director-announcer of the popular Elgin stations makes his bow to you in an interview with H. J. Meister.
- "Howdy, Pap!" 13
Genial Jack Nelson describes the latest monument to the L.O.O.M.; a thousand watts of entertainment.
- High Power WSAI..... 15
A Cincinnati station where progress is the watchword; E. M. Boyd tells you all about its inception and career.
- Studio Gossip 19
Intimate sidelights on studio activities; what the artists are doing.
- High Frequency Harry's Page..... 21
The wit of ON THE AIR gives you some new radio humor.
- Operating the Deresnadyne..... 23
Harry J. Marx gives final instructions and tells how to tune and operate the set.

On the Air

A MAGAZINE OF RADIO

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Radionotes

RADIO FANS throughout the country will watch with interest the coming radio conference to be held in Washington under the supervision of Herbert Hoover. Radical steps are bound to be taken, especially in the broadcasting field. Whatever happens, the fan is bound to be affected, and broadcast listener organizations should have some sort of representation when the leaders meet to decide the future of this newest and greatest form of education and entertainment. It is a sure bet that the broadcasters and manufacturers will be there.

CONGRESS is going to be asked to appropriate funds for hospital radio installation. This is a campaign which the Disabled American Veterans plan to wage at the coming session, and work of compiling statistics is already under way in Washington.

In the opinion of the writer the Government should willingly undertake this expense. To date, the only receiving sets available for hospitals housing disabled world war veterans, have been those privately donated. Largely through subscription by private individuals has the lot of these unfortunate men been made happier, when it is the sworn duty of the country which they served, to do all in its power to care for them.

When it is realized that medical authorities are practically unanimous in their opinion that not only is radio a conservative form of recreation for any veteran compelled to spend long hours in hospitals, but has a distinct value in treatment, being rated "good medicine," particularly for mental and tubercular diseases, surely there is no reason for the authorities to hesitate. It should be the bounden duty of every member of Congress to support such a movement without question.

Many hospitals have been placed in isolated places, where it has been difficult to obtain entertainment that appeals to the men. In some hospitals theatricals are practically unknown and what entertainment there is, is supplied by neighborhood talent.

Sporadic drives by individuals or organizations to equip hospitals with receiving sets, while highly commendable and appreciated, is not enough. It is a matter for Congress, and Congress should see to it that action is taken immediately. It is the least a grateful country can do.

WHAT do you know about short wave broadcasting? The leading article in this issue tells you of the enormous strides made during the past few months in developing this most important feature of radio. Short waves point the way for future international broadcasts and the fascinating history of the progress made by KDKA should be read by every radio fan.

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No. 1

What Do You Know About

SHORT WAVE Broadcasting?

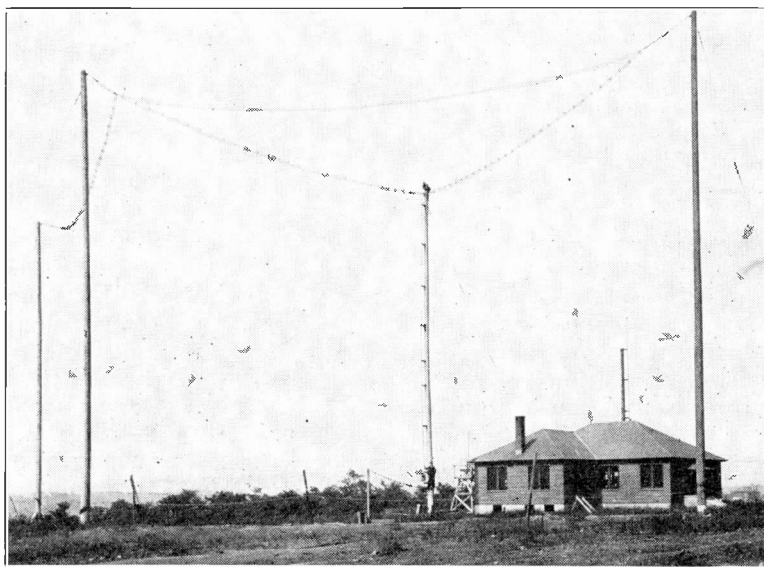
- ❑ DO YOU KNOW that Station KDKA has been heard in Spain, England, France and even South Africa on Low Waves?
- ❑ DO YOU KNOW that short waves point the way for future international broadcasts and rebroadcasts of foreign programmes?
- ❑ DO YOU KNOW that high frequency broadcasting requires special and absolute precision in its application as a means of communication?

WITHIN the last few weeks radio listeners on four continents have become aware of a new phase in the development of radio broadcasting, namely the use of short-wave lengths in the transmission of radio broadcasting programs. A quick succession of spectacular accomplishments in radio broadcasting and rebroadcasting has brought this system of transmission prominently to the attention of the public. The successful reception and repeating in England of programs from KDKA at Pittsburgh, Pa., the reception of this same station by the ship, Arctic, while lying in the frozen North, only 11 degrees from the North Pole; then the successful reception of the Wills-Firpo boxing match in Argentine; and finally the consistent reception of Station KDKA in England, France, Germany, Spain and South Africa

By Forbes W. Fairbairn

during the recent international tests, have made it evident that

People have read in the newspapers and magazines that this great range has been accomplished by the use of a high-frequency or short wave transmission. The public accepts this as a rapid development in a rapidly developing art and consider it as having been perfected practically overnight. This is a very mistaken idea. Like most other great achievements it is the result of unusual engineering knowledge and foresight and painstaking experiment and development coupled with unusual facilities and technical experience.



The antenna system, counterpoise and apparatus "shack" of the short wave transmitter which broadcasts the regular programs of KDKA on wavelengths around 75 to 100 meters at the same time the regular higher wave is used. The signals of this station are regularly heard in Europe and more distant points, while the regular wave is entirely inaudible

something different was being introduced in broadcasting which has pushed the limits for successful reception out to much greater distances.

A brief history of the development of this new system of radio transmission will be interesting. During the year 1920, Mr. Frank Conrad, Assistant Chief Engineer of the Westinghouse Electric and Manufacturing Company, an outstanding radio engineer of the radio world, main-

tained, as a hobby, a radio schedule with J. C. Ramsey, of Boston. With the power then available, that is, about 100 watts in the antenna, communication was very uncertain during the summer months and had to be abandoned entirely during particularly unfavorable periods, owing to the reduction of the received signal strength and the increased interference from strays. The radio frequency employed in these transmissions was about 1,200 kilocycles or 250 meters. Being aware of the reduction of atmospheric strays on the higher ranges of frequency (short waves) then in use, and from experiments in listening to harmonics from other transmitting stations, Mr. Conrad was convinced that there were greater possibilities of improvement in reliability of transmission, by increasing the frequency rather than by decreasing it as was the general tendency at that time.

The First Short Wave Tests

A SERIES of tests was run between Station 8XK, maintained at Mr. Conrad's home in Wilkesburg by the Westinghouse Electric and Manufacturing Company, and Mr. Ramsey's station in Boston, with the cooperation also of the stations of the Massachusetts Institute of Technology and of R. D. Decker, of Boston.

These tests were made during the spring of 1921 and consisted of a series of transmissions from each of the Boston stations at various wave lengths, and measurements were made at Wilkesburg of the audibility of received signals. The result indicated a gain of signal strength as the frequency was increased which, coupled with the great reduction in interference from strays on the higher frequencies, increased reliability of transmission with a given antenna power.

To permit of further observations the equipment of 8XK was remodeled to better adapt it to higher frequencies. The remodeled equipment consisted of a

coupled circuit in which the local oscillating circuit was coupled to the antenna circuit through a coupling condenser or inductance. With this arrangement it is unnecessary to extend the antenna down-lead into the building containing the radio equipment and as the current in the coupling wire is small because it represents the energy component only, a comparatively small conductor can be used. This small current minimizes losses due to high frequency fields. The operation of the transmitting connection was so satisfactory that it was adopted



Above, an interior view of the "shack" housing the transmitter, showing the apparatus that hurls signals into the atmosphere with such intensity that they actuate the diaphragms of headphones in Europe, Africa and South America. Right, a photo of the "daddy" of broadcasting, Mr. H. P. Davis, vice-president of the Westinghouse Electric Company, and the sponsor of these important developments



for the several broadcasting stations operated by the Westinghouse Company.

The transmission tests during the following year between Mr. Conrad's station and Mr. Ramsey's station in Boston, at 5,000 kilocycles (60 meters), indicated much greater reliability of communication than during previous operation on 1,200 kilocycles (250 meters).

These tests were being followed by H. P. Davis, vice-president of the Westinghouse Electric Company, well known as the "Father of Radio Broadcasting" on account of his establishing KDKA, the pioneer broadcasting station of the world.

Further Experiments Sanctioned

MR. DAVIS recognized the importance of these high frequencies for use in broadcast repeating and for more reliable communication over the longer distances, where communication becomes more or less difficult and unreliable with the lower frequencies used at present in ordinary broadcasting. Mr. Conrad was commissioned to build a transmitter with sufficient power to more thoroughly demonstrate this. This transmitter was built as an adjunct to the transmitting equipment of KDKA and the program of KDKA was simultaneously transmitted on its regular broadcasting wave (340 meters) and on this high frequency wave (90 meters).

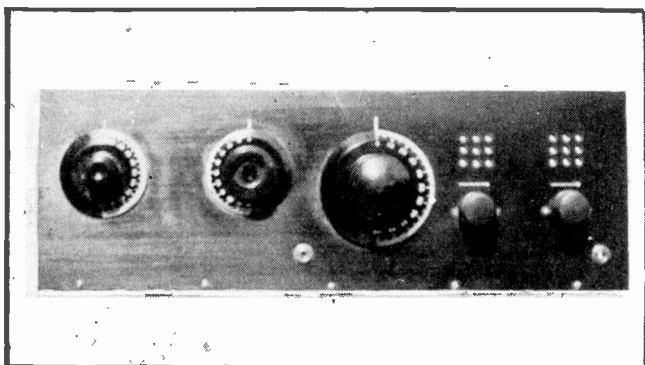
In the operation of this transmitter difficulty was experienced in maintaining a fixed frequency. The wave would vary through a range of frequencies of as much as 1,000 cycles, so that it was difficult to receive telephone signals on a sharply tuned set. This variation of frequency was due in part to changes taking place in the various circuits of the factory building, so the vertical pole antenna was replaced by the conventional form of inverted "L" with insulated counterpoise. This arrangement overcame the abrupt frequency shifts, but there remained the generally irregular fluctuations due to various causes, such as vibration of connecting wires, or variations of plate supply voltage.

To eliminate vibration due to machinery in the building, the whole transmitting structure was then suspended from a set of springs. The effect of these changes was to greatly improve the constancy of frequency.

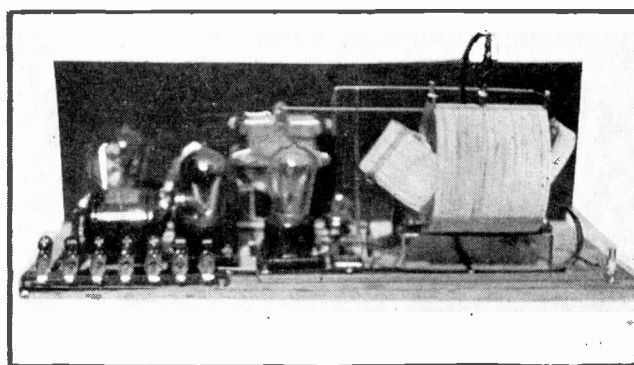
Experiments Assume Greater Proportions

THIS transmitter was equipped with four 250-watt air-cooled oscillators and six modulators of similar type. The four oscillators delivered approximately 800 watts to the antenna circuit. The first transmission experiments were carried on between Pittsburgh and Cleveland, attempts being made at Cleveland to pick up the high

(Continued on page 14)



Simplicity and efficiency are the keynote of the panel design of this three-tube re-generator



The coils are set far back to offset hand capacity. The high frequency wiring is kept clear of the baseboard

The TECHNICAL EDITOR'S Set

Incorporates some unusual feats of engineering skill in its design.

By FELIX ANDERSON

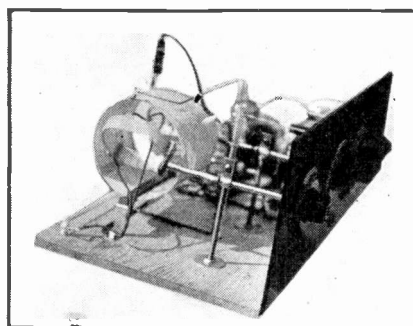
TEN years of active experience in the radio game as a transmitting ham, experimenter, student and teacher of radio have taught me that the balmy days of summer are the logical days for renovating, rebuilding and general installation of radio receiving systems. If you have been a broadcast enthusiast for any length of time, you have doubtless acquired the habit. Summer static, decreased ranges and outside interests contribute largely to the "seasonal" aspect of the game, something that many writers, manufacturers and advertising men are seeking to ignore. Regardless of how the issue is ducked, the summer days are coincident with decreased interest, especially with respect to listening.

It is the wise citizen radioist, however, that employs this season to greater or less advantage, and the wise radio fan does so by utilizing inactivity in listening time at constructing new sets or in remodeling and rebuilding his last season's receiver.

Truly, this time of the year is the time when one should consider how the fall and winter programs are to be enjoyed. Like coal, the cost of radio goes up with colder weather—and around Christmas time it becomes nearly as scarce, with respect to apparatus and accessories.

What Type of Set?

IN THE past six months we have witnessed a veritable deluge of varied supers, multi-supers, auto-super heteros and flexes. Furthermore, we are more or less acquainted with their familiarities, their traits and results, and we are in a more advantageous position to judge them as affects their merits.



This side view gives you an idea of the antenna and tickler coil mountings. A threaded brass rod furnishes the vertical adjustment, and a brass washer soldered to the shaft makes the horizontal adjustment permanent and smooth. Note the clip, used to enable separation of the lower wave stations

In general, I have come to the conclusion that the set in vogue next fall will be one of the three-tube type—preferably a sharp tuning regenerative affair. I base this contention on the ever increasing number of high-power stations, and also the overwhelming multiplication of the low wave class A broadcasters that now virtually "infest" the air.

Then, too, I have always harbored a rather sympathetic interest in the three-tube, loosely coupled, tickler-feedback, regenerative set, because of the many records I have been able to make for myself, and for the excellent showing this smaller, less expensive contraption will make against five-, six- and eight-tube sets. If you feel like I do, you

can easily recognize this preference for the smaller fellow that will lick the big bruiser all hollow. So my choice rests with the Old Reliable, brought up to date with some of the remarkable new units and accessories that the profession now boasts.

Some of the Advantages

BRIEFLY, let me enumerate some of the features of the set that I am appointing to do my next season's radio work.

A specially wound coil, incorporating some of the latest ideas in low loss design, together with one of the new low loss condensers makes it highly selective. This selectivity is further emphasized by the use of a low ratio of antenna to secondary circuit, which likewise reduces the nuisance of malignant squeals so often evident in broadcast reception.

The receiver has five controls in all on the panel. Only two of these are actively used, the secondary tuning circuit selecting the station and the regeneration controlling the audibility and which contributes to the distance-getting qualities of the set. The remaining three are but rough settings, the antenna coil angle being varied with the knob you see at the extreme left of the panel view (controlling the input, and incidentally the selectivity and volume as well); the two filament controls, one for the detector which must be separate and one for the two audio amplifiers.

Two Audio Stages Plenty

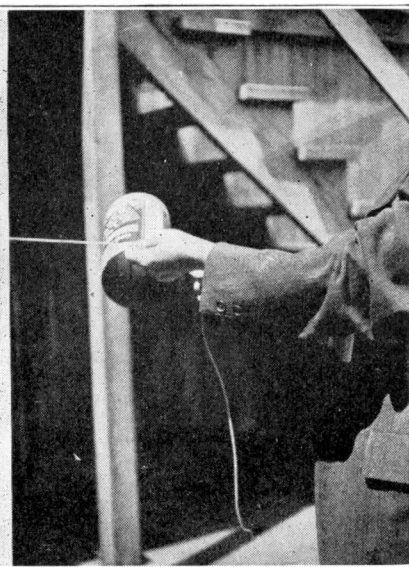
The set employs two low ratio high grade stages of audio amplification, connected in the usual cascade fashion, which furnish ample volume on stations



The winding form is slit in three sections with a scissors, cutting the cardboard lengthwise. A common Quaker Oats box serves the purpose



As each cut is made, it is "backed" up with gummed paper so that the form can be taken apart without wrecking the finished inductance



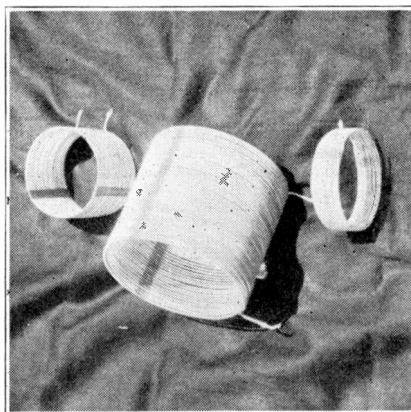
After the strips of celluloid have been fixed in place with gummed tape, the wire is fastened to some distant post or fixture and the turns are rolled on

two thousand miles away. A fixed pencil mark grid leak is used—chiefly because its performance is thoroughly satisfactory, and also because of its inexpensive nature.

Openwork construction, plenty of room for charged bodies and wire, carefully placed units together with an unusually unique style of wiring makes this set, in my estimation, one of the most efficient that I have yet seen designed.

With respect to selectivity, it might be well to state that my location is not one to be envied. One mile from WEBH, less than that from WQJ, and with WBBM, WIBO, WENR, WDBY, within a radius of 5 miles with WGN, KYW, WLS, WMAQ, WGES, WBBM, and WMBB within 10 miles. And they all seem to be going at once when I want to try for long distance. Right here, I want to say that I'm no radio liar, and I don't claim to tune them all out and get anything I want. But I do break through with this set, and with at least half of the above broadcasters going, I tune KDKA, WOC, WSAI, all the suburban stations like WTAS, WJJD, WHT and WORD and listen to them with little or no interference. I can separate WLS from either WGN or WEBH (one mile away) without the least interference from either—no noises or mush either.

This trick is accomplished by spreading the tuning of these stations out over the scale by means of a tapped coil. The coil consists of a 47-turn, 4-inch, specially-wound, spaced-turn winding, with a tap at the thirtieth turn. When the clip (used to vary the number of turns) is on the forty-seventh turn the set tunes (with a .0005 mfd. Cardwell) from 300 to 600 meters with plenty of separation on the high wave stations, and when attached to the thirtieth turn, WQJ at 448 meters can be received with the dial set at 95.



