Everyday Mechanics

Current Science

30 Days FREE TRIAL

Single Control 7-Tube

$77

RETAIL PRICE
Completely Assembled

The Randolph

SINGLE CONTROL – ILLUMINATED DRUM

POWERFUL seven-tube radio at factory price. Test it without spending a cent. We claim the Randolph Seven will out-perform any radio and we want you to satisfy yourself that it will. To do this, we will send you this powerful radio to try for 30 days. Test it for distance, clearness, ease of operation, tone and every other way you can. Unless it more than satisfies you, return it to us. **Every Randolph set must make good before it is sold.**

Battery or ALL ELECTRIC OPERATION

The Randolph Seven is sold for use with batteries or connected for operation direct to electric light socket—absolutely batteryless—no chargers or batteries—just **plug in** socket and **tune in.** 100% efficient either way. Its construction and performance have been tested and approved by leading radio engineers and authorities and leading radio and scientific publications.

Single Control—Illuminated Drum

One drum dial operated by one simple vernier control tunes in all stations with easy selectivity to tremendous volume. No overlapping of stations. Illuminated drum permits operation in the dark. Volume control for finer volume modulation. This is a 7-tube tuned radio frequency receiver with power transformers and power amplification. Space wound solenoid coils Full and completely shielded. A real receiver of the highest quality. Tremendous distance, wonderful tone quality, simple to operate.

The Randolph cabinets are in themselves beautiful pieces of furniture made of carefully selected solid burl walnut. Bas-relief bronze escutcheon plates are mounted on the dial panel. In design and appearance it is a cabinet worthy of the high-quality radio it contains. Solid walnut beautifully shaped surrounds the soft verdi-green panel.

Nothing has been spared to make the Randolph Seven the leading radio receiver. We are so sure that it will surpass even your best hopes that we know how safe we are in making the **30 day free trial offer.**

Read What Owners Say

I have logged more than 50 stations from coast to coast.—Lloyd Davenport, Littlefield, Texas.

I have logged 52 stations from Cuba to Seattle—the set is a world beater.—J. Tampkinson, Detroit, Mich.

Your set is a revelation—has all others tied to the post for distance and selectivity.—Waldo Powers, Vergennes, Vermont.

On strength of its performance sold two more sets this week. T. Scanlow, Orlando, Florida.

Beautiful Ampliphonic Console Set

Made of the finest carefully selected solid walnut. Two-tone shaded finish. Has built-in cone loudspeaker that compares with any on the market and accurately reproduces high and low notes. Send for the folder today that shows this beautiful console in full colors and gives complete details. **Compares with most table sets in price.** For **battery** or **all-electric operation** ready to **plug in** and **tune in.** Write for complete descriptions.

Randolph Radio Corporation

711 W. Lake St. Dept. 124, Chicago, Ill.

BIGGEST DISCOUNTS to AGENTS and DEALERS

WORK either full or part time and make big money. Tremendous advertising campaign helps you sell. Regardless of whether you have ever sold before, be sure to get our proposition. The Randolph sells on first demonstration. Men and women both can make money this easy way. Get your demonstration set for thirty days **FREE TRIAL.**

6-Tube

$55

Retail Price
SINGLE CONTROL

The Randolph

Now you can have a new, modern, single-control, six-tube radio. Do not compare this set with old style 2-dial 6-tube sets selling for about the same price. The Randolph 1928 Senior Six has also been tested and approved by the leading radio engineers.

Comes in a beautiful solid walnut cabinet of hand-rubbed finish. Single control. Illuminated Drum with space for logging. Absolutely dependable and very selective. **Sent for 30 Days Free Trial. You test it before you buy.**

Mail Coupon Now

The Randolph Radio Corporation are pioneers in the manufacture of radios. All of its vast and unlimited resources have been used in making and perfecting of the Randolph Receiver. Because of our long and successful experience in the radio business, we are perfectly confident in sending out a Randolph Radio on trial. We know what it will do. Mail us the coupon now for the greatest radio offer ever made.

USE THIS COUPON TODAY!

Randolph Radio Corporation,
711 West Lake Street, Dept. 124
Chicago, Illinois.

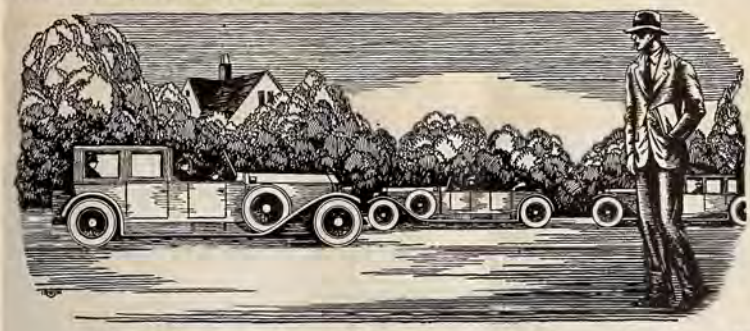
Send me full particulars about the RANDOLPH Six and Seven-Tube Table and Console Sets with details of your **30 Day FREE Trial Offer.**

Name.....