The finished coils look like this. The tickler (left) and antenna coil (right) are wound on bottles, which are broken when the collodion is dry. Low loss! I should say so

This spreads the tuning on the lower waves out considerably, and enables me to separate the Class A stations without especial difficulty. When the dial is set around 10 the 180 meter phones of the amateurs can be heard, and not infrequently have I enjoyed listening to them "chew" the rag back and fourth. With the clip set at the forty-seventh turn, the tuning of the low-wave stations becomes very critical, decidedly so under 350 meters. By setting the dial at 95 I often copy stations on lake steamboats handling traffic with

How to Make the Set

BUT this recounting of results is nearly always boring. The description of its construction is immeasurably more interesting, so let's hop to it.

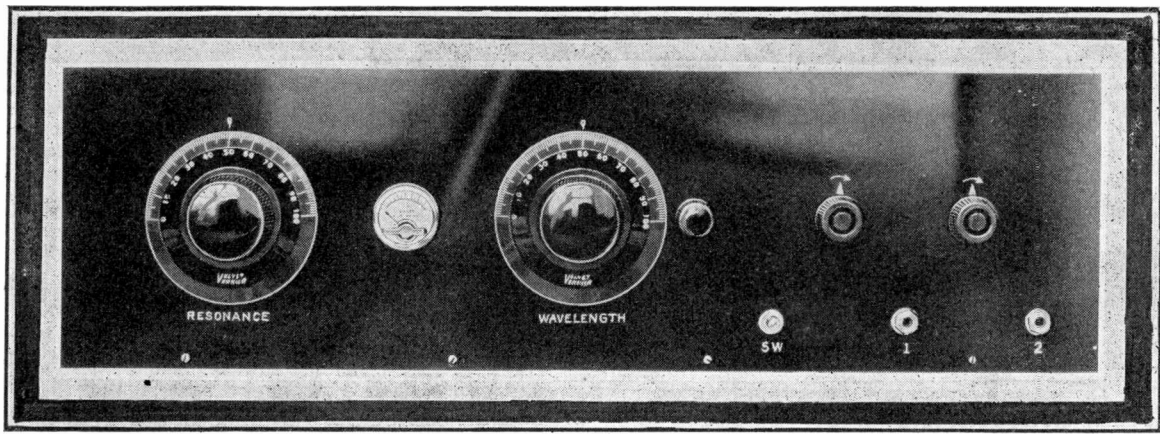
Our first consideration lies in the selection of the proper parts and accessories. I am giving the trade names of them just as I used them, not be-

cause they advertise or do not advertise with us, but because I believe they are worth specifying.

LIST OF PARTS

- 1 Bakelite, formica or hard rubber panel 7x21x $\frac{3}{8}$ inch.
- 2 Dials, 3-inch size.
- 1 National Velvet vernier dial, 4-inch size.
- 2 Allen-Bradley carbon disk rheostats, universal type.
- 1 Carter 4-spring jack.
- 1 Carter 1-spring jack.
- 6 Round-head brass screws, $\frac{3}{4}$ inch.
- 1 Yellow clear pine baseboard (dried and sparvarnished). Size 10x21x $\frac{1}{2}$ inch.
- 2 Threaded brass rods $3\frac{1}{2}$ inches long $\frac{3}{8}$ in stock.
- 4 Bolts to fit.
- 2 Brass coil mounting brackets $1\frac{1}{4}$ inches high with $\frac{1}{2}$ inch feet top and bottom.
- 2 Pieces of bakelite for coil mounting $5\frac{1}{2} \times 2 \times \frac{1}{4}$ inch.
- 2 Pieces of bakelite for L₁ and L₂ mounting (to rod). Size $2 \times \frac{1}{2} \times \frac{1}{4}$ inch.
- 2 Pieces of brass rod 6 inches long $\frac{1}{4}$ inch stock for shafts L₁ and L₂.
- 4 Pieces flexible wire lead for L₁ and L₂ 8 inches long.
- 1 Small clip, tight jawed.
- 2 Pieces brass $2 \times \frac{1}{2}$ inch $\frac{3}{8}$ stock. Shaft bearings.
- 1 Pyrex, or porcelain socket.
- 2 Kellogg tube sockets (audio stages).
- 1 Cardwell 21-plate .0005 mfd. condenser.
- 2 Karas Harmonik audio transformers.
- 1 Fleming binding post rack (has 7 posts).
- 3 Dubilier or Muter .00025 mfd. condensers, fixed.
- 1 Dubilier or Muter .002 mfd. condenser, fixed.
- 3 UV-201A or Musselman 201A tubes.
- 1 Pencil Mark grid leak (round type with cap).
- 4 Lengths bus bar wire.
- 5 Feet No. 18 rubber-covered wire.
- 2 Dozen assorted mounting screws.
- 1 A battery.
- 2 B batteries, Burgess or Eveready, 45-volt.

(Continued on page 22)



RADIO FREQUENCY *and* REACTION Successfully Combined AT LAST In

The BROWNING-DRAKE Receiver

By G. H. BROWNING

WITH the increase in number and power of radiocasting stations, it is necessary to discard many of the sets which hitherto have been used with satisfaction, and substitute in their place more selective ones. The superheterodyne has been brought forth to fill just such a need.

In the quest for a set which would employ fewer tubes and, at the same time, have somewhat the selectivity and sensitivity of a super, Mr. Frederick H. Drake, and the writer, both doing research work at Harvard University, set to work mathematically to see just how much amplification might be expected from a tuned radio frequency transformer.

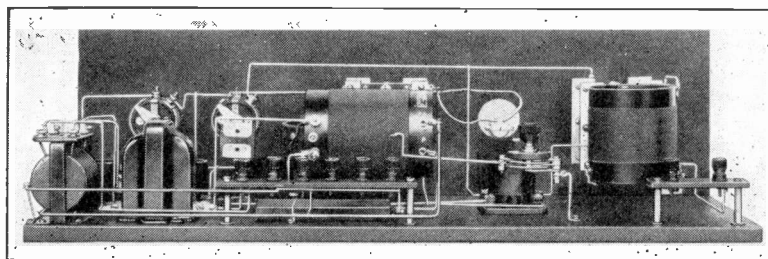
Slot Wound RFT Best

Theory indicated the best constants for frequency transformers, but laboratory tests at Harvard showed that without a "slot" wound primary to minimize capacity coupling the predicted amplification could not be obtained.

The tuned transformer, thus developed was tried in a number of circuits but it was found after some little experimenting that the best signal strength could be obtained by regenerating on the secondary of the R. F. transformer and stabilizing the first circuit so it would not oscillate. The results of this combination seem to be better than using two stages of radio frequency amplification besides being much easier to build and operate.

The resultant "hook-up" popularly

APPARATUS USED	
One	panel—7x24-inch.
One	baseboard—8½x23½-inch.
One	National tuning unit B-D 1.
One	National unit B-D 2.
One	Rathbun 3-plate vernier.
Four	standard Benjamin tube sockets or one UV 199 tube socket with three standard sockets.
Two	high grade transformers, such as the Rawland-Lyric, General Radio, or Samson.
Two	Yaxby rheostats (one of ten ohms and one of thirty ohms resistance).
One	25-ohm fixed resistance.
One	Hoyt 2-inch voltmeter
One	.0001 mf. fixed condenser. (Hilco.)
One	.001 mf. or .002 mf. fixed condenser.
One	.00025 mf. fixed grid condenser.
One	Electrad variouhm
One	BMS double circuit jack.
One	BMS single open circuit filament control jack.
One	filament switch.
One	1 mf. by-pass condenser



A rear view of the Browning-Drake Regenaformer Receiver, which so successfully combines radio frequency and regeneration in a four-tube hook-up. Note the generous spacing of the units, and the general all-around appearance of efficiency.

known as the Browning-Drake circuit is not new but depends for its efficiency on the design of the tuned radio-frequency transformer. The set consists

essentially of one stage of tuned radio-frequency amplification and a regenerative detector, to which any type of audio amplification may be added.

Much time was given to the placing of apparatus, considering both the appearance, and also as to electrical characteristics, with the result shown. The dimensions are given for the parts recommended. Note that the center of the two condensers are 8 inches apart. This liberal spacing makes the task of "balancing" easier than would be otherwise the case.

The illustration on this page shows the layout behind the panel and the placing of apparatus.

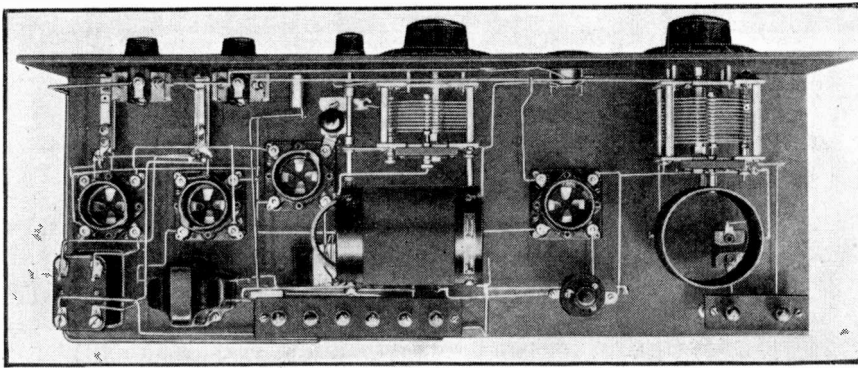
Constructional Data

THE layout of the parts entering into the complete receiver has been so placed as to make the connecting leads as short as possible. Thus the RF amplifier tube is placed between the antenna tuning system and the regenaformer, while the three other tubes are placed at the right of the second tuning condenser. The two variable air condensers which support the coils should be mounted so that the rotor plates move towards each other.

The connections from the .0001 mf. condenser to the coil should be made of flexible wire so that connections from point 1 to point 2 or from

point 1 to point 3 may be tried to see which gives the better results.

Be sure the stator plates of the condensers go to the grid of the tubes, as



A top view of the Browning-Drake combination radio frequency-regenerative receiver which is responsible for many exceptional long distance reports. This illustrates what is meant by placing the parts so that while the leads are short, all-around efficiency and appearance are not disregarded

this will eliminate body capacity when tuning. In connecting up the set, be sure to solder connections directly to the wire of the antenna coil, and the secondary of the regenerator.

Sometimes the 1 mf. condenser acting as a by-pass across the "B" battery can just as well be omitted if the leads to the "B" battery are short. This is the reason it is marked optional.

It will be noticed that the rheostats are connected in an unusual way, which facilitates the use of the voltmeter, so that it reads the maximum voltage across the filament of all tubes. This voltage is controlled by rheostat No. 2. Rheostat No. 1, which has 30 ohms resistance, really acts as a volume control regulating the filament voltage of the first tube. More will be said later, concerning the setting of these rheostats.

Choice of Tubes

THE ideal arrangement of tubes would be a DV3, or UV199 in the first socket with UV201A tubes in the other three. The 25 ohm fixed resistance shown takes care of the small tubes filament voltage so that if rheostat No. 1 is never turned on more than half way, there is no danger of

burning it out. The picture diagram shows a standard socket for the radio-frequency tube. If a DV3 is chosen for the radio amplifier, this will be used as shown. If a UV199 is used, a UV199 socket would be substituted in place of the standard one for the RF tube.

DV3 tube or UV199's may be used in all sockets satisfactorily, though not quite so much volume will be obtained. In this case, the 25 ohm resistance should be omitted.

Balancing

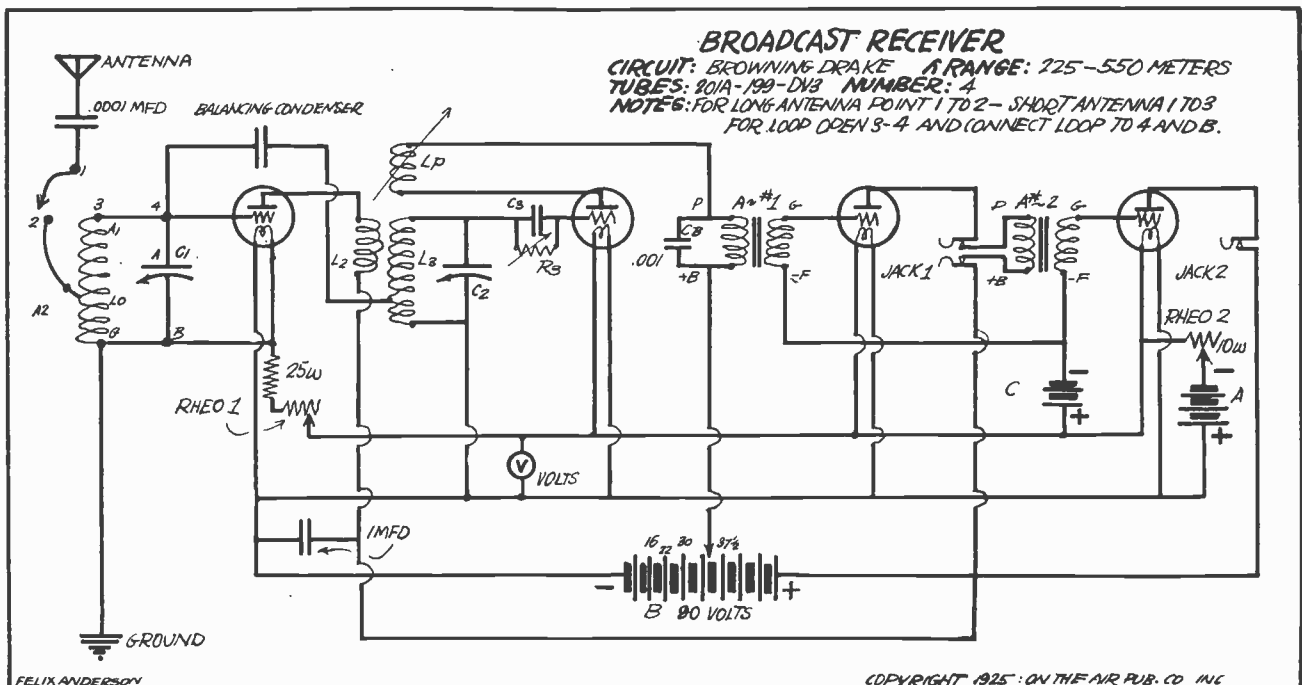
When the set has been carefully constructed according to the diagrams given, the next step is to balance it so as to obtain the most volume, and eliminate radiation. We shall assume that a DV3 or UV199 tube is in the first socket with 201A tubes in the other three. After connecting antenna, ground, and batteries with rheostat No. 1 off, turn rheostat No. 2 until the voltmeter reads five. Then turn rheostat No. 1 about half way on, and tune in a local station. Turn rheostat No. 1 completely off, leaving the RF tube in its socket, and retune for the station. Set the balancing condenser until changing the setting of the .0005 mf. condenser does not affect the signal

strength. (This usually occurs when the balancing condenser is set for minimum signal.) The set is then ready to operate at maximum efficiency. Balancing in this way should be very easily done if wiring diagram has been followed.

Tuning the Set

A few notes on tuning may be helpful though actually operating the set is the only way one can acquire the knack of doing DX work. If the set is performing normally, the volume coil L_p can be tuned to such a position that placing a finger on the stator plates of the .00035 mf. condenser gives a "pluck" in the receivers. This means circuit L_2C_2 is oscillating. With the volume coil in that position, turn the dial of the .00035 condenser until a whistle is heard. Turn dial of the .0005 condenser until this whistle is loudest. Then adjust the volume coil until the whistle disappears, and by slightly retuning, the station should come in.

The receiver described has performed very well indeed from all reports. During the recent trans-Atlantic test, Madrid was received with a three-tube set, and a telegram was obtained verifying the reception. Verified reception has also been obtained from KGO, Oakland, Calif.; KHJ, Los Angeles, Calif.; Mexico City and Calgary, Canada.



FAIRY TALES COME TRUE IN RADIO

A Story of the Kaiser and **The Singing Stoker**

By JAMES BRADBURY

SEVERAL months ago a gentleman appeared at the Edison studio of Westinghouse station KYW. He had with him a portfolio of music. No one of the staff had ever seen him before. A strong German accent was noticeable in his conversation.

The stranger was Frederick William Lange, who has since become an exclusive artist of the station. His career as a singer dates back to the days before the war, when he was serving a term of enlistment as a stoker on board the ex-Kaiser's famous steam-yacht "Hohenzollern." Gifted with one of those rare, deep, resonant baritone voices, that comes naturally to few people, and with a natural desire to sing, he frequently burst into song during his working hours, and it was on one of these occasions that the former Kaiser Wilhelm, then passing near one of the vents leading to the stoke-room, heard Lange's voice. Lange certainly must have been in one of those moods that carried keen interpretation, for the Kaiser was impressed. He ordered the man "who was singing" to report to him. Lange, of the "black gang," as the stokers are referred to in maritime circles, hastened in response to this order, confused, flustered, and not over-near because of the vocation he was just then engaged in.

The Kaiser upon seeing Lange, said, "Do not be frightened; you have done nothing wrong. You are an artist. Tell me, with whom did you study?"

"Your Majesty," Lange stammered, "I have never studied."

"Never studied! Then how is it you sing so beautifully?"

Lange explained, to the best of his ability, that he loved opera, that he was fond of singing, and that he was merely trying to imitate famous singers, whom he had heard from the galleries.

The Kaiser was much pleased. "Go to your quarters, clean up, and come back to my cabin," he said.

To quote Lange: "He made jokes that day—something we never again heard him do. Usually he was so gloomy. Finally, I sang the best I could, and the Kaiser liked it. He was most fond of Beethoven,



Frederick William Lange, whose life for the past ten years reads like the proverbial fairy tale. His deep, resonant baritone voice is known to thousands of listeners throughout the United States

Schumann, and Brahms—sentimental selections. 'Their mood,' he said, 'is like my mood.'

Lange was taken out of the stoke-room and assigned to light duties, and almost daily was in the Emperor's cabin until the end of that cruise.

"I feel blue today," the Kaiser would say—"Sing for me." Thus Lange would sing the Kaiser into a good temper.

When the war came on, Lange recalls what the Kaiser told him after singing several selections. He was particularly gloomy that day, so gloomy that Lange was actually frightened. The Kaiser told him, "Do not get into my mood. You are a young man. You have no cares, no responsibilities. You can smile, and yet, I suppose, you envy me. It is queer."

At the finish of the cruise, the Kaiser sent Lange to Kiel to study music at the Emperor's expense. Lange was still attached to the yacht, however, and on short cruises he entertained the Kaiser, much to the jealousy of the rest of the crew.

With the passing of events, there came July 14, 1914. To quote Lange again, "Never shall

I forget the day. We were at sea, headed for Berg. I was passing the wireless room when I saw one of the operators run out and dash for the Kaiser's cabin. Then the aides were sent for. The conference was long. Finally, they came out, and an orderly came for me. I was brought before the Kaiser."

"Lange," said the Kaiser, "I want you to sing for me—only one song, 'The Wanderer.' The Archduke Ferdinand has been assassinated." Lange never saw the Kaiser again.

With Lange's coming to Chicago, he drifted into the KYW studio, unknown, and unprepared to sing. Steve Trumbull was conducting the program that evening and he was asked to permit Mr. Lange to sing. His first song so impressed the people in the studio that he was immediately asked to sing another. This was his first attempt to sing into a microphone, but numerous letters were received, speaking of his wonderful voice. Musical critics have praised Lange's singing. Today he stands well in the fore of becoming one of radio's real luminaries.

Enter The SUPER-AUTODYNE

Q *Pressley Balanced Input Circuit Obviates Necessity of Separate Oscillator—Circuit Employs Only One More Tube Than The Less Effective Neutrodyne Receiving Set*

THE receiving system to be described in this paper is the result of considerable research and experiment in an endeavor to produce a super-heterodyne that would give equal or better results than could be obtained with any existing type, yet which would employ a maximum of six tubes, for this number must certainly be considered the maximum allowable limit henceforth, if the word "efficiency" be used unblushingly in connection with this system of reception.

There has been no question in the mind of even the most uninformed, that the super-heterodyne was the ideal radio receiver, and the desire of every enthusiast has been to be the owner of a set containing many more tubes than any other in his community. Yet this has been the real drawback of the super,—the necessity of using from seven to ten tubes in order to obtain super-heterodyne results. The aim of receiver designers has been, not to improve results, for a super that really justifies the name will go down to the lowest noise-level—the limit of practical sensitivity—but rather to reduce the number of tubes used and at the same time retain the sensitivity, selectivity and quality of reproduction obtainable with the best of sets.

To the mind of the engineer, there are but two practical methods of attacking this problem—either make the tubes do more work, or raise the efficiency of each circuit of the receiver right up to the maximum limit, or both. The first method of attack may be considered an expedient, and boils down to reflexing—causing one or more tubes to perform various functions, such as radio and audio amplification simultaneously. This is not entirely practical, in view of the frequencies to be handled, except in one section—the frequency changer. Here, there is no reason why one tube may not be used for the first detector and oscillator, providing the separate tuning circuits may be satisfactorily isolated. Up to the present, this has been impossible, except by the second harmonic method.

A top view of the new Super-Autodyne receiver employing the Pressley system of producing the beat frequency. Note the open style of construction, a feature that makes for efficiency

By **McMURDO SILVER**
Assoc. I. R. E.

The next method is to improve the efficiency of each section of the system so that fewer tubes will be required to give the same amplification hitherto obtained.

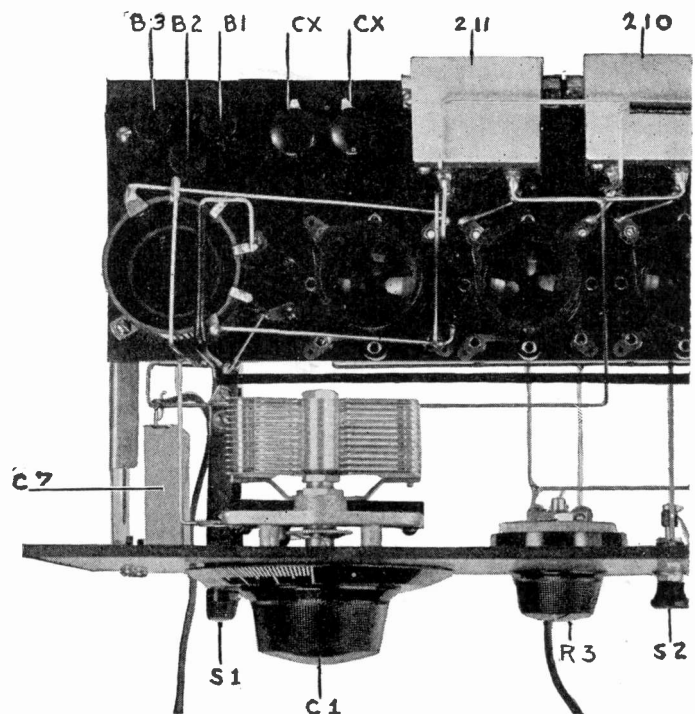
Autodyne Frequency Changer

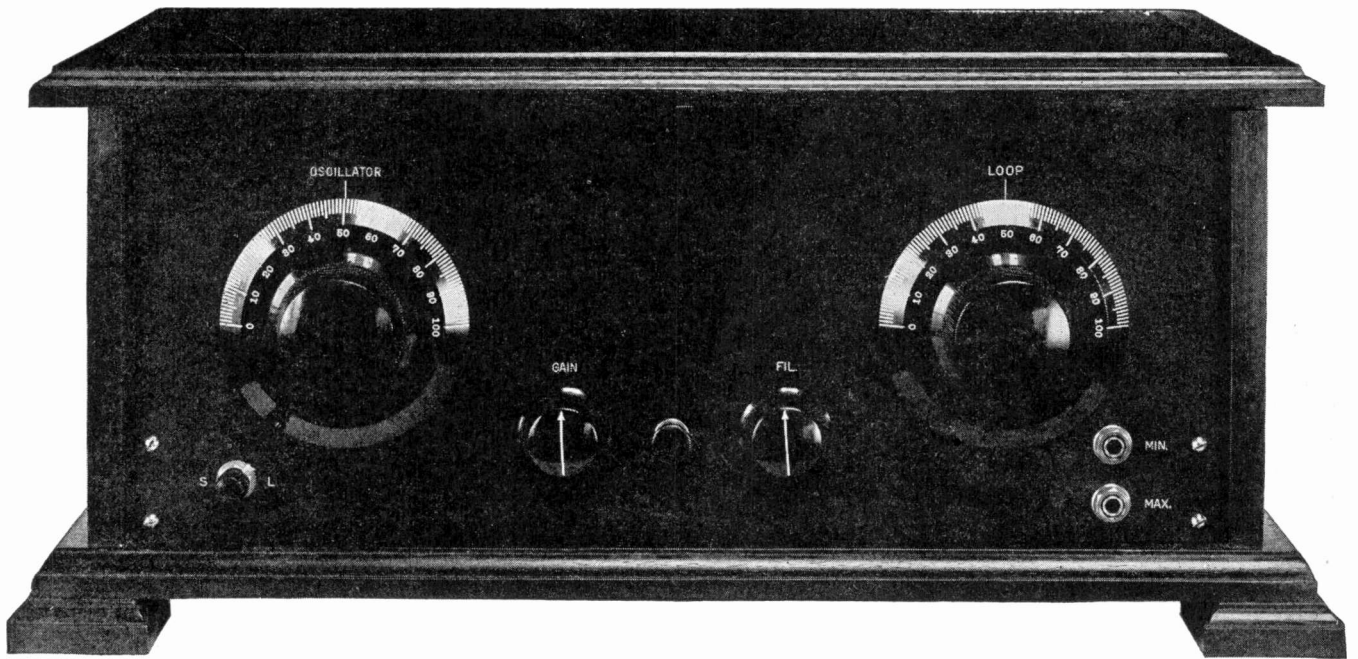
THE development by J. H. Pressley, a Signal Corps engineer, of the balanced autodyne circuit, not only performs the required function with one tube, but does it much better than either the second harmonic autodyne with its amplifying muffler, or what has hitherto been considered about the limit for sensitivity, the regenerative detector and separate oscillator. This autodyne circuit appears to give a much greater gain than any of the frequency-changing circuits previously utilized, and, at the same time, is far simpler to build and operate than any of its predecessors.

The actual first tube circuit is shown in Figure 1. The

LIST OF MATERIALS

- 2—C1, CP, SM—305 S.L.W. condensers.
- 2—4" moulded dials.
- 1—R4 6-ohm rheostat.
- 1—R3 240-ohm potentiometer.
- 3—BL, B2, B3 binding posts.
- 1—J2 Carter 101 jack.
- 1—J1 Carter 102-A jack.
- 1—C-5, 211 SM-211 filter.
- 2—S-M-210 charted intermediate transformers.
- 1—L1, L2, L3, SM-101B coupling unit.
- 1—SM or Benjamin 6-gang socket shelf.
- 2—T1, T2, Thordarson transformers.
- 2—C7, C8 .5 condensers.
- 2—C3-C4 Muter .00025 condensers.
- 2—C9, C10 Muter .002 condensers.
- 1—C6 Muter .0075 condenser.
- 2—CX, CX Continental .000025 condensers.
- 1—R1 SM .5 Meg. leak.
- 1—R2 SM 2 meg. leak.
- 1—S1 Carter jack switch.
- 1—S2 Benjamin 8630 switch.
- 1—SM No. 701 color cable.
- 1—pair Benjamin No. 8629 shelf brackets.
- 1—Bakelite panel, 7" x 18" x 1/8"
- Small parts: 29 6/32 R.H.N.P. machine screws, 3/4", 2 6/32 R.H.N.P. machine screws, 1 1/2", 31 6/32 nuts, 1 spaghetti, 10 bus-bar, 25 lugs.





coils L_2, L_3 are theoretically equal, as are the condensers CX, CX . Actually, they cannot be made fixed and equal, so CX, CX are made adjustable, to obtain substantially a condition of equality. These units make up a bridge circuit, shown by the heavy lines. Since L_2 equals L_3 , the potential across them is equal, so that it is also equal between points 3 and 4, and 5 and 6. Likewise, the potential across CX and CX is equal. Since the potential across 3 and 6 is the same for both inductance and capacity, then point 4, 5 and the join between CX, CX

A SAMPLE LOG

Below is a log, representing one hour's work by an operator unfamiliar with the system. The set was located 600 feet from WGN, one-half mile from KYW, and WMAQ, and many other Chicago locals were also operating. All stations were heard on the loud-speaker.

WCEE	19	48.5	S	KSUO	67.5	78	L
WTAS	23	61	S	WCBD	29	23	L
KDKA	23.5	65	S	WHAZ	33	30	L
WGR	31	71	S	WLW	42	41	L
WDAF	31.5	21	L	WTAC	50.5	54	L
WTAM	36	31	L	KFI	49.5	53	L
KSID	36.5	33.5	L	KSUI	48	45	L
WCCO	40.5	39	L	WQJ	50	45	L
WOS	44.5	45	L	WTAY	16	37	S
WCAP	50	53	L	WBCN	18	43	S
WSAI	53	58	L	WJJD	22.5	61	S
WEAF	55.5	58	L	WLS	28	85	S
WCX	60.5	67	L	WBAP	52	56	L
WOAW	63	70	L	WEBH	32	95	S
WGN	32	28	L				

The station separation was very pleasing on some of the unlisted lower wave stations, due to the use of the straight-line-wave length condensers. A comparison with a standard five-tube neutrodyne on a 100-foot antenna was unfavorable to the neutrodyne.

Anybody could like this simple artistic panel design. The two dials form the main controls used for operation. The two others are merely set at the desired value, before the process of tuning is followed out

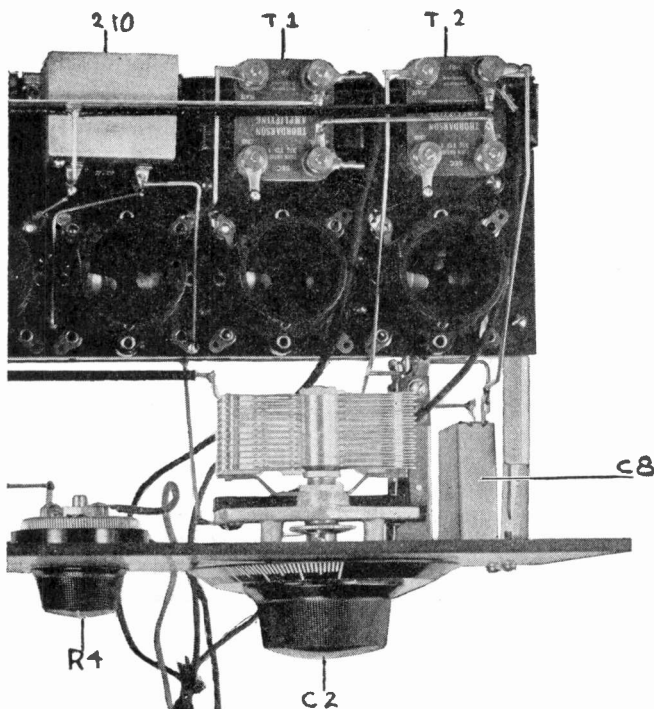
are at equal potential, and are also theoretically at zero potential, since these points are neutral with respect to 3 and 6. Then, circuit B_1, C_2, B_2 , may be connected at these neutral points, with substantially no reaction on the frequency of the bridge circuit. Further, as these points are neutral with respect to 3 and 6, no energy in the bridge circuit can get into B_1, C_2, B_2 , since there is no potential difference across

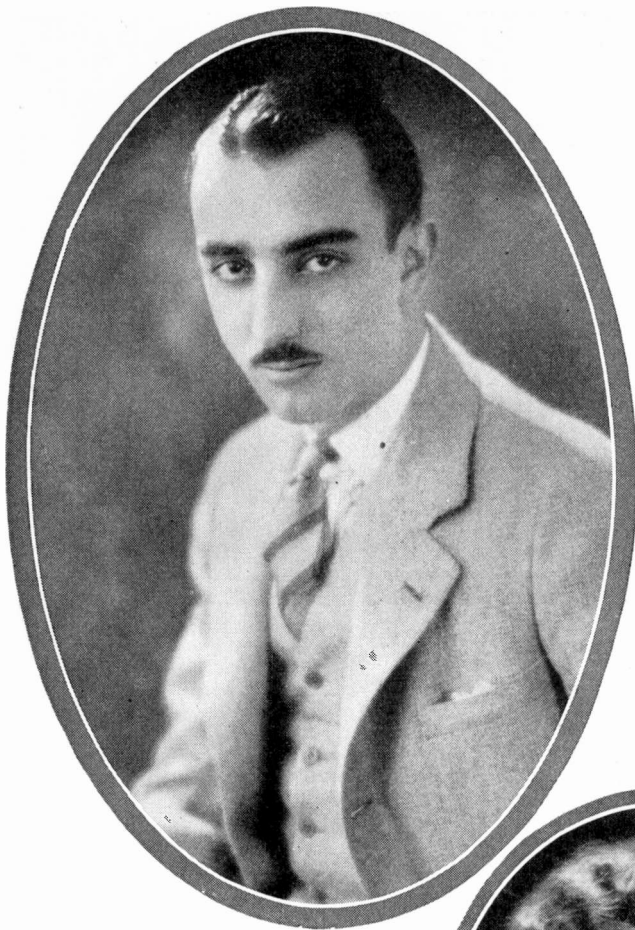
these points of the bridge. Therefore, the frequency adjustment of the bridge circuit cannot react upon that of the B_1, C_2, B_2 , circuit, and vice versa.

Since the signal is fed from the loop and its tuning condenser to the oscillator, it will divide equally across the bridge arms. If a tube detector is connected across one capacity CX , the drop in potential may be used to cause rectification. It would appear that some of the signal voltage is lost by this method, but actually it is not—it is, as a matter of fact, considerably reinforced when the new component is finally fed to the amplifier, probably due to regenerative amplification. The coil L_1 , coupled to L_2, L_3 , causes the bridge circuits to oscillate at a frequency determined by these coils CX, CX and CI which is made variable for the purpose of tuning the oscillator circuit. As previously explained, this energy cannot get into the loop circuit, so radiation is confined to what may be experienced from the oscillator coil system itself—a negligible amount. The arrangement is exceedingly sensitive; it is possible to eliminate one tube from the receiver, and obtains better results than with two.

THE intermediate amplifier is the only other unusual feature of the receiver. It employs but two stages

(Continued on page 30)





WILLIE, TOMMY
ANNIE, SAMMY
and
HERBIE

at home

KIMBALL HALL
CHICAGO-ELGIN

every night



By H. J. MEISTER.

surely that's all a radio entertainer is expected to do.

"The Elginites" who nightly listen to WTAS and WCEE like "Herbie" and "Herbie" likes them. He admits it. Listen:

Likes to Entertain

"Why shouldn't I?" he queried. "I like to entertain and people the world over like to be entertained. If I can write a song that people like, it makes me all the happier, and if I can help people forget their little worries and troubles and sorrows for a few hours, so much the better.

"Yes, I was born in Chicago not so very long ago, went to school here and was a general nuisance around the house just the same as any kid.

All Set for Law

"When I entered Northwestern University it was pretty well understood that I was going to take up law—that is, my mother and

father understood so. I had other ideas, but you know how it is.

"So every possible moment I could find away from school and my studies, I spent in cultivating my musical bump, as Mr. Conn says. I finally organized an orchestra—this was long before popular broadcasting—entertained at clubs, and generally tried to forget all about the legal affairs of the world. Perhaps the world did lose a great lawyer, what?" and he smiled reminiscently.

"Anyway, just about that time law was forgotten

(Continued on page 28)

AND now "Herbie" has joined the merry family of "Willie, Tommy, Annie and Sammy" at Elgin, Ill. "Willie, Tommy, Annie and Sammy," as every radio fan knows, make up the inimitable family who nightly hold forth from the Sapphire studios of stations WTAS and WCEE, pioneer broadcasts of the middle west, whose voices have been heard nearly half way around the world.

"Herbie" is Herbert Mintz, better known as "Our Herbie", program director and announcer, accompanist and general entertainer of the Elgin air entertainment factory. His radio career extends way back when there was but one broadcasting station in Chicago, KYW, when he and a few others were really the voices of the "windy city," and when there were but a few radio broadcasting stations in the entire country. It was there he was baptized "Our Herbie" and by that name he is known wherever there is a radio receiving set.

Mintz has a personality that fairly radiates radio. A tall, dark, pleasant sort of chap, quiet and unassuming, with just that sort of gruffly soft voice that registers so well over the air, he is admittedly one of the most popular artists "behind the mike" that the middle west has produced. He sings well, plays piano well, talks well, and extemporizes well—



The handsome fellow above is the owner of the pleasant voice you hear nightly from WTAS. None other than Herbert Mintz, program director, artist, announcer and pianist

A recent addition to the staff of exclusive artists at the Chicago studio is Miss Violet Eaton, a La Granger whose popularity is ever on the rise.