Address.....

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

Mark here ( ) if interested in Agent's proposition.



Many times in the old days, while I trudged home after work to save carfare, I used to gaze enviously at the shining cars gliding by me, the prosperous men and women within. Little did I think that inside of a year, I, too, should have my own car, a decent bank account, the good things of life that make it worth living.

I Thought Success Was For Others

Believe It Or Not, Just Twelve Months Ago I Was Next Thing To "Down-and-Out"

TODAY I'm sole owner of the fastest-growing Radio store in town. And I'm on good terms with my banker, too—not like the old days only a year ago, when often I didn't have one dollar to knock against another in my pocket. My wife and I live in the snuggest little home you ever saw, right in one of the best neighborhoods. And to think that a year ago I used to dodge the landlady when she came to collect the rent for the little bedroom I called "home"!

It all seems like a dream now, as I look back over the past twelve short months, and think how discouraged I was then, at the "end of a blind alley." I thought I never had had a good chance in my life, and I thought I never would have one. But it was waking up that I needed, and here's the story of how I got it.

I WAS a clerk, working at the usual miserable salary such jobs pay. Somehow I'd never found any way to get into a line where I could make good money.

Other fellows seemed to find opportunities. But—much as I wanted the good things that go with success and a decent income—all the really well-paid vacancies I ever heard of seemed to be out of my line, to call for some kind of knowledge I didn't have.

And I wanted to get married. A fine situation, wasn't it? Mary would have agreed to try it—but it wouldn't have been fair to her.

Mary had told me, "You can't get ahead where you are. Why don't you get into another line of work, somewhere that you can advance?"

"That's fine, Mary," I replied, "but *what* line? I've always got my eyes open for a better job, but I never seem to hear of a really good job that I can handle." Mary didn't seem to be satisfied with the answer but I didn't know what else to tell her.

It was on the way home that night that I stopped off in the neighborhood drug store, where I overheard a scrap of conversation about myself. A few burning words that were the cause of the turning point in my life!

With a hot flush of shame I turned and left the store, and walked rapidly home. So that was what my neighbors—the people who knew me best—really thought of me!

"Bargain counter sheik—look how that suit fits," one fellow had said in a low voice. "Bet he hasn't got a dollar in those pockets." "Oh, it's just 'Useless' Anderson," said another. "He's got a wish-bone where his back-bone ought to be."

As I thought over the words in deep humiliation, a sudden thought made me catch my breath. Why had Mary been so dissatisfied with my answer that "I hadn't had a chance?" *Did Mary secretly think that too?* And after all, wasn't it *true*, that I had a "wish-bone" where my back-bone ought to be? Wasn't that why I never had a "chance" to get ahead? It was true, only too true—and it had taken this cruel blow to my self-esteem to make me see it.

With a new determination I thumbed the pages of a magazine on the table, searching for an advertisement that I'd seen many times but passed up without thinking, an advertisement telling of big opportunities for trained men to succeed in the great new Radio field. With the advertisement was a coupon offering a big free book full of information. I sent the coupon in, and in a few days received a handsome 64-page book, printed in two colors, telling all about the opportunities in the Radio field and how a man can prepare quickly and easily at home to take advantage of these opportunities. I read the book carefully, and when I finished it I made my decision.

WHAT'S happened in the twelve months since that day, as I've already told you, seems almost like a dream to me now. For ten of those twelve months, *I've had a Radio business of my own!* At first, of course, I started it as a little proposition on the side, under the guidance of the National Radio Institute, the outfit that gave me my Radio training. It wasn't long before I was getting so much to do in the Radio line that I quit my measly little clerical job, and devoted my full time to my Radio business.

Since that time I've gone right on up, always under the watchful guidance of my friends at the National Radio Institute. They would have given me just as much help, too, if I had wanted to follow some other line of Radio besides building my own retail business—such as broadcasting, manufacturing, experimenting, sea operating, or any one of the score of lines they prepare you for. And to think that until that day I sent for their eye-opening book, I'd been wailing "I never had a chance!"

NOW I'm making real money. I drive a good-looking car of my own. Mary and I don't own the house in full yet, but I've made a substantial down payment, and I'm not straining myself any to meet the installments.

Here's a real tip. You may not be as bad-off as I was. But, think it over—are you satisfied? Are you making enough money, at work that you like? Would you sign a contract to stay where you are now for the next ten years, making the same money? If not, you'd better be *doing* something about it instead of drifting.

This new Radio game is a live-wire field of golden rewards. The work, in any of the 20 different lines of Radio, is fascinating, absorbing, well-paid. The National Radio Institute—oldest and largest Radio home-study school in the world—will train you inexpensively in your own home to know Radio from A to Z and to increase your earnings in the Radio field.

Take another tip—No matter what your plans are, no matter how much or how little you know about Radio—clip the coupon below and look their free book over. It is filled with interesting facts, figures, and photos, and the information it will give you is worth a few minutes of anybody's time. You will place yourself under no obligation—the book is free, and is gladly sent to anyone who wants to know about Radio. Just address J. E. Smith, President, National Radio Institute, Dept. M-91, Washington, D. C.

J. E. Smith, President,
National Radio Institute,
Dept. M-91, Washington, D. C.

Dear Mr. Smith:

Please send me your 64-page free book, printed in two colors, giving all information about the opportunities in Radio and how I can learn quickly and easily at home to take advantage of them. I understand this request places me under no obligation, and that no salesmen will call on me.

Name_____

Address_____

Town_____

Everyday Mechanics

RADIO AGE

Current Science

Established March, 1922

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CONTENTS
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Chats

WE HAVE developed in the Radio Age laboratory a seven tube super receiver that is remarkable for the simplicity of its construction. Notwithstanding the ease with which its parts may be assembled it produces results in tone quality, selectivity and power that one would look for in the best eight tube super.

But the most important fact about the new super is that it incorporates a new piece of equipment that has never before been called to the attention of radio fans. This feature alone would be enough to command the interest of fans all over the country. We are going to tell all about the receiver in our November issue and with the editorial text we are going to print drawings, photographs and blueprints. We suspect that this set will be the one many fans will decide to build as a foundation for their winter radio adventures. Frankly, we hope thousands will build it.

* * *

RADIO AGE has always been a magazine for the man who builds his own. We pioneered in the hook-up field five years and more ago and we have been printing hook-ups in blueprints for so long that the average fan calls us the "blueprint magazine." The thought gives us some pleasure in view of the fact that the set-makers are coming into their own again. Manufacturers who for a time devoted most of their attention to making complete sets, have returned to the business of making parts. New manufacturers with solid resources and extensive experience in manufacturing have entered the parts field. Home experimenters are on the increase. We will have constructional articles in ample volume for them in each forthcoming issue.

Frederick Smith

Editor of RADIO AGE.

Restored Enchantment

This is the Eveready Layerbilt that gives you Battery Power for the longest time and the least money.

THERE is no doubt of it—radio is better with Battery Power. And never was radio so worthy of the perfection of reception that batteries, and batteries alone, make possible. Today more than ever you need what batteries give—pure DC, Direct Current, electricity that flows smoothly, quietly, noiselessly. When such is the current that operates your receiver, you are unconscious of its mechanism, for you do not hear it humming, buzzing, crackling. The enchantment of the program is complete.

Batteries themselves have improved, as has radio. Today they are so perfect, and so long-lasting, as to be equal to the demands of the modern receiver. Power your set with the Eveready Layerbilt "B" Battery No. 486. This is the battery whose unique, exclusive construction makes it last longer than any other Eveready. Could more be said? In most homes a set of Layerbilts lasts an entire season. This is the battery that brings you Battery Power with all its advantages, conferring benefits and enjoyments that are really tremendous when compared with the small cost and effort involved in replacements at long intervals. For the best in radio, use the Eveready Layerbilt.

EVEREADY
Radio Batteries
—they last longer

Radio is better with Battery Power

At a turn of the dial a radio program comes to you. It is clear. It is true. It is natural. You thank the powers of nature that have once more brought quiet to the distant reaches of the radio-swept air. You are grateful to the broadcasters whose programs were never so enjoyable, so enchanting. You call down blessings upon the authority that has allotted to each station its proper place. And, if you are radio-wise, you will be thankful that you bought a new set of "B" batteries to make the most out of radio's newest and most glorious season.