A Thousand Watts of Geniality

"Howdy, Pap!"

WJJD—

a monument
to the
generosity
of the
LOYAL MOOSE



The photograph above shows some of the sturdy juvenile broadcast artists that broadcast from WJJD. Did you ever see a healthier, more robust group of orphans?

The circle to the left is none other than Jack Nelson, the chief announcer and director of the Mooseheart station, at his desk in the Palmer House remote control studio

If you haven't tuned in on WJJD's organ recitals, you ought to. Albert F. Brown is shown at the console of the Geneva organ, which broadcasts every night by wire from Mooseheart

on the birthday of James J. Davis, Secretary of Labor in the Late President Harding's and in President Coolidge's Cabinet. Hon. Mr. Davis is director-general of the Loyal Order of Moose, which owns and operates the station. Mr. Davis is also the founder of Mooseheart, and the station is named in his honor—WJJD.

Mooseheart—The City of Childhood

MOOSEHEART is the 1,132-acre estate of the Loyal Order of Moose, where the 650,000 members of the Order take care of over 1,250 dependent children,—of deceased Moose. It is called the City of Childhood, where these children are cared for, educated and trained so that when they graduate they are fully able to take care of themselves. In other words, they are taught how to live intelligently, and how to make a living. These boys and girls come from all over the continent from Alaska to Florida and are of all ages from five months up to nineteen years.

In the city proper are all the buildings necessary for their care. Schools, theatre, gymnasium, athletic field, laundries, printing shops, industrial shops, cement plant, hospital, power and heat plant, fire department, residences and dormitories, in fact everything needed to be complete in itself,—except a police department. The thirty-acre lake, where the boys have built many cabins, affords the means for swimming in summer and skating in winter. On the rest of the estate are the farms and dairies, with all modern equipment for supplying whatever is necessary for Mooseheart needs.

All student enterprises which one finds in the ordinary high school and lower schools are there,—athletic teams, bands, orchestras, glee clubs, publications, cadet corps, Camp Fire girls, etc. It is by these boys and girls, singly and in groups, that the afternoon and early evening programs for WJJD are supplied. We only regret we do not have the space in this issue to tell some more about Mooseheart, so we might repeat the words

By JACK NELSON

THE two stations WJJD and WTAS have many things in common. A more friendly pair of stations cannot be found any place on the air. Their amiable working together on their wave length of 302.8 meters is a striking example of courtesy and cooperation between radio stations. Jack Nelson (Director) and Ralph Shugart (Chief Engineer of WJJD) and Charles Erbstein (the Boss) and Carl Meyers (Chief Engineer of WTAS) have long been friends, their friendship dating back to the days when they were (with KYW) practically the only ones on the air from Chicago,—when the first two were with old WDAP.

Both stations are similarly located about 35 miles in the same direction from Chicago, WTAS near Elgin, and WJJD near Aurora, both in the Fox River Valley less than fifteen miles from each other. The antenna towers of WTAS are right at Mr. Erbstein's home, Villa Olivia, overlooking his private golf course down in the valley and WJJD's towers are on the highest point of Mooseheart overlooking the Fox River, Mooseheart Lake and Mooseheart itself, the work- and play-ground of the 1,250 children at Mooseheart. Both stations have studios in Chicago, one in the Palmer House and the other in the Kimball Building hardly over a block apart, and both are using Western Union lines for their remote control work.

WJJD formally opened on October 27th, last year,

of praise uttered by visitors, ordinary folks like you and I, and people of fame like David Lloyd-George, famous for their excellence in statesmanship, letters, sociology, professions, theology, philanthropy, pedagogy, and the like.

New Studio Planned

Even before opening the station Mr. Nelson realized the importance of having a studio in Chicago for the convenience of professional talent, and started to work on it. The difficulty of getting the lines was the only thing that caused delay. While waiting for the Chicago Studio, the playing of Mr. Albert F. Brown on the Geneva Organ at Geneva, Ill., became a feature of the station (and still is, for that matter), and his playing attracted the ear of many a radio fan.

Finally, the Garod Studio in the Palmer House was opened on March 9th, and simultaneously broadcasting of Charley Straight's Orchestra at the Rendezvous Cafe, Chicago, was begun, followed shortly by the addition (during the dinner hour) of John Cerny's Trio at the Belmont Hotel, Chicago.

Jack Nelson and his staff look forward with great eagerness to the opening of the new Palmer House next fall because in the new building a suite of eight rooms have been designed for radio with every modern idea for beauty and efficiency included.

Short Wave Broadcasting

(Continued from page 4)

frequency signals and repeat them through a small broadcasting set installed there. It was found that the signals received at Cleveland were very much louder than those received from the regular broadcasting transmitter having about the same power output. It was also found that the signals were nearly as loud during the daylight hours as at night. These experiments were conducted at 3,300 kilocycles, (91 meters) and 3,750 kilocycles (80 meters).

At first, serious difficulty was experienced in obtaining good quality for telephone transmission, the signals received being very much distorted. This distortion was practically removed by careful adjustment of the transmitting set and the employment of a comparatively strong signal.

Reports received from various sections of the country on the comparative signal strength of the two waves from KDKA indicated the possibilities of establishing a broadcasting system which would cover the entire country with a comparatively high degree of reliability. To carry out this scheme it was thought advisable to install a transmitter about midway between Pittsburgh and the Pacific Coast to act as a repeating station. Hastings, Nebraska, was selected as the location for this station, its distance from Pittsburgh not exceeding that which these

tests indicated could be covered with fair reliability.

The transmitting at East Pittsburgh was designed to operate only within the frequency range of 3,000 to 3,600 kilocycles, but the set at Hastings (KFKX) was designed to operate at a frequency within this range, or at a lower one within the regular broadcasting range. This arrangement permitted operation under a scheme in which the short wave signals being transmitted from KDKA could be received in Hastings and from there retransmitted on the regular broadcasting wave (880 kilocycles).

Results Substantiate the Theories

IT WAS possible also to retransmit from Hastings (KFKX) on a high frequency wave which was necessarily spaced sufficiently from the connecting wave of Station KDKA to prevent feed-back troubles in the receiving equipment used at Hastings. Advantage then could be taken of the better transmission efficiency of the high frequency wave when it was desired to reach the Pacific Coast with a signal capable of again being relayed.

The experimental work detailed above occupied the summer of 1923, but on November 22, 1923, a talk given at Pittsburgh by E. H. Sniffin, manager of the Westinghouse Power Sales Department, was received at a meeting of the National Electric Light Association being held at Salt Lake City, the transmission circuit, being from KDKA to KFKX on 3,000 kilocycles; from there retransmitted at 1,050 kilocycles, at which frequency it was received at Salt Lake City. This event marks the first regularly scheduled high frequency long distance relay transmission.

During this time tests were also being carried on between an experimental receiving station located at the Metropolitan-Vickers Electrical Company's works at Manchester, England, on the high frequency waves transmitted from KDKA. So successful were preliminary tests late in 1923 that it was decided to hold the actual broadcasting of the first program exclusively for England on New Year's Eve. Accordingly, on December 31, 1923, Vice President H. P. Davis, of the Westinghouse Co., broadcast a New Year's greeting from the Pittsburgh Post Studio of Station KDKA. This greeting was transmitted at 7 p.m., Eastern Standard Time, which because of the difference in time, was 12 o'clock midnight in Great Britain. This message was received on a short-wave receiver, and repeated from Station 2LO of the Metropolitan-Vickers Company in England and also simultaneously transmitted from seven other stations of the British Broadcasting Company. This was the first prearranged regular broadcasting from KDKA sent to England for re-broadcasting there.

On March 25, 1924, knowing that many of the people in the Spanish speaking countries of South America

were nightly listening to KDKA, a special program of Spanish music and speech was broadcast on both long and short wave sets of KDKA and repeated from KFKX. Reports of the success of this broadcasting were received from listeners in all parts of South America. This was the first of a special Spanish broadcasting service to South America which has been continued. On October 11, 1924, an international radio banquet was held by the H. J. Heinz Company in Pittsburgh. For this banquet 62 short wave receivers were made and distributed to the branch offices of the H. J. Heinz Company in the United States, Canada and Great Britain. Thus equipped, they were able to listen in on the banquet proceedings transmitted by KDKA in Pittsburgh. This was the first attempt to hold an international dinner by radio and was particularly successful in London, where every word of the ceremonies were reported having been heard.

The results of the International tests recently conducted between this country and European countries is now a matter of record. Several American stations were heard in a fragmentary way. KDKA, however, at East Pittsburgh, operated by the Westinghouse Electric Company, was heard consistently throughout the entire tests.

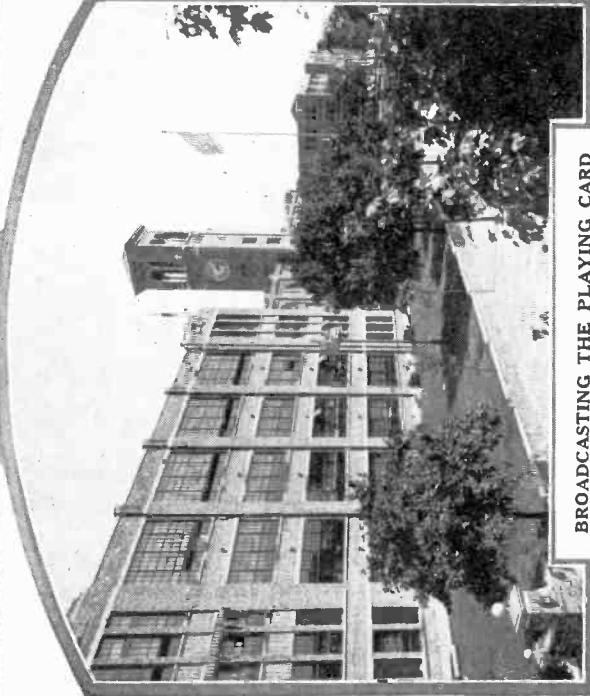
The results obtained so far indicate that, although there is considerable further development required, the use of these higher frequencies will be a decided forward step in extending the range of broadcasting stations. For comparatively short distances there are no particular advantages to be gained over the normal wave other than the possibility of increasing the communication channels.

International Programs Possible

IT IS in the possibility of greatly extending the broadcasting radius that the greatest promise lies, and through the medium of the short waves to boost or repeat broadcast programs make it possible to encircle the globe.

In the development of its short wave system of repeating programs of Westinghouse Company has produced a practical method of covering the globe in the radio messages. The system now in use between East Pittsburgh and Hastings, if installed between the points, for instance, between Paris and New York, would immediately effect a system of international broadcasting much more effectively than would the establishing of super-power transmitting station between the two points. The short wave stations also would not interfere with the broadcast listeners because their short waves are inaudible to the ordinary broadcast receiving set. It is generally believed that the Westinghouse short wave repeating system is the radio broadcasting system which eventually will be used to cover the earth with broadcast signals.

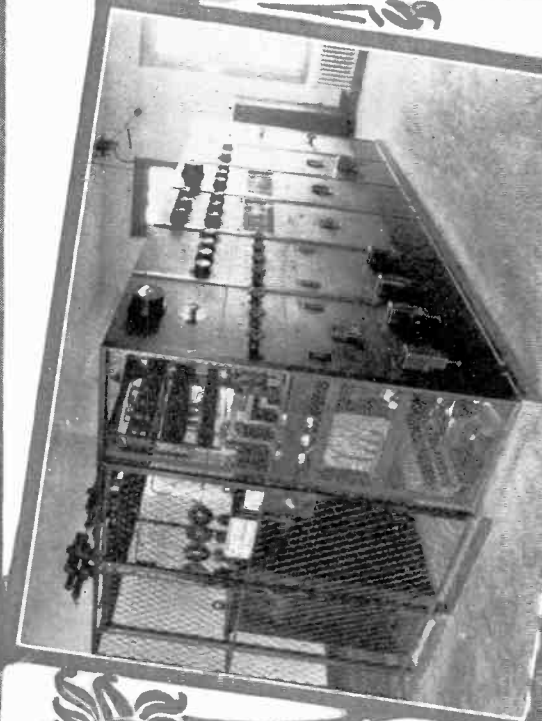
"WSAI — CIN-cinnati!"



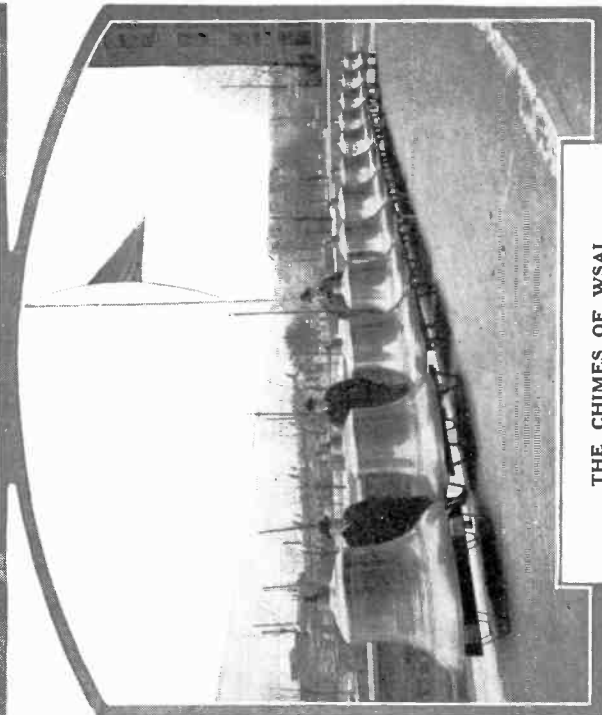
BROADCASTING THE PLAYING CARD
Here is the home of WSAI, Cincinnati. The studios of this popular station are located in the building you see above, and the famous chimes which have been heard on four continents are on the roof, beside the tower which can be seen in the background.



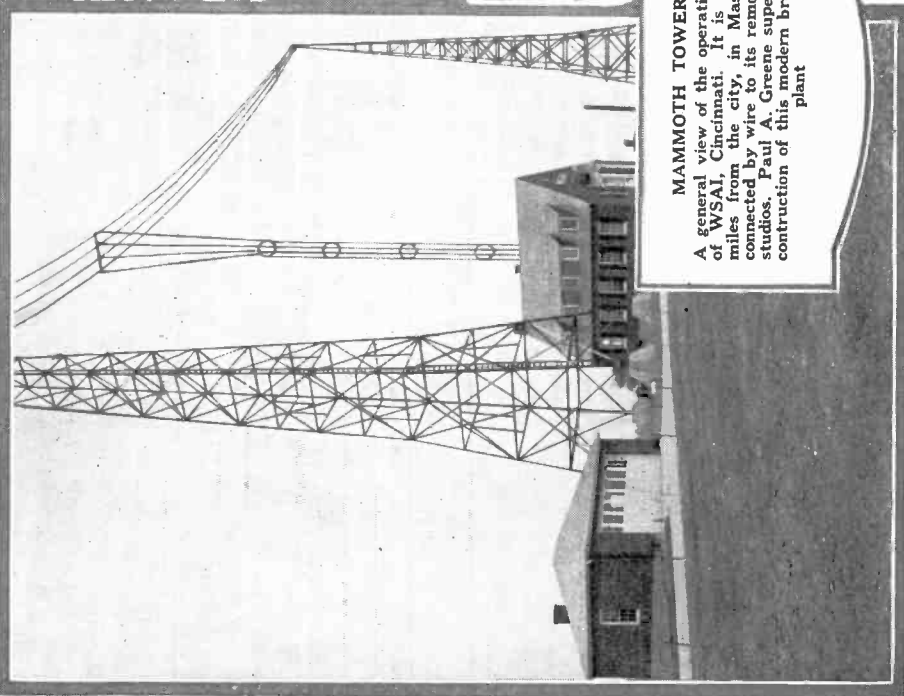
THE CONCERT STUDIO
From here go forth the studio numbers which have made WSAI such a popular station. Special telephone wires connect this studio with the operating plant at Mason, Ohio, from where the entertainment is thrown to the four corners of the earth.



HIGH POWER!
The works of WSAI! View of the high power transmitter, located in the station at Mason, Ohio. This is one of the most complete plants in the country and is the last word in radio installation.



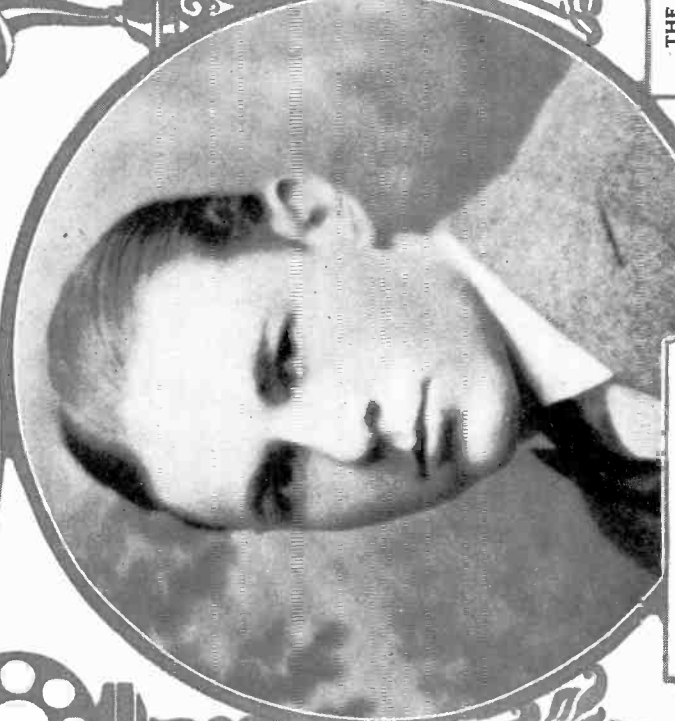
THE CHIMES OF WSAI
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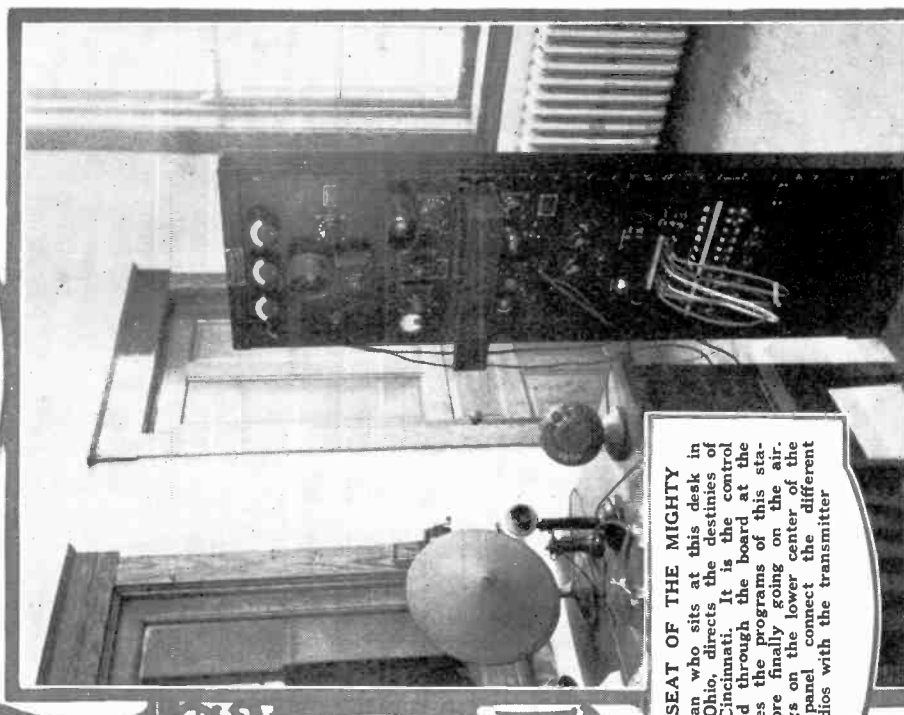
MAMMOTH TOWERS!
A general view of the operating station of WSAI, Cincinnati. It is located 21 miles from the city, in Mason, Ohio, connected by wire to its remote control studios. Paul A. Greene supervised the construction of this modern broadcasting plant.



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One of the most popular members of WSAI staff is Miss Heubach, soprano, who has been a feature here since the inception of the station.



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The man who sits at this desk in Mason, Ohio, directs the destinies of WSAI, Cincinnati. It is the control desk, and through the board at the right goes the programs of this station before finally going on the air. The plugs on the lower center of the control panel connect the different studios with the transmitter.

"WSAI-- Cincinnati"

The Station of the Wonderful Chimes

(Continued from page 15)

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In front and to one side of the transmitter is located a small concealed room, known as the control room. Here the chief operator controls the entire system, checks the quality of the signals communicated to the WSAI studios in Cincinnati, 20 miles away. In this room a radio receiving set also has been installed with an antenna running at right angles to the transmitting antenna. With this set, the chief operator can tune in on his own station and can listen to other stations, comparing the quality of transmission and reception.

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A Station Where PROGRESS is the Watchword

HIGH-POWER WSAI

SOME HIGHLIGHTS IN THE HISTORY OF WSAI

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IF THE radio commentator would put his finger upon a broadcasting station that embodies the progress and development of radio—and its spirit—he need look no farther than Station WSAI, Cincinnati. The broadcasting plant of the United States Playing Card Company is a true symbol of radio progress. It has kept pace with new developments, has been a pioneer in adopting them to the uses of making transmission finer and purer. Today its new station at Mason, Ohio, 20 miles from Cincinnati, is a model for others to follow.

The thing that brought the United States Playing Card Company into the broadcasting field is typical of the uniqueness that has marked the history of Station WSAI. It all revolved about a set of chimes—the very chimes that so many thousands of radio fans have heard upon the air. These chimes, a set of 12 bells, the largest of which weighs a ton, were bought and installed by the company with the idea of broadcasting their music round the world.

So in November, 1922, Station WSAI came into being. A 500 watt broadcasting plant was purchased from the Western Electric Company and Paul A. Greene, one of the Western Electric's Engineers, was sent to Cincinnati to install it. The playing card company had no personnel for the operation of the station, and Greene was asked to take charge of the operation and arrange the dedication program. Thus was established a connection that soon was made permanent and that continues at the present. Greene now is the director of the company's radio activities, has a large personnel under him and has become one of the country's most prominent radio engineers and announcers.

Station WSAI's dedication program was presented June 7, 1923. Its quality set a standard for that time, a standard that has been raised by the station from month to month, until now its programs are recognized as among the finest.

As in its later moves in the radio field, WSAI's first plant was the best; it was the then latest development of the Western Electric's engineers. The plant was an 1-A broadcasting station, with two antenna steel towers, 156 feet high, supporting a T-type antenna. The station consisted of a transmitter panel, power panel, speech input equipment, a motor generator set and a duplicate set of batteries. Two 250-watt tubes were used for the oscillator, and two of the same rating to modulate the oscillator. There was a 50-watt speech amplifier in the transmitter to run the modulator tubes.

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The first change in its station was the addition of a condenser microphone in equipment to pick-up sound. Shortly after this came a radical change in power supply. The station did away entirely with its motor generator and used 24-volt storage batteries for filaments in the transmitter and 1,600 volts of storage battery plates. This addition, made in January, 1924, bore the fruit of eliminating the noise so commonly heard in the modulated radio frequency oscillation component—called the carrier wave, and Station WSAI's was the first equipment of its kind that ever had had a battery supply put upon it. Since then any number have used storage batteries in transmission.

At the same time the station found it to be necessary to improve its studio facilities, and another studio was added, assuring a continuous program by alternating from one studio to the other.

At that time "just a minute, please," had begun to be a source of annoyance to listeners-in. The alternating studios took care of that trouble.

With its added equipment the station found its progressiveness rewarded. Radio fans expressed their appreciation—reports came from England, Ireland, Scotland, Alaska and Hawaii.

But WSAI, along with other stations, realized that all the refinements they had added had not achieved one thing—increased the range of their broadcasting; it was the quality of transmission that had been improved. The need was greater power, that not only would serve to send concerts to other countries but would assure fans in the United States reception of signals all months of the year.

So in the fall of 1924 the United States Playing Card Company decided to buy the most powerful and most up-to-date broadcasting plant available. It decided upon the Western Electric 5-Kilowatt transmitter, and the one purchased was the first that that company put upon the market.

At this time, and before the installation, high power had become a dominant issue in the radio field and was the subject of considerable discussion at Washington. Mr. Greene represented WSAI at the third Hoover conference. Serious objection was made to the proposed increase in power, but it finally was decided to permit the use of high power in an experimental way. Greene declared he was prepared to satisfy the public

(Continued on page 18)

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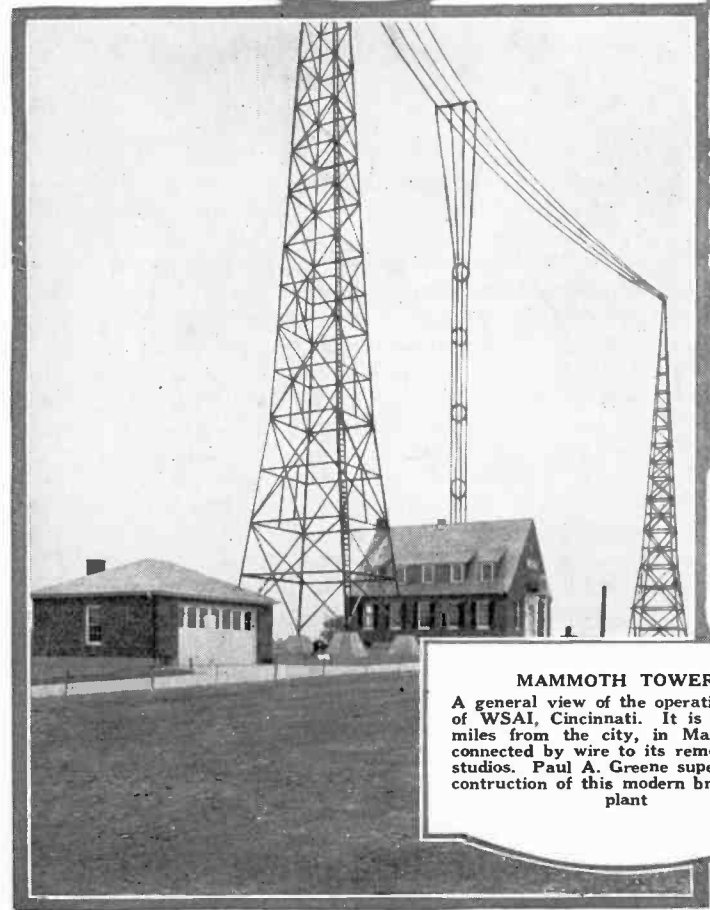
“WSAI — C



BROADCASTING THE PLAYING CARD
 Here is the home of WSAI, Cincinnati. The studios of this popular station are located in the building you see above, and the famous chimes which have been heard on four continents are on the roof, beside the tower which can be seen in the background



THE CONCERT STUDIO
 From here go forth the studio numbers which have made WSAI such a popular station. Special telephone wires connect this studio with the operating plant at Mason, Ohio, from where the entertainment is thrown to the four corners of the earth

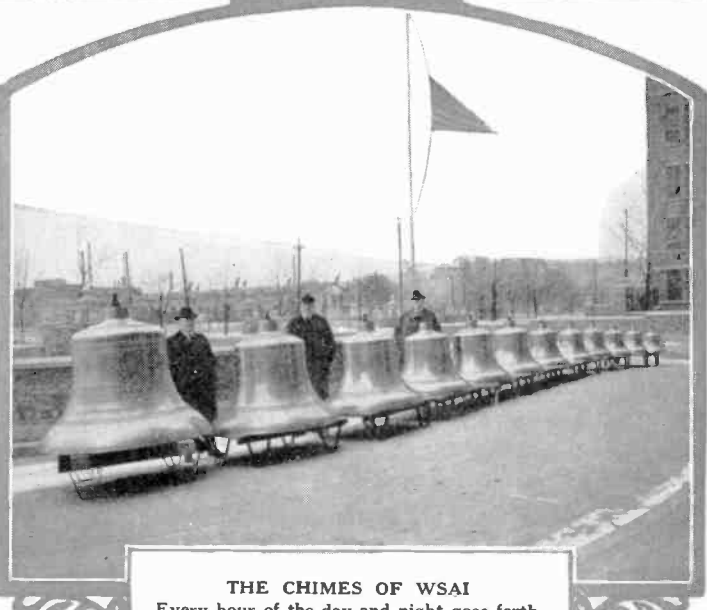
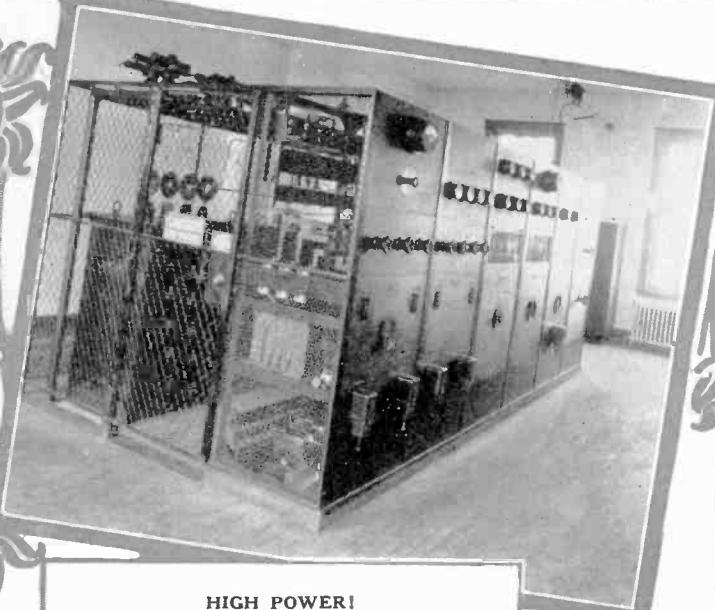


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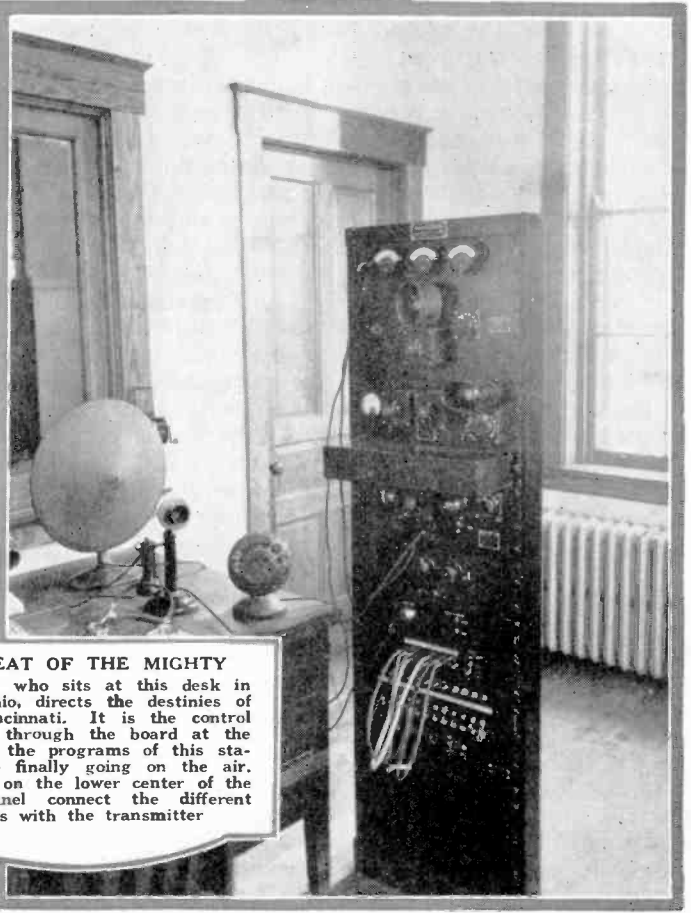
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Frank Westphal, who formerly starred at WTAS, is now the director in charge at WENR



Adele Kaier, actress, artist and authoress, is frequently heard from Gimbel Bros. WGBS



We are inaugurating this department with the hope that publicity men, press agents, studio directors and radio fans will keep us supplied with necessary material and photos. Contributions are always welcome



STUDIO GOSSIP

By FORBES W. FAIRBAIRN

THERE is a new studio and program director at WTAS and WCEE. He is Herbie Mintz, long a favorite with radio fans, and he assumed his duties with the Elgin stations last month. Besides arranging programs and directing the studio, he doubles at the piano and microphone. His acquaintance among radio artists enables him to bring an exceedingly diversified quality of talent before the Elgin microphones, and the popularity of his programs has been abundantly endorsed by fans throughout the country.

There are a hundred persons enjoying radio programs and talking about them to their friends, to every one who takes the pains to write to the station, thanking the staff for the enjoyment the programs give, in the opinion of Archey Cameron New, an attorney of Baltimore, who is a radio listener.

"I am amazed at the number of people who dread writing a letter," Mr. New wrote. "As a member of numberless committees, I have had constant acquaintance with this failing on the part of the public. Broadcasters have no way of judging public appreciation unless the public writes."



"NED"
Miller a well-known WTAS star and his "worse" half and partner



"CHES"
Cohn are frequently heard from Mr. "E's" station at Elgin



Station WHT, located on the mighty Wrigley Building, Chicago, has unearthed a child Paderewski in Master Fred Witmer, 12-year-old wonder at the piano. While scouring Chicago for new and novel entertainment for his station listeners, Charles Burke, the program director for WHT, heard of this new child marvel. After an interview with Mrs. Witmer, the young lad's mother, she was kind enough to allow her son to appear for one evening at the Wrigley Building station.

The young pianist sat down at the piano in the WHT studio and faced the 'mike' like an old-time broadcaster and went through a program of some of the most difficult selections. In conclusion the young man played "Where the River Shannon Flows." Instead of stopping at the end of this number the young marvel went into a syncopated

arrangement of the famous old Irish tune.

He is the son of Simon C. Witmer, prominent Chicago attorney at 208 South La Salle Street and resides at 5211 Harper Avenue. Fred, according to his mother, played his first tune when he was five years old. He had been to kindergarten and on returning home told his mother that he had heard some wonderful music. His mother asked what it was, and instead of humming it, the little tot climbed on the piano stool and drummed out the tune of "Over There."

Frank Morris, WTAS and WCEE favorite, seriously ill for the past two months, will soon be on the job in the Elgin studios. Frank, with his Irishola and "Comealleges," has been one of the outstanding radio sensations of the year and has been missed tremendously by "The Boss" and listeners. Hundreds of letters have been received during his illness expressing sympathy and hope for a speedy recovery.

John Black, writer of "Dardennella" and other song hits, has joined the staff of WHT, Chicago. John will have a voice in program directing and will

be a daily feature in the station entertainment.

Radio fans have heard Art Linick, famous comedian of Westinghouse radiophone station KYW sing his song about William Tell, and how skillfully that gentlemen shot his arrow into the apple. Now comes the boomerang. Kid Cupid has been hovering around town quite a bit lately, and this time drove his dart for a center hit into Art Linick's heart, for this time he was the young man whose fancy lightly had turned into other things than dispensing frivolities o'er the radio.

This time it was Miss Iza Winternitz, daughter of Mrs. Mary Winternitz, of 3930 Pine Grove Avenue, Chicago, who completely captivated the famous radio comedian. What will all the girls say now? The clown of the air is about to become introduced to the real art of kitchen lore. He has been vocalizing "Mrs. Schlagenhauer" over the radio, and being the inventor of that character and its impersonator, he ought to be quite a handy kitchen-mechanic by this time. How lucky the future Mrs. Art Linick will be, and how fortunate Mr. Linick is in winning a handsome, beautiful belle of Chicago.

The wedding took place on Saturday, June 13th, at 3930 Pine Grove Avenue, Chicago, which will be their future home, after spending a honeymoon in regions unknown.

William Stoess, assistant studio director of the Crosley WLW superpower broadcasting station, will serve as director during the absence of Fred Smith, who is on an extended tour of Europe, where he will visit all the larger broadcasting stations.

Stoess is a post-graduate of the Cincinnati College of Music and is an excellent violinist. He received the gold medal of merit given to him through the Springer Endowment Fund. He is not only a soloist but he is the conductor of several orchestras heard from time to time by those who tune-in station WLW.

The Brock Sisters, famous harmony singers, first saw the light of day in a small town in Iowa. How small the town is—or was—will never be learned. When interviewed recently these youthful and demure children of beauty answered the time-worn question as

to birthplace with the following salutation:

"As soon as we were old enough to know where we were we prevailed upon our parents to move to Florida."

So from the time these enchanting girls were fourteen they have known Clear Water, Florida, as their home. In 1923, when they were several years less than twenty, their mother brought them to Chicago to study for Grand Opera. After attending the Lyceum



Allow us to introduce you to the Moline Sisters, Dorothy (left) and Marjory (right), whom you have undoubtedly met 'on the air' from WJJD, where they broadcast exclusively. In the center we have Art "Goofy" Linick, who recently married (darn it!)