NATIONAL CARBON CO., INC. UCC New York—San Francisco

Unit of Union Carbide and Carbon Corporation

Tuesday night is Eveready Hour Night—9 P. M., Eastern Standard Time

WEAF—*New York*	WGR—*Buffalo*	WGN—*Chicago*	WRC—*Washington*
WJAR—*Providence*	WCAE—*Pittsburgh*	WOC—*Davenport*	WGY—*Schenectady*
WEEI—*Boston*	WSAI—*Cincinnati*	WCCO—*Minneapolis, St. Paul*	WHAS—*Louisville*
WDAF—*Kansas City*	WTAM—*Cleveland*	KSD—*St. Louis*	WSB—*Atlanta*
WFI—*Philadelphia*	WWJ—*Detroit*	WMC—*Memphis*	WSM—*Nashville*

Pacific Coast Stations—9 P. M., Pacific Standard Time

KPO—KGO—*San Francisco* KFI—*Los Angeles*
KFOA—KOMO—*Seattle* KGW—*Portland*

Have you heard the new Victor record by the Eveready Hour Group—orchestra and singers—in Middleton's Down South Overture and Dvořák's Goin' Home?

Current Radio Wisdom in Tabloids

Extract from a speech by O. H. Caldwell, member Federal Radio Commission, at meeting of manufacturers in Chicago.

THERE, as I see it, is the far bigger job that faces you, the radio manufacturers, jobbers and dealers of the country,—the job of putting adequate radio service into every one of America's 22,000,000 homes! For what will it avail the American public to have good broadcast programs and clear undisturbed reception if only a small fraction of our citizens actually have radio sets in their homes, as at present?

So far, only a bare start has been made on this huge task of equipping the Great American Family with radio, for to date we have fitted up only 6,000,000 homes with radios, out of the 22,000,000 homes on the Continent—a saturation of barely 25 per cent. Yet the people of the United States have 18,000,000 automobiles, 16,000,000 wired homes, 16,000,000 telephones, and 11,000,000 phonographs, and only 6,000,000 radios.

* * *

From an address by Admiral W. H. G. Bullard, of the National Radio Commission, read to the National Electrical Manufacturers Association.

THE craze for radio broadcasting has swept Japan and in an hour's ride from Yokohama to Tokio on the trolley, an attempt to count the antennae would make one dizzy.

Broadcasting in that country is under the supervision and regulation of the government though the broadcasting companies are privately owned. The government says what stations shall broadcast and what shall not. Every purchaser of a radio receiving set is required to pay the government a tax which cannot even be considered moderate. It is a yen (50 cents in gold) a month, and the government, after retaining its share based on the cost of administration and clerical work necessary to collect it, returns to owners of the broadcast stations the remainder and prorates the amount among the different stations which it has licensed. This provides a considerable amount for each station and allows the administration of each station to acquire the best talent possible for educational and entertainment purposes. Moreover, all the transmitting stations are opened freely to any government bureau or office that wishes to broadcast events which the government desires to inform the public.

* * *

Extract from a speech by U. S. Senator C. C. Dill, author of the Senate radio bill, at the Northwest convention of the American Radio Relay League, in Spokane, Wash.

WHETHER or not the law will eventually permit us to forbid ownership of frequencies is still in question. Once started along that line it would not be long before all available frequencies would be taken up and the free development of radio rendered impossible. Of course the framers of the Constitution could have in mind no such problem, but the attempt is being made to cover it with the clause permitting regulation of interstate commerce.

* * *

From an interview with David Sarnoff, Vice-President and General Manager, Radio Corporation of America.

THE Radio Corporation of America was formed to play its own part in the development of the radio art and the radio industry. Essentially, we are an operating and sales organization, vitally concerned also with research and manufacture. We are not merely a patent holding or a licensing company.

We are licensing competitors under patents necessary for the type and character of set upon which they have built their business.

While it is true that our own line this year will cover every type of modern radio set, fact remains that we have specialized in the development and manufacture of super-heterodyne sets. It is the one element in our line that most distinguishes it from competitive radio equipment. To divide the use of our super-heterodyne patents would be almost to offer our trademark for competitive exploitation.

In the second place, the super-heterodyne is a circuit of such finely-balanced electrical precision that to give these patents to other manufacturers would be to "sell" rather than to "deliver." The high character of the several types of radio equipment now on the market is not the result of patent development alone—manufacturing experience, equipment and organization are also important factors.

The fact is significant that while a number of manufacturers have succeeded with other types of sets covered by our patents, there is no successful imitation of the super-heterodyne circuit.

* * *

From an interview with Mrs. Lotta Harrauff, who was crowned Queen of American Radio at the Radio World's Fair last year:

OUR Radio Commission has had a hard task thrust upon it and we cannot be certain of the result until colder weather comes, when distant reception is to be had, and until that time comes I do not believe anyone is qualified to say that the assignment of wave lengths is, or is not a failure. Personally I do think that the best results will be gained by the changing of wave lengths.

Living in the center of the United States, I have tuned in stations from every direction consistently, and my belief is that the broadcasting stations must be put into zones and the hours divided.

We will not be too harsh with our Radio Commission for their's is a tremendous task, but we would ask that they come to this part of the country and make tests. What would be perfection in New York would be chaos here.

* * *

From an article by E. E. Free, Ph. D. special contributor to Radio Age on Scientific subjects:

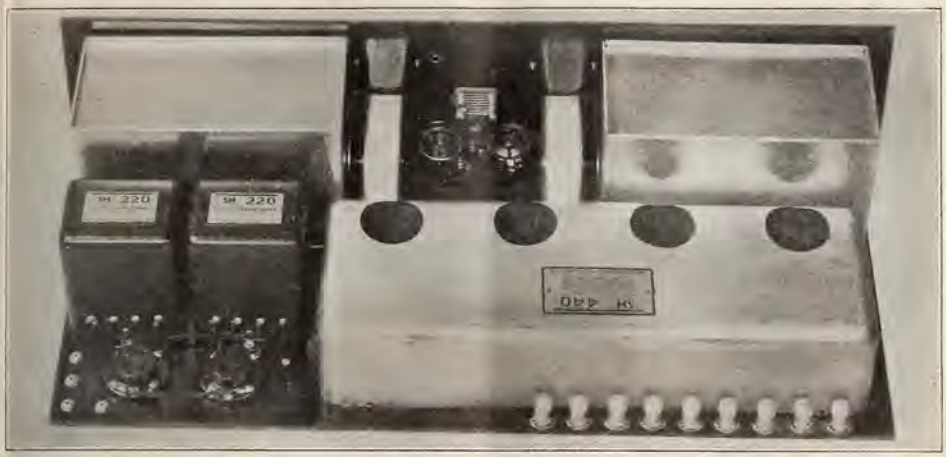
RADIO echoes that probably travel entirely around the earth before they are heard have been noticed by British radio amateurs who listen to the powerful transmitting station PCJJ at Eindhoven, Holland. This station has been relaying English broadcast programs and listeners have heard two distinct sounds for each note; one a fraction of a second later than the other, as though some kind of echo were present in the transmitting studio. A similar effect is heard sometimes in music halls the acoustic properties of which are bad, one sound coming directly from the singer or player and the echo of this sound arriving an instant later from the walls or ceiling of the room.

In the case of the PCJJ radio program, such echoes originating in the broadcasting studio have been proved not to occur and it is believed that the second sound heard by the listeners is due to a radio wave which travels around the earth. It is thus delayed a fraction of a second, so that it arrives slightly after the wave which crosses the Channel directly from Holland to England. The speed of radio waves is believed to be so great that such a wave would pass entirely around the earth in about one-seventh of a second. This would make the radio-echo that much later than the direct wave; a difference corresponding to a real echo cast by a wall about seventy-five feet away.

* * *

Transmission of tables of figures by wire in a manner to avoid errors is described in a telephone company magazine:

THE Bell Laboratories Record, an internal publication of the scientific laboratories of the Bell Telephone System, describes a recent instance in which a collection of important numerical data had to be sent hurriedly from Los Angeles to New York City. The figures were typewritten on sheets of paper and carefully checked. These sheets were then transmitted by wire, just as a photograph would be transmitted. The entire process being automatic, no mistakes in the figures were possible. The copies received in New York were unquestionably true copies of the original documents in Los Angeles. Some experts predict that methods of transmitting written or printed documents will be perfected so that all telegrams will be sent in this way instead of by the present translation into code and back again into words.



Jewelers' Time Signal Amplifier incorporated in Superheterodyne receiver

Bringing the Old Super Up to Date

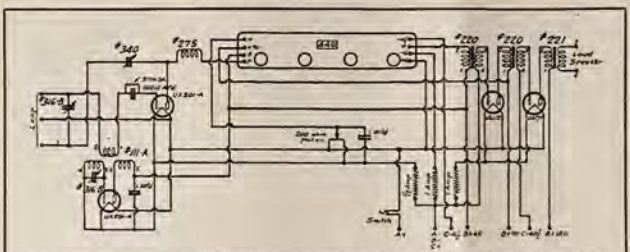
HARKING back to the old days of the UV-1716 transformer—when that item was the only available one at the disposal of the broadcast listener that could be used as an intermediate transformer in super-heterodyne construction, and following this circuit to the present day, it is apparent, above all other things, that a proper intermediate amplifier is the very key to the whole super-heterodyne situation. Realizing this and also taking into consideration the added density of broadcast station population it is not hard to see that receivers of this type constructed sometime ago were not built to function to the point of present day standards, especially as far as selectivity and sensitivity —which means DX reception—is concerned. Two principal factors are responsible for this, first the situation that concerns intermediate frequency transformers, the other the broadcast situation. Up to the present time the builder of a super-heterodyne was always forced to rely upon individual units for the construction of the intermediate amplifier—usually three or four transformers—most of the time selected out of random stock—and at other times on transformers which were sold as being peaked but which when assembled and in operation had entirely different characteristics in the receiver than when they were matched. This resulted not only in a lack of selectivity and sensitivity, far from the real possibilities of a super-heterodyne circuit, but in many cases resulted in a tone quality with which discriminating fans were not satisfied because of the cutting of the side bands owing to improper peaking.