Here's the famous Leviathan - WGBS broadcasters, Brooke Johns, Gene Buck and Director Dailey Paskman of the WGBS outfit



Art School one year, they came to the conclusion that Mary Garden would not surrender her laurels for many years, so the sisters gave up their ambition to climb the opera ladder and took positions in one of Chicago's famous clubs.

While appearing in a series of southern harmony songs, a famous Chicago motion picture manager discovered them and gave them a long term contract to appear in Chicago theatres. At the expiration of their contract the Brocks, Julia and Ruth, went to the west coast on a six months vaudeville tour arranged by Irving Berlin.

Today they are back in Chicago, appearing regularly at McVickers Theatre, WHT and WTAS.

Having in mind the welfare of both the City of Montreal and the Province of Quebec, the Montreal Press Club has inaugurated a series of broadcast programs through station CKAC, La Presse, Montreal, to take place every Tuesday, with a view to boom Canada's oldest province and to induce tourists to visit Montreal and surroundings.

At the initial concert, the President of the Montreal Press Club, Mr. Robert Lipsett, city editor of the Star, pointed out the various reasons why automobilists should come to Montreal and Quebec. He hoped that some day, in the near future, famous American and Canadian visitors would be able to broadcast their impressions of Canada's metropolis from the Oriental room of the Club, where the broadcasting is being done.

To be able to weigh 28 pounds less than you have weighed for several years is the ambition of many radio fans. That this is possible is proved by the appearance in the Crosley WLW studio of Miss Emma Theye, 53 years old, who has been a member of the Y. M. C. A. radio class in setting-up exercises. She lost the 28 pounds from February to April, in following the instructions of William Stradtman. The class will be resumed in the fall.

You radio fans of the middle west who are fond of touring have an opportunity of seeing the famous WTAS-WCEE orchestras in action if you drop in at the Purple Grackle, restaurant de luxe, located on the Lake street road, two miles east of Elgin, Illinois. Here while enjoying a delectable chicken or steak dinner you will hear the wonderful dance music which is such a feature of the Elgin broadcasts. The Purple Grackle has one

of the largest dancing floors in the northern part of the state and is the most popular rendezvous in the vicinity. It is just two miles from Villa Olivia, the home of "Willie, Tommy, Annie and Sammy."

Yes, sir, "Sen" Kaney is married. A confirmed bachelor for years, he proved an easy victim for Dan Cupid when the right girl came along. "Sen" has been the "Everybody Happy" announcer of KYW, Chicago, for a long time and his marriage to a very charming St. Louis girl was the culmination of a real radio romance. We will tell you more about it in the October issue of ON THE AIR.

When dry "B" batteries become discolored they will soon cause noises in the receiver.

HIGH-FREQUENCY HARRY'S PAGE



STATION BLAH, now broadcasting. We will open our program with the Yowl Brothers Quartet, singing, "Who's Busy Troubling the Trouble-Shooter's Daughter, While the Trouble-Shooter's Busy Shooting Trouble?"

Radio may be a wonderful companion, but you can't get much of a thrill out of kissing the loud speaker.

Fisher's Luck

*Fisher's luck is something queer.
It doesn't come to me, I fear.*

* * * *

About a year or so ago,
I took a fishing jag on.
I read ten books, just so I'd know
Just what to take, and where to go.
On fishing tackle, I spent dough
Enough to fill a wagon.

My fifty-dollar rod and reel
Delighted all the neighbors.
But, tho I fished with vim and zeal,
My total catch made scarce a meal,
No fish of size were in my creel,
Regardless of my labors.

My son, upon the other shore,
(His stuff cost half a dollar.)
Extracted whoppers by the score.
Sometimes he hauled out three or four,
And laughed, until he made me sore,
And hot beneath the collar.

Now, with my superhet, I sit
And fish for things dramatic.
My son, across the room, has lit
His single tube, and tunes a bit,
And hears both coasts, and more, with
it,

While all I get is static.

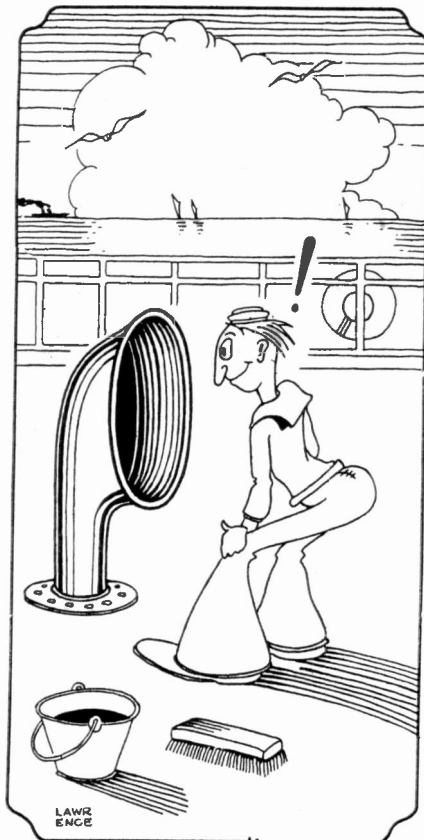
* * * *

*Fisher's luck is something queer.
It doesn't come to me, I fear.*

Somewhere, along the wet edge of Lake Michigan, lies the Beach of Dangerous Curves. 'Tis so named, because of the exceeding shapeliness of its disporting mermaids. That's where the Ukulele Twangers hang out. Using Uke music for bait, they manage to gather a nifty collection of the aforementioned Dangerous Curves. Alas, them days has went forever. A low-down sheik came by last night, with a portable radio set, and now he's got the audience. Ain't science wonderful?

A French scientist says that static is caused by a bug in the air. Maybe he meant a bug in the ear. Anyhow, if he's right, Willie will hafta sit up on the roof, and shoo the pesky bugs off'n the aerial, while papa tunes for PWX.

"Why get married?" sez the Old Maid. "A radio and a parrot are just as good as a man. The parrot swears, and the radio roams around the country all night."



[The New Sailor] "MAN, DAT'S SOME LOUD SPEAKER!!"

In Memoriam

Here lies UV-200,
He did his duty well,
Until I gave him 90 volts,
And blew him all to pieces.

Our Own Intelligence Test

They started it in the army. It's the cross-word puzzle without the diagram. If you could wade through it, letter perfect, they felt that you were too good for this world, and stuck you in the front line trenches, where you could shuffle out of it more or less gracefully. If you crabbed half of them, they made you a second looey. It was nearly impossible to miss all of them. That's why there are so few generals. Try these on your cranium.

1. If a variometer is a carnivorous animal, put a ring around the eighteenth word in this sentence. If it is

part of a radio set, cross out all the X's in Xantippe.

2. If WCX is in St. Louis, turn three handsprings, and hop out the window. If it is somewhere else, climb up on the roof, and eat one of the shingles.

3. You can hear 2LO, London, on a crystal set. If this is true, throw your superhet into the ash can. If it is not so, put a black ring around the eye of the gink who sold you the set.

4. Valentino, Chaplin, Marconi, Darwin, Caesar, 'invented the art of radio. Tie a pink ribbon around the correct name. If Darwin is correct, hang by the tail from your aerial, and throw cocoanuts down the chimney.

5. If static is a disease, put your thumb print in the upper left hand corner of this page. If it is an animal, cross out all the Z's on the last page of the Dictionary. If it is a dawgone nuisance, turn off your tubes, and ramble for the alfalfa.

6. If a superheterodyne is a medical symptom, swallow your fountain pen, and count ten. If it is a radio set, mortgage your wrist watch and try and get one.

7. A radio tube is full of air, gin, vacuum, howls, electrons, tooth paste. Draw a square circle around the correct word. If none are correct, have your head examined.

8. If a 90-volt B Battery will paralyze a 6-volt tube, what makes the grid leak? Answer yes or no.

9. The oscillatory pulsations of the incoming wave-train are above the human audibility range, until they have percolated through the detector. If this statement is wrong, put an X on the spot where the murder was committed. If it is right, throw your Dictionary at the cat. If you can't understand it at all, shake, brother; neither do we.

10. If "On the Air," is a novel, write your name backwards on this line If it is a pretty good radio magazine, write out a check for a year's subscription, and shoot it in.

The Rejuvenation of Bill

You don't know Bill. Six months ago, he was the zero without the rim. You had to look twice, before you saw him once. Girls paid more attention to the wall paper than they did to Bill. He just wasn't there, that's all.

Then Bill took up radio. Tight ear-phones flattened those flop-ears of his and made him look human again. The head band on 'em put a marcel in his hair, that gave him a Johnbarrymore-ish look. Straining to hear PWX on

(Continued on page 25)

Building a Receiver with the TECHNICAL EDITOR

(Continued from page 6)

- I Antenna not over 85 feet total length.
- I Spool No. 18 DCC wire, 1/2 pound.
- I Spool No. 22 DCC wire, 1/4 pound.

Drilling the Panel

First drill 5 holes of 1/8 inch size along the bottom edge of the panel, 1/4 inch from the edge. Start the first one 1 7/8 inches from the left-hand end of the panel, and then drill them 4 3/8 inches apart until 5 holes have been made. These holes mark the bottom of the panel, and are used to screw the panel and baseboard together. Using the left-hand, 7-inch side of the panel as a square, draw a line the length of the sheet, three (3) inches from the top. Measure 2 5/8 inches along this line, and make a mark. This marks the place for the shaft of the antenna coil L₁. Along this same line measure off 7 3/8 inches, and make another mark. This is the tickler coil shaft hole marking. The distance between the two holes should be 5 inches.

To mount the condenser divide the panel into 3 1/2-inch halves, and draw a line marking the center. Measure off 12 inches from the left-hand side of the panel, and make a marker on the line which divides the panel into two even halves. This is the point for your condenser shaft. The other mounting holes for this unit and the National vernier dial are determined from the template and the instructions

enclosed with these pieces of apparatus. The rheostat positions are located by measuring off a line 2 5/8 inches from the bottom edge of the panel. Then the detector rheostat is located by measuring along this line 5 1/2 inches from the right-hand side of the panel. The audio rheostat is similarly located on this line 2 1/2 inches from the RH edge.

The jack holes are located by drawing a line along the length of the panel 1 1/4 inches from the bottom edge. The first jack is then placed 9 1/2 inches along this line, measuring from the left-hand end of the panel. The second jack is 1 1/4 inches along the horizontal line, this distance being measured from the right-hand end of the panel. I drilled a series of 9 holes above each rheostat for ornamental purposes, in rows of three, the first row being 1 1/2 inches from the top of the panel. The center row is exactly above the rheostat knob, and the holes

are separated by a half inch.

Use your own judgment on the sizes of the drills, and follow the templates and instructions given with the condenser and dial. Only one hole apiece is necessary for the rheostats and jacks.

The shaft holes should be drilled with a quarter-inch drill, and they should be made carefully, since the panel acts as a bearing for the shaft in turning.

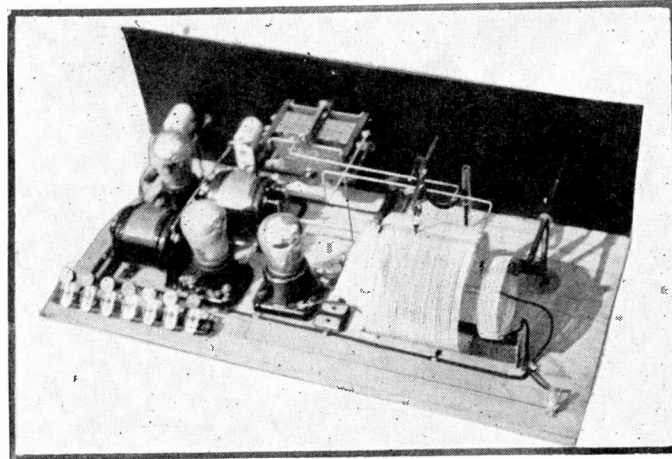
Engrave indicators if you wish, and fill them with jewelers' wax, Bon-Ami or other white substance. I used nail white.

If you have made a neat job the panel need not be grained, but if you find it has been scratched in the course of drilling, grain it by rubbing it with a medium or fine sandpaper until all the shiny surfacing has been removed, and then wipe it with a rag which has been saturated with thin oil.

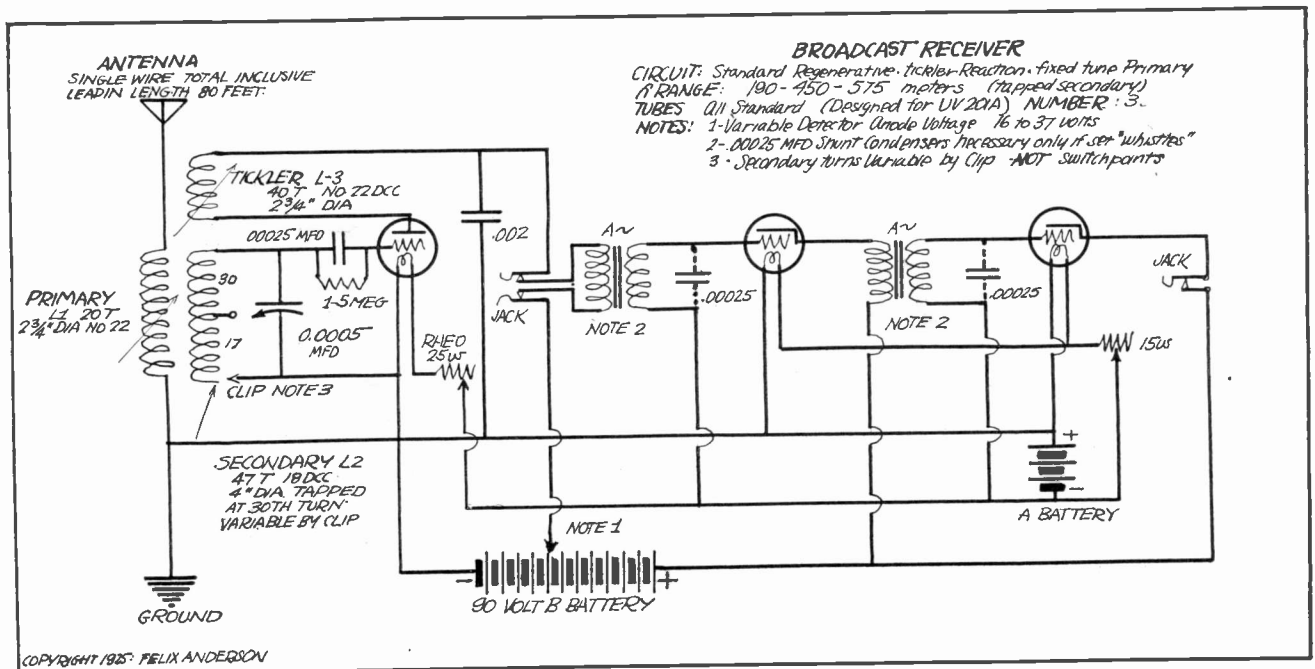
The Shaft Mountings

NEXT prepare the shaft mountings consisting of the threaded brass rod. Drill two holes in the baseboard, one 2 5/8 inches and the other 7 3/8 inches, three inches from the side that is to be screwed to the panel. Countersink the bottom. Then make the bushings by bending the two 2x1/2 inch brass pieces around the rods that are to be the shafts, and drill a small hole in the leftover. Spring them apart, and put a small bolt with a nut to fit through these holes for tension adjustment. Then solder the round side of these bushings to the threaded brass rod, and screw the support into place on the baseboard with the two bolts for that purpose.

The shafts are then stepped into
(Continued on page 27)



A perspective view of the receiver described by Felix Anderson in the accompanying text. Miss the wiring? No wonder. All the battery leads, and leads common to the ground, are run in a well defined path along the baseboard in No. 18 rubber insulated cable. Note the clip arrangement mentioned in the text



Operating the DERESNADYNE

☞ *HARRY J. MARX gives final instructions and tells how to tune and operate the set*

☞ *Advises careful purchases of accessories for results*

IT SEEMS to be a simple matter for the average fan to assemble the apparatus on the front panel, but for some reason or other the rear of a lot of sets look like a cross-word puzzle. Perhaps the inside is not visible for guest's criticism, but don't overlook the fact that in nine cases out of ten, it's the rear of the panel that is the cause of unsatisfactory operation. Figure 7 gives a clear illustration of the best arrangement of apparatus on the baseboard and at the same time indicates the logical arrangement of wiring to conform to the hook-up diagram, Figure 1. There is ample room on the baseboard, so no fears need be entertained regarding the accessibility of the various units for soldering the leads.

The Binding Post Strips

This strip carries the three midget jacks J-1, 2 and 3. When the midget plug P-1, connected by a flexible lead to the antenna post, is plugged into J-1, maximum selectivity is obtained. This need only be done when interference is bad, such as may be encountered in very large cities. J-2 gives a little less selectivity for interference conditions but increases the volume, whereas when interference is negligible then J-3 will give most volume.

This strip not only carries the battery binding posts but also two more midget jacks, not marked, for loud speaker connections. This facilitates the connections and eliminates the necessity of jack on the panel with plugs and wiring running all over the front of the set.

Seven of the binding posts specified in the list of parts are used for these battery connections, while the other two are used on the antenna and ground post strip.

All three strips are mounted one and three-quarters inches above the baseboard by means of the twelve spacer tubes specified in the list of parts.

The additional jack is mounted on the grid terminal of the tube socket V-1, making electrical connection with it. When using an outdoor aerial, the midget plug P-2, which is connected by a flexible lead to the grid terminal of the paddlewheel inductance L-1, is plugged into this midget jack J-4.

When a loop is used, connections are made directly to the antenna and ground binding posts, but plug P-2 is taken from jack J-4 and left disconnected, while the plug P-1 is inserted in jack J-4 instead. This takes the coil L-1 from the grid circuit and directly connects the one side of the loop to the grid. The other end of the loop, on the ground post, connects to the negative filament but inside of the rheostat R-1.