It is generally conceded by all of those who have studied the various characteristics of receiver designs on the market that the super-heterodyne principal of reception allows not only the sharpest of tuning and the ability to reach out farther than any other circuit, but to make these possibilities a reality requires 100% efficiency in each of the circuits that comprise the whole. On the other hand, a super-heterodyne that served our purpose two or three years ago with broad intermediates, is no longer able to cope with present day broadcasting conditions because where we had one station three years ago we probably have ten today. The old set with broad intermediates was sharp enough for the condition of those days but now the set probably will not even be able to break through where broadcasting stations abound, especially in localities like New York and Chicago. There is also another item that has not been mentioned before and that is the increase in power used by broadcasting stations and this in congested areas has further handicapped the older receiver while, on the other hand, this condition with a really sharp set of intermediates if anything has been "pie" for the super built for present day broadcast reception.

We now find upon the market a Jewelers' Time Signal Amplifier which adapts itself effectively to a super-heterodyne intermediate amplifier and through the use of which all of the difficulties experienced in this particular section of the receiver are overcome. This Jewelers' Time Amplifier consists of three stages of R. F. amplification and a detector—a unit designed primarily for the jewelry trade in receiving the time signals from station NAA—Arlington —whose wavelength is 2677 or 112 K. C. This unit is constructed to automatically tune in that station and no other—sharply peaked to NAA frequency and with a band so narrow as to prevent interference from any other station. As one fan remarked recently, this amplifier used as an intermediate unit in a super in reality amounts to a "band-pass amplifier." How this works out can best be realized when we stop to consider that the signal band in this amplifier is but 10, sometimes 7 K. C. wide. As all broadcast stations are separated at least by 10 K. C. this unit is by far the most selective and sensitive that has been on the market.

The amplifier is peaked and wired and ready to hook into the circuit. The four component circuits of the amplifier are peaked as one unit instead of four, in other words, our intermediates can be treated as one unit rather than a number as previously. Large air core transformers with a tremendous amplification gain are used in every stage—the secondaries all being tuned with matched fixed condensers. Each stage is individually shielded and the entire assembly is housed in a copper and brass catacomb which does away absolutely with any possibility of interaction of circuits or the pick up of parasitic noises. The amplification gain as measured in laboratory tests exceeds considerably that of any amplifier that can be built of individual parts for here is found an amplification gain of 10 per stage or a total amplification factor of 10,000 for the unit with the unit non-critically adjusted.

This Jewelers' Time Signal Amplifier being absolutely complete in itself (with the exception of tubes) contains all of the parts that are usually found in an intermediate frequency amplifier. In the assembly in addition to the four large air core transformers are four tube sockets, four fixed tuning capacities (one across the secondary of each transformer), two bypass condensers, of 1 mf. capacity and one fixed condenser of .002 mf. capacity.



A typical split-loop Superheterodyne circuit with the Jewelers' Amplifier substituted for old Intermediates

In adapting the time signal amplifier to super-heterodynes that have been built previously our task is very simple. The outward appearance of the old set can remain exactly as it now is, the controls in no way being different. This is of considerable importance because it means that the new catacomb can be dropped right into the receiver in place of the old I. F. amplifier. As a matter of fact there is but one control for the time signal amplifier, the oscillation control which is simply the conventional potentiometer. In substituting this efficient time signal amplifier, therefore, in place of our old intermediates the front end of our super and the A. F. amplifier remains exactly as it was. The customary first detector and oscillator stage are not affected, the catacomb merely displacing the old intermediate stage and the second detector. Inasmuch as the Jewelers' Time Amplifier is but 15" long, 5" wide and 3" deep we will usually be able to displace the units which are being removed and find room to spare. The audio amplifier system of the receiver, providing of course that it delivers the tone quality that we demand today, remains intact exactly as it is.