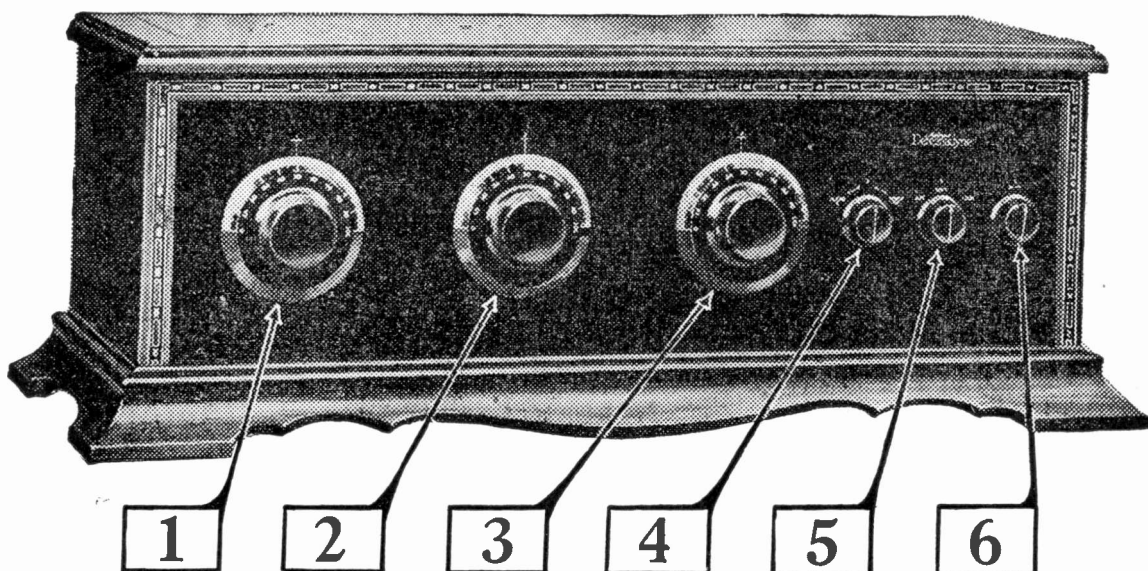
Accessories Required

WHEN the set is completed the following accessories will be required for operation of the set: Loud speaker; five vacuum tubes; six-volt storage battery; ninety volts "B" battery; antenna and ground system; necessary wire for connections.

The tubes should be all of the A type; be sure you are using good ones. Poor tubes will ruin the best set.

(Continued on next page)

The appearance of this receiver is such that it is a creditable addition to the furnishings of any room. Note the harmonious arrangement of the panel controls



OPERATING the DERESNADYNE

(Continued from page 23)

The storage battery should be of a good reliable type with about 80 ampere-hour capacity, in order to avoid frequent recharging. It would be advisable to buy a good charger for this purpose. The use of dry cells is possible but will not be found economical.

The "B" battery can consist of four 22½-volt units or two 45-volt units. The heavy duty type are recommended for greater economy in the long run. Storage "B" batteries will also be found very satisfactory, but good ones must be purchased.

When it comes to the subject of loud speakers, naturally a good one is advised. The tips on the cord are plugged into the two midget jacks. If one of the ends of the cord has a colored thread in the braiding, it should be connected to the jack marked plus (+) in the picture diagram Figure 7.

Tuning the Set

Before trying to operate the set, it will be well to carefully read over the following points on the tuning of the set:

TURN the stage control switch knob 5 to the loud position; if during the tuning the volume is too loud, it can be shifted to the soft position. When in the loud position the rheostat knob 6 will have to be advanced more as one more tube is connected in the filament circuit.

This rheostat knob should be turned to about a horizontal position pointing to the right. With knob 5 in the loud position all five tubes should light, but in the soft position only the first four will be lit. Don't turn knob 6 any further than necessary. Why use more battery current than is necessary to operate the set? In addition economical op-

eration will also increase the life of the tubes.

The plate balance knob 4 should be retarded (turned to the left) for low wavelengths, near the zero end of the large dials and advanced to the right for high wavelengths near the 100 end of the large dials. This is indicated by the arrow arrangement shown in the panel layout, Figure 6. Advancing this knob 4 increases the strength of reception, and retarding it clears up reception and eliminates undesired noises.

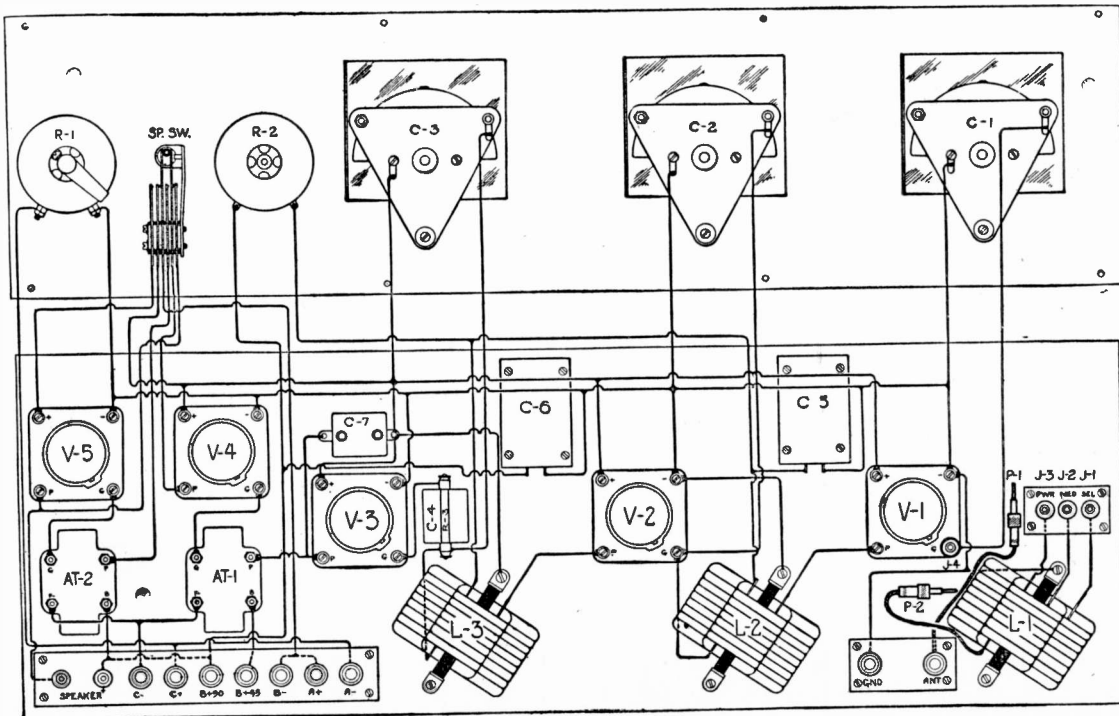
To locate stations, turn dials 1, 2 and 3, slowly, keeping approximately the same number on each dial in line with the indicator line on the panel. This can be done by setting dials 2 and 3, say at 60, then turning dial 1 slowly from 55 to 65. If no station is heard set dials 2 and 3 at 57 and repeat the operation with dial 1 going from five points below the setting to five points above. This is done because different antennas slightly affect the setting of dial 1. Proceed with this operation until a station is heard, but don't forget the relative position of knob 4 on different wavelengths.

After a station is heard, carefully adjust each of the three dials for best position. Then adjust knob 4 for maximum clearness and volume. Make a record of the dial setting for each station that you tune in and keep it for reference when you want the stations again. This will also provide a guide of the approximate setting for any particular wave length you may wish to tune in for.

AN ESPECIALLY effective way to plot out a wavelength chart is to procure a sheet of cross section paper and number the left-hand edge in meters of wavelength starting with 225 and continuing upward to 550. Then from the lower left-hand corner of the sheet number the divisions of the paper into degrees.

When a station is heard, look up the wavelength and jot down the dial reading. Make a point on the chart where the dial reading line and wavelength lines meet. After a dozen or so readings have been made, draw a line or curve connecting the points, and you can determine from this curve the dial setting for any wave you want.

This easily traced wiring diagram must be closely followed if the best results are to be attained. The wiring is shown in detail from the antenna circuit to the battery input terminals



New Unit Developed

The Walbert Manufacturing Company of Chicago has recently placed on the market an auxiliary unit to be used with any type of receiving set to increase the range, volume, and selectivity of the receiver.

This unit, called the Penetrola, positively stops regenerative and all other forms of oscillating receivers from radiating.

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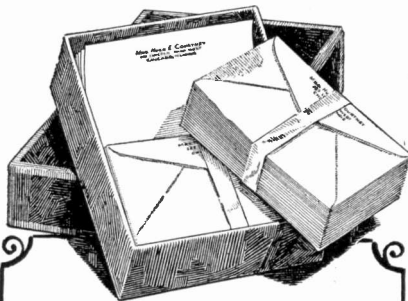
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To avoid errors please Write or Print Clearly

High Frequency Harry

(Continued from page 21)

his one-tuber, put an alert, eager look on Bill's map that made him look like a poet going somewhere to poetize. He learned the latest songs, and the dance music taught him how to shake a wicked pair of ankles.

That ain't half of it. Bill soaked up all the wise cracks that trickled in over his Dinkyplex, polished them up, and passed them out as his own stuff. That made Bill a two-stage-amplified riot. Radio is some little wonder-worker, huh?

Thank Heaven They've Found Sally—

Our Own Questions and Answers
 Sir: Having heard that a crystal can be restored by washing it in alcohol, I dropped it in a bottle of gin. Now it don't work. What'll I do? (Signed) Fuller Bunk.

Answer: Connect a corkscrew in parallel with the tuning condenser. If this fails to work, send us the gin for further analysis of your problem.

Gentlemen (if any): I have 3 variometers, 2 condensers, 2 tube sockets, a paperhanger's outfit, and a happy disposition. What kind of a set shall I build?

Answer: Throw away everything except the happy disposition. You'll lose that soon enough, without trying to coax a radio set together.

Radio Hash

One Chicago fan built himself a one-dial crystal set. Selectivity is something a one-dial crystal set ain't got. He tuned in on a description of a wedding, but got several other things along with it, with this result:

"The church is rapidly filling with—hogs and cattle slightly lower. It is beautifully decorated with—oats and corn steady; wheat, somewhat higher. Solemn indeed is the moment, as the organ softly plays—'Red Hot Mamma'—to the soft rustling of—all the animals in the Green Forest. And Willie Woodchuck said to Tommy Tadpole—'Who Takes Care of the Caretaker's Daughter, While the Caretaker's Busy Taking Care?'

"Now the wedding march thrills out, as the bride and groom—retire to their corners, and await the bell. The bride is dressed in—WQJ, Chi-CAW-go—with a trimming of—three cups of flour, two eggs, and a cup of molasses. The groom is—partly cloudy, and somewhat unsettled, with possible showers in the evening. At last they reach the altar and the minister—leads with his left to the jaw, and they clinch."

Station, BLAH, signing off until the next spasm. Cuckoo, cuckoo, cuckoo. High-Frequency Harry.

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EDITORIALS

A GREAT many radio editors and many more radio writers seem to feel that the only way to make a "radio" summer successful is to build a portable receiver and journey far and wide amongst bugs and brambles in search of an ideal (if there is such) camp spot, and there erect an antenna in order to enjoy the really wonderful programs broadcast during the summer months.

It seems to us that this conception of enjoying radio in enervating summertime is absolutely passé. We are all more or less common humans, and it strikes us that a more enjoyable way to appreciate radio in summertime is to take it easy. It may be too hot to enjoy selections from a good, snappy dance orchestra by dancing to them—but it is doubtful if any of us are unwilling to sit quietly and absorb inanimately the rhythm and pep that more ambitious mortals can create in a hot broadcast studio.

Our conception of the proper way to enjoy summer programs is thoroughly illustrated and exemplified on our back cover advertisement. The only effort necessary in this case is to reach over and turn the A battery switch and rotate the dials to the point where the most pleasing selections are heard. Then with a cooling, effervescent drink in one hand, and a comfy chair to sit on, with the noises of the day stilled and with a cool breeze sneaking in the window at your side, you are in our estimation ready to listen to a summer radio program.



NOW we've given you one side of the story. Supposing you stop for a moment to consider the other fellow—the one who is supplying you with all this nerve soothing, refreshing entertainment.

The people and artists rendering the selections over the radio in the summer are real heroes in our estimation. Super-beings would be a more appropriate term since they truly accomplish things that the average listener would scorn to attempt.

The studios must be quiet. Hence doors must be kept closed. A studio must be heavily draped and padded in order to secure the proper acoustical effects for broadcasting—it is significant that no one would like to hear a Wabash avenue elevated train accompany Colman Goetz while singing his famous "Bologna Song."

Hence the studio gets "HOT." The orchestras get "hot"—both physically and temperamentally. One fellow once contended that a broadcast studio during a spell of simmering summer weather got "hotter than hades with the lid on." And yet the announcers, the

directors, the personnel and the artists endure discomfort in order to entertain you while you sit in your Morris chair enjoying radio in the accepted summer fashion. Those people deserve credit and acknowledgment.

So even though you are peevish because your collar is wilting, and even if you feel that it is "too hot to think," sit down and drop them a card telling how much you appreciate a number or a selection or a program. The average artist and radio performer gets nothing much more than a bad case of "radio tremens" when performing before the mike, and there is no better medicine for this "dread" disease than twenty or thirty applause and acknowledgment cards in the next morning's mail.

Crash through and let them know you appreciate their efforts. If you don't—why—WHY—we hope the goblins short your A battery or cut your antenna lead in.



WE WONDER if you have noticed any difference in the amount of interference from amateur stations operating with code. In the first place, the amount has been practically negligible excepting for a few insignificant key clicks and harmonics which amateurs as a rule are willing to eliminate if possible.

If you have noticed an absence of code interference from the amateur, you can just bet your loudspeaker that it has ceased because said amateur is now transmitting on 80 meters—possibly he has gone down to 20 or 40.

We are surprised at the unusual lack of activity that listening on the 150 to 200 meter band will reveal. Truly, we thought our receiver was playing dead on us, for no matter how hard we tuned the phone diaphragms were as dead as stove lids, with the exception of a few well operated "ham" phones.

This fact gives rise to the thought that it is not improbable that the Department of Commerce will take advantage of this abandonment of wavelength band for broadcast purposes. We doubt if the amateur will resent it, because his experiments show that he can do better work with lower powers at 20, 40 and 80 meters than he can with double the power on 150 or 200.

It is also well to remember that we can operate a greater number of stations in the 150 and 200 meter belt than we can in the 250 to 300 meter band, because as we lower the wavelength the frequency becomes higher, and as the frequency gets higher, we can separate the stations more readily, provided they are allowed several cycles for overlapping.



Building a Set with the Technical Editor

(Continued from page 22)

holes drilled into the small pieces of bakelite ($2 \times \frac{1}{2} \times \frac{1}{2}$ inch), and are held in place with collodion or glue. The coils are tied to these pieces with thread.

Winding the Coils

The coil winding is not difficult for those who have read the June, 1925, issue of ON THE AIR. They are wound Sanderson style, and are easily made if you have a little patience.

Procure two bottles $2\frac{3}{4}$ inches outside diameter. Next cut three strips of celluloid (auto curtain stuff is O. K.), the strips being the length of the bottle and about $\frac{1}{8}$ inch wide. Fasten them to the bottle securely, dividing the circumference into three even sections. They may be held in place with gummed paper or tape.

The coils L^1 and L^2 are wound on forms like the one described, L^1 having 20 turns, and L^2 having 40 turns. The ends of the wire (beginning end and finish of the coils) are held in place with tape or gummed paper, and collodion is painted over the wire exactly where the celluloid strips lie on the glass. When this has been done set them aside until thoroughly dry. Then break the bottles gently, and, lo! you have an air supported coil.

The secondary coil L^2 is wound slightly differently. Procure a Quaker Oats box, and slit it into three longitudinal sections, one at a time. As each slit is made, back it up with gummed paper. (See the illustrations accompanying.) Then three strips of celluloid are laid over the cuts and fastened into place with gummed paper. Punch two holes in the cardboard former, and thread the wire through and start winding. No. 18 DCC wire is used on this coil. The turns of this coil, as well as those of L^1 and L^2 are spaced, that is each turn is wound with a space between it and the preceding turn, the space being about the thickness of the wire. The turns are rolled on, the rolling being accomplished by unwinding sufficient wire for the coil before starting the rolling, and straightening by fastening it securely to some post or object, and pulling until all the kinks have been removed.

When 30 turns have been made, make a twisted loop, and tighten it down to the former. Then resume winding until 47 turns have been rolled on. This number of turns is satisfactory if a Cardwell condenser is used. If you intend to use another type, better put on a few more turns—say about 55 and prune the coil down till a 535 meter station comes in at about 85 on the secondary dial, with the clip set at the 47th end turn.

After the required number of turns have been wound, fasten the finish end

and paint over the wire at the celluloid strips. Allow the collodion to dry thoroughly. Then with a knife, cut away the gummed paper strip backing the longitudinal cuts, and the form will come out easily. Do this carefully, so as not to spoil the cylindrical effect of the coil.

The clip, soldered to a piece of flexible wire, which is in turn soldered to a piece of bus bar connected to the A plus side of the filament and the rotary condenser plates, is held rigid on a piece of glass rod stepped into a hole in the baseboard, and held firm with glue or collodion. The photograph on the title page of this article gives the detail.

Mounting

NEXT mount the condenser and dial, the rheostats and jacks, and screw the panel to the baseboard.

Inspect the terminals and connections of the sockets and transformers thoroughly, and bend the springs of the tube sockets up so that no poor connections exist.

Then proceed to screw these units into place on the baseboard as shown in the illustration on this page. Mount the Fleming binding post rack on the back right hand end of the baseboard. The respective parts are as follows: Directly back of the condenser is the detector tube and socket, then the second audio tube, immediately under the end of the condenser the first AF transformer for stage number one, and directly back of the most right hand rheostat is the first audio frequency tube. Back of this we have the second audio transformer. You see the apparatus has been so placed to shorten leads, and at the same time to minimize the wiring of the set.

Wiring

Start wiring the set by putting in the filament circuits, using the No. 18 rubber insulated wire. This wiring is all run along the floor of the baseboard, and is kept bunched and in a well defined path throughout the set. You can see what is meant from the illustration on this page. Immediately to the left of the second audio transformer, and directly under the condenser. The wire running from the binding post rack in the illustration along the two tube sockets, and by the coil is the A plus—ground wire, and shows how the insulation is chipped off and the joints soldered in T fashion to the main wires. The A plus, A minus, all the B battery leads and wires connecting to the ground are made with the rubber covered wire. The plate, grid and audio input and output leads alone are made with bus bar. Only 9 connections are made with this bus bar wiring.

Since all coils are wound in the same direction it will make little or no difference where the flexible leads of L^1 and L^2 are soldered. Reversing them sometimes gives better results.

After the filament circuit has been

put in, wire progressively the antenna circuit, secondary input circuit, detector plate circuit, first amplifier and then the second amplifier. All the battery leads in rubber covered cable should be completed first, however.

The grid condenser and leak are soldered directly to the grid post, having been soldered together before the wiring commences.

Operation

Operation is very simple. The batteries and intercepting circuits are connected up, and the tubes inserted. Inspection of the wiring should take place before the B circuit is closed, however.