On the Jewelers' Time Amplifier we will find eight binding posts, four on the left hand side and four on the right. The left hand side binding posts are marked N, +90, B and P. The N terminal is connected to the center arm of the potentiometer on our panel and controls the oscillation of the intermediates (a ½ or 1 mf. bypass condenser connects across the arm and minus end of the potentiometer). We all know that with an intermediate amplifier the closer we approach to the oscillating point (toward the negative side), the more sensitive the receiver becomes and with a proportionate volume increase. This control works exactly the same in the time signal amplifier as it does with ordinary intermediates. The +90 terminal connects to the 90 volt B battery line. The terminal marked B connects to the 45 volt battery line and the terminal marked P is the one that is connected to the plate of the tube socket of our first detector—this carrying the signal from the detector tube to the first stage of the time amplifier. A choke coil should be included in this lead, such as the S-M 275, if a split loop circuit is used.

On the right hand end are four terminals marked —4½, P, —6 and +6. The terminal marked —4½ goes to the negative of our 4½ volt detector C battery. Rectification of the signal in what then becomes our second detector, which is the detector in the time amplifier, is brought about by the use of a C battery rather than by a grid condenser and leak, because of the advantages of greater handling capacity. The P terminal carries our signal to the first audio transformer. The —6 terminal is negative A battery lead and the +6 terminal is the one going to the positive side of the A battery. In the time signal amplifier we will find that the negative A terminal is grounded, in other words, the entire housing as well as the shields in the housing that separate each stage from the other are connected to A—.

Inasmuch as the Jewelers' Time Amplifier is completely wired the matter of bringing an old super-heterodyne up-to-date requires but a very few hours. In all probability it will take longer to tear out the old intermediates than to substitute this new unit. With this substitution the old super-heterodyne is not only brought up to date but a careful search of what the market affords has also definitely demonstrated that there is nothing to be had that will give the results of the renovated receiver. As has already been said the Jewelers' Time Amplifier with an amplification factor of approximately 10,000 gives us an amplification gain in the intermediate stages far beyond that to be found in ordinary amplifiers. Comparative laboratory tests have shown that through the use of the time signal amplifier owing to its tremendous per stage gain, distant stations could be brought in with loud speaker volume barely audible with other sets with an equal number of tubes. The selectivity is such that in Chicago it will allow reception of out of town stations within 10 K. C. of powerful locals.

90,000,000 Radio People

Approximately 90,000,000 of the 1,000,000,000 people living within the world's constant radio reception area receive radio broadcast programs, in some form according to a report on potential markets for receiving sets by Lawrence D. Batson, Electrical Equipment Division, Department of Commerce.

About 18,000,000 receiving sets are now in use, according to Batson, who estimates that 200,000,000 sets would be required to service all of the people within the constant reception area on a basis of five members to each family.

Fifty-seven foreign countries now maintain regular broadcast service with Canada, Cuba, Russia, Sweden, Australia, Germany, United Kingdom, Argentina, and Mexico ranking first in order of number of broadcasting stations maintained and regularly operated.

Radio broadcasting, according to Batson, has attained as great importance in international, national, and family life abroad as it has in the United States, all circumstances considered, and has now been recognized by all of the principal foreign governments as an important means of disseminating entertainment, information, and instruction.

Radio programs have a striking similarity all over the world and it is not without some basis of possibility that programs broadcast throughout the whole universe may be expected to prove more popular than those of local origin, the report states.

More news and some direct advertising find place in foreign programs and government communications are formally presented to the people through the microphone, but in general a typical American program is likewise typical for any part of the world, according to Batson.

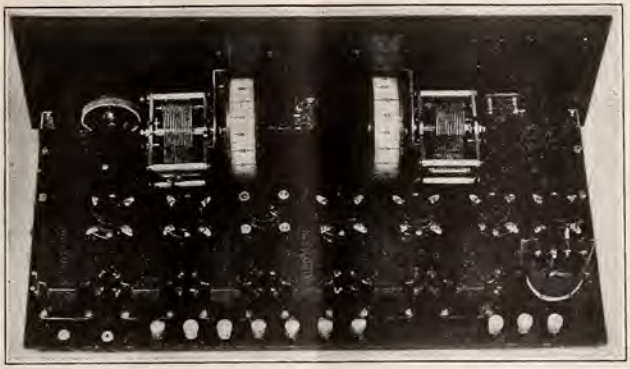
Congestion of broadcasting stations has occurred so far only in the United States, Canada, and Europe. Mexico City, Buenos Aires, Sydney, and Melbourne and a few other cities having sufficient number of stations to require particular attention to wave lengths in order to prevent interference but their problem has been simplified in these places by the fact that the full wave band is available. These cities are favored, too, by the fact that there are no other stations operated in close proximity to the city limits, according to the report.

North America and Europe have broadcasting stations scattered throughout the inhabitable area. South America is well served except in the interior and the extreme northwestern part of the continent. Other developments are spotty except in Australia and New Zealand where stations are well distributed.