Increase the filament brilliancy until normal is reached, and start operating by setting the condenser at 50 degrees. Advance the tickler till the set oscillates. If it does not do so immediately, adjust the grid leak until it breaks into generating with a soft hiss. Knocking indicates too high a resistance of the leak—more pencil marking should be added. If it sounds mushy, erase until the best effect is obtained.

The rest is very simple. Rotate the secondary dial, with the antenna coil set parallel to the secondary inductance, and when a signal is heard, increase the regeneration until the best reception is obtained.

Not infrequently, I find that the present day tubes when used as audio amplifiers, give off a high pitched whine or whistle, and to eliminate this I solder a .00025 mfd. fixed condenser across the G and F minus terminals of the transformers. This simple expedient eliminates the objectionable noise entirely.

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Watch for
the new
enlarged

On the Air
for
October

on all
news-stands
September 15

Radio Stagehands' Work Unnoticed

Back of the footlights of Westinghouse station KYW are a number of people who do not frequently receive newspaper notoriety and are not so often heard of by radio fans, by virtue of their limited activity before the microphone. Visiting the office of the station, one would find a beehive of activity. There is Miss Mary L. Casey, an auburn-haired young lady whose ancestors hailed from the lands of Erin and who years ago came to America with other hardy pioneers.

Thus, in the search of their golden dreams they drifted into Chicago and now are found in Jackson Park Highlands, where the Caseys hold sway among the other prominent people. While Miss Casey is a luminary among the younger set of Chicago, the radio fans have not heard so much about her, although she has become an important cog in KYW's machinery. She is the individual who keeps the newspapers informed regarding the station's program. It is her duty to prescribe time to the various outside pick-ups of KYW, speeches and other features that become a part of the station's programs. All the correspondence of the station comes under her supervision, as do many other things that become a part of the curriculum of a radio station.

Station WRNY, located at The Roosevelt Hotel, 45th Street and Madison Avenue, New York City, went on the air officially June 12th. For ten days prior to the opening, the station operated between the hours of midnight and 3 A. M. under the call letters 2XAL. Reports have been coming in from all over the country that the reception is very powerful and the modulation exceptionally clear. A surprising fact revealed was that Station WRNY comes in better in Philadelphia, Baltimore and Washington than any other New York station. So far the most distant point in which the station has been heard is Denver, Colo.

WRNY is on the air with a special program daily between the hours of 12 and 2 P. M. High class musical programs are rendered so that diners during luncheon may enjoy their radio concert.

Foreigners Call for U. S. Radio Sets

During the past month many calls for data and information on U. S. radio apparatus came from potential purchasers and agents in Spain, Australia, Brazil, Ireland and Sweden. Sweden and England also desire American radio tubes. Queries of this sort come in each week to the Department of Commerce, which reports that they are an index to the growing popularity of radio throughout the world, as well as an indication of favor toward American radio sets. The rapidity with which U. S. radio exports are increasing also emphasizes this trend.

Portable Radio Sets Carried by Travelers

The song of the open road, green fields and mirror-like lakes, all call to the radio devotees to come out into the warm air of the day or sit beneath the star-lit sky of evening.

Tourists who stop for the evening in the motor camps along the way are able to enjoy the orchestras and jazz bands in the large cities, or perhaps hear the results of their favorite baseball team's battle with its opponent. Music from the choirs of the churches are brought to the listeners, while the business men in the party are informed of the closing quotations of the stock market. All this is made possible through the use of broadcasting and portable-radio receivers.

Portable radio receivers are coming into more general use than in past seasons because they are no longer of the makeshift variety, but are designed for use all-year-round, as is the case with many leading portables.

One of the most important factors responsible for the increased use of radio receivers in the summer time is the policy of broadcasting stations to maintain a schedule of programs throughout the summer. Super-power broadcasting has also added to the demand for receivers, because owners are assured of hearing some of the most important higher-power stations, like WLW, WTAS and others, throughout the year.

The Mexican Government is contemplating the erection of several radio beacon stations along the Gulf at principal ports and points where navigational aids are needed by mariners. It is reported that the apparatus selected will be of an automatic type enabling navigators to establish their exact positions themselves, thus avoiding dangers of coastal steaming routes. The U. S. Naval system will probably be followed and no charge for service will be made. There are many dangerous points along the Mexican coast. It will be recalled that the U. S. S. Tacoma went aground off Tampico a year or so ago, resulting in the loss of the ship and several liners. These aids to navigation will, it is felt, be of great service to coastal fruit and oil shipping.

Willie, Tommy, Annie, Sammy Acquire 'Herbie'

(Continued from page 12)

and I began to really study music. And I have been studying ever since and like it."

Fans Appreciative

"Herbie" has been in charge of the WTAS-WCEE programs for the past three months. Under his direction the best radio talent available in Chicago has been heard over the Elgin "air lanes," and thousands of fans have weekly sent in their thanks for the varied program that has been given them. "Herbie" is a composer of no mean

ability. Many of his songs are real "hits." "Brown Eyes" and "You Are Too Sweet for a Dream," are his two latest and are achieving great success wherever played and sung. He sings them himself, and accompanies himself on the Kimball piano from the Kimball Hall studios of the Elgin stations.

Has Found Vocation

Like all other radio directors and announcers, Mintz thinks radio is just in its infancy. He has well conceived ideas of what it is going to develop into and wants to stay with it while it grows.

"We both met each other while we were young—radio and I," he explains, "and now we are so chummy that we don't care to separate. Radio is the greatest form of entertainment and education in the world. Just wait till it grows up."

Oh, yes, "Herbie" is married. It happened just six months ago and it is a howling success!

Big 3 ft. Telescope

Has unusually powerful lenses—magnifying over 8 times. Makes people and objects miles away seem close. Brings new pleasures to home, farm, camp, sport. See moon and stars as never before. New Ferry "Wonder" telescope has 5 sections—opens out over 3 ft. long, measures 12 inches closed. Big, strong and powerful yet light, compact, easy to carry. Body and draws fully brass bound with knurled edges. Covered with black leatherette.

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Building the SUPER - AUTODYNE

(Continued from page 11)

and is on the order of those described by the writer in On the Air for May, 1925. It differs, however, in that it employs special laboratory charted transformers which are a compromise between the extreme selectivity of properly designed air-core coils, and the great stability and amplification of good iron core transformers. But two core laminations are used in each transformer, of 7 mill silicon steel, one in the shape of an "F" and one an "L." The air gap formed, together with other recently developed features of the design, permits the realization of almost an ideal curve, extraordinarily high amplification over a 10,000 cycle band, with a sharp cutoff either side. The amplifier, employing two of these transformers together with a sharply tuned filter which is provided with a laboratory adjusted tuning capacity, C_s , gives tremendous amplification, for it also employs controlled regeneration, adjustable by means of R_s .

While more than two stages might be employed, two will go down to the best noise level, so that more are unnecessary. Further, there is a decided drop in amplification in adding more stages, which will react upon the preceding two, so that three stages give only slightly better results than two. This should really be written "slightly more noise," for two stages give more than enough gain.

Before going into a description of a receiver designed along the lines outlined, it might be well to justify the use of the name "super-autodyne." "Heterodyne" is generally considered to refer to a source of external power—a separate detector and oscillator tube. "Autodyne" refers commonly to a tube performing the functions of rectification and oscillation simultaneously, so it was

considered logical to call the six tube receiver a "superautodyne"—and it certainly deserves the appellation "super," for the results obtainable are surprising.

While the outfit will deliver about the same energy with either dry cell or storage battery tubes, the dry cell tubes will generally be sadly over-loaded, and it is, therefore, suggested that UV-201A tubes be used throughout, altho even so it is possible to overload the sixth tube. This will be appreciated when it is realized that in Chicago it is possible to get volume sufficient for dancing from the west coast stations on five tubes using only a small loop, under favorable conditions.

The portability of the set may be realized even with storage battery tubes by means of the leads if a car is handy. These leads permit connection to the car battery through the dashboard light socket for the A sup-

You Don't Have to Mortgage the House to Build This Six Tube Super Receiver

ply. If this is not possible, it is suggested that the necessary dry batteries be carried in an old hand satchel, or even a lunch box or tool kit. Then connections can be made quickly with the color cable used for the battery leads, and the receiver set up in a few seconds time. This battery bag can also easily contain the folded loop and a small speaker, when they are not in use. Blanket straps will provide an easy means of carrying the receiver, so that the whole set can readily be managed by one man.

The advantage of this arrangement is that the same set serves for camping

or traveling that is used to provide entertainment at home at other times. It is possible, if the builder prefers, to have a luggage shop make a carrying case so arranged that the receiver is at the top, the batteries below, and the loud speaker in the lower compartment with them, either at the side or in the middle.

Follow Specifications for Best Results

THE material required to build this receiver is listed below, with the designation letters used in the diagrams and cuts following the quantity of each item required. While it is entirely permissible to substitute any other standard parts for those listed, it is strongly recommended that the parts specified be used for several reasons. The actual space available is such that parts of larger or different dimensions could not be substituted in some instances, and in the case of the RF Transformers, and SLF condenser, it would be inadvisable to substitute, since the results of the receiver depend in a large measure upon the use of the types recommended.

After the receiver has been wired, the necessary batteries should be connected to it, the rheostat just turned on, and the autodyne tube inserted in its socket. The phones must be connected to the set, the switch S_1 set at "L," C_1 at 40, and C_2 varied rapidly throughout its scale. A plunk will be heard, indicating an unbalanced bridge circuit. With one condenser CX set all in, turn the other CX slowly out, rotating C_2 meanwhile. If the plunk does not disappear, reverse the operation, leaving the other balancing condenser all in to start with. Once the plunk has been balanced out for all settings of C_1 and C_2 , condensers CX, CX should never be touched. If squealing, or clicking is experienced at low settings of C_1 , it will be necessary to use a smaller grid leak at R. This leak will generally vary between .25 and .5 megohms.

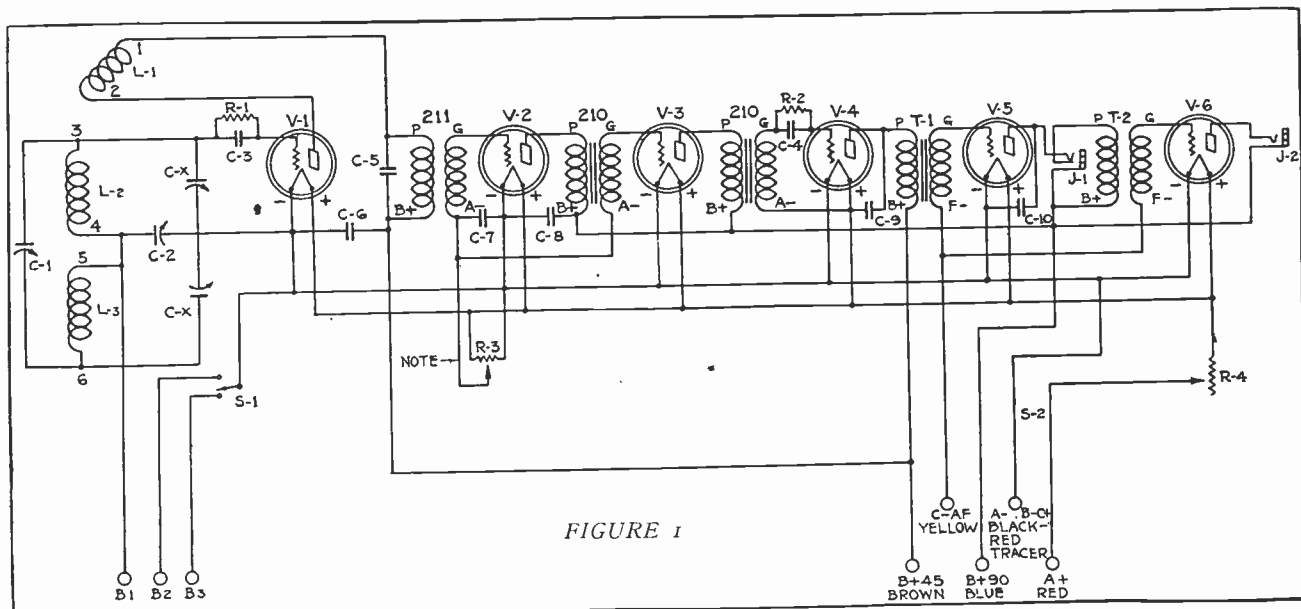
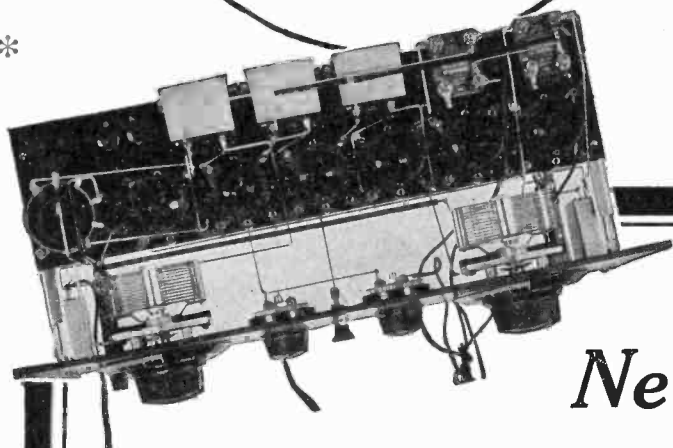


FIGURE 1

SUPER-SM AUTODYNE

*



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Read the description of this remarkable radio achievement in this issue of "On the Air." Plans and instructions describing this set in detail may be had for 50 cents.

Complete Parts

	Each		Each
2 S-M 305A S-L-W Condensers.....	\$ 5.00	2 Thordarson 3½-1 Transformers.....	4.00
2 4" Moulded Dials	1.00	2 .002 Condensers .....	.40
1 U. S. L. 6-Ohm Rheostat.....	1.00	1 .0075 Condensers .....	.75
1 U. S. L. 240 Ohm Potentiometer.....	1.50	2 .000025 Balancing Condensers.....	1.50
3 Insulated Top Binding Posts.....	.05	1 S-M .25 Meg. Leak .....	.50
1 Carter 101 Jack .....	.70	1 S-M 2 Meg. Leak .....	.50
1 Carter 102A Jack .....	.80	1 Carter No. 3 Jack Switch.....	1.15
1 S-M 211 Filter with Matched Tuning Capacity	8.00	1 Benjamin 8630 Switch .....	.30
2 S-M Charted Intermediate Transformers	8.00	1 Belden Color Cable .....	.85
1 S-M 101B Coupling Unit	2.50	1 Pair Benjamin 8629 Shelf Brackets.....	.70
1 S-M 6-Gang Socket shelf (536-201A, 537-UV199)	10.80	1 Bakelite panel, 7"x18"x3/16", drilled grained and engraved	6.00
		Spaghetti, bus bar, lugs, screws, nuts, etc.	1.00

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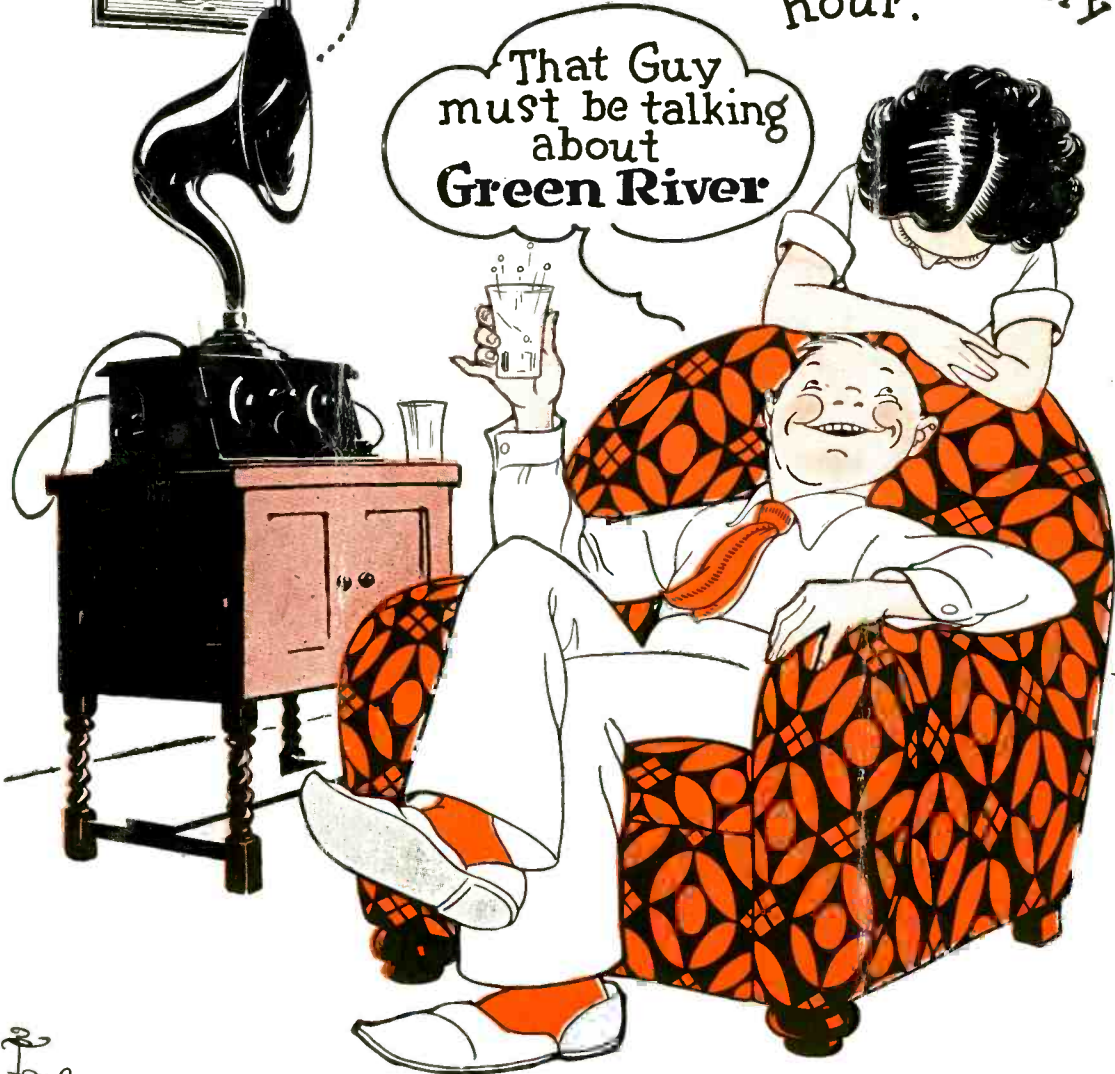
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