Some foreign countries regulate radio broadcasting on a strictly commercial basis with broadcasting corporations holding exclusive or quasi-exclusive concessions. Where such regulation is enforced, owners of receiving sets are usually assessed a fee for reception privileges, according to Batson.

In countries where monopolies do not obtain, any person or firm showing satisfactory general qualifications is granted permission to operate a broadcasting station. In a few countries where unusual political or economic conditions prevail, the possession of broadcasting and reception equipment is rigidly denied, according to the report.

SEE NOVEMBER ISSUE FOR SUPERHET CIRCUIT WITH NEW FEATURES



Back panel and baseboard view of the Thompson Super Seven, showing the compact and neat arrangements of parts

The Thompson Super Seven

Incorporating the Latest Ideas in Tone Quality and Selectivity

By SIDNEY J. THOMPSON

IN DESIGNING the seven-tube super described in this article the two main objectives were to devise a superheterodyne receiver which would possess the excellent qualities expected of this most interesting of radio receiving instruments but which would combine this satisfactory result with a low cost.

Considerable experimental work was done and many intermediate transformers were tried. Some of these were low-priced transformers which were immediately discarded because of their lack of ability to reach the standard demanded by the designer for this receiver.

It finally appeared that the only alternative was to produce a super that could deliver the goods but to proceed blindfolded, so far as cost was concerned. This would have defeated us in trying to reach one of our chief objectives.

As a last resort, several manufacturers of high grade products were called upon and the cooperation of their engineering staffs requested. Then there began an elimination contest which was to result finally in the selection of a combination of quality parts to produce the two desired results. No attention whatsoever was paid to the products used, for the engineers were instructed to produce the finest reasonably priced superheterodyne that could be built with quality products.

List of Parts for the Thompson Super Seven

1 Silver Marshall No. 340 Midget Condenser	$ 1.50
6 Silver Marshall Tube Sockets, 50c ea.	3.00
2 Silver Marshall Drum Type Dials No. 805, $3.00 ea.	6.00
1 Pair Silver Marshall Brackets	.70
1 Yaxley Filament Switch	.50
2 Yaxley Imp. Jacks, 25c pr.	.25
1 Yaxley 2 L Resistance	.15
1 Yaxley 3 L Resistance	.15
1 Yaxley 30 Ohm Rheostat	1.35
1 Tobe .006 Condenser	.45
1 Tobe 1 mfd. Condenser	.90
1 Tobe .002 Condenser	.40
1 Tobe .00025 Condenser	.35
1 Tobe .001 Condenser	.40
2 Halldorson Precision Iron Core No. 540 Transformers, $6.00 ea.	12.00
1 Halldorson Precision No. 541 Filter Transformer	6.00
2 Halldorson Overtone Audio Transformers, $6.00 ea.	12.00
1 Halldorson Overtone Output Transformers	6.00
1 7x21 Panel drilled and engraved	3.40
1 9x20 sub panel drilled and engraved	4.95
1 3 meg. gridleak	.50
1 Resistor Mounting	.35
2 Camfield .0005 mfd. Condensers, $6.00 ea.	12.00
10 X. L. Spring Binding Posts 15c ea.	1.50
1 Ellis Oscillator Coupler	3.00
1 Spring Socket	.75
Total	$78.55
When aerial and ground operation is desired in preference to a loop. Use—	
1 No. 2 Ellis Antenna Coupler	$ 3.00

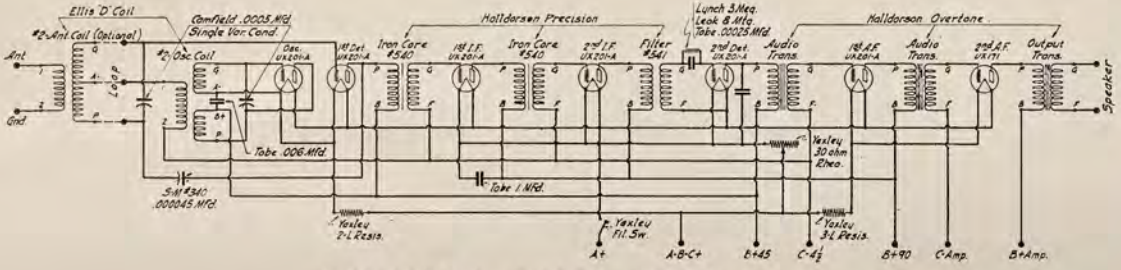
Tonal Quality and Overtones

Let us consider what is required to produce true rendition of the original broadcast. It is not a difficult matter to obtain excellent high note reproduction, likewise it is not difficult to obtain excellent low note reproduction.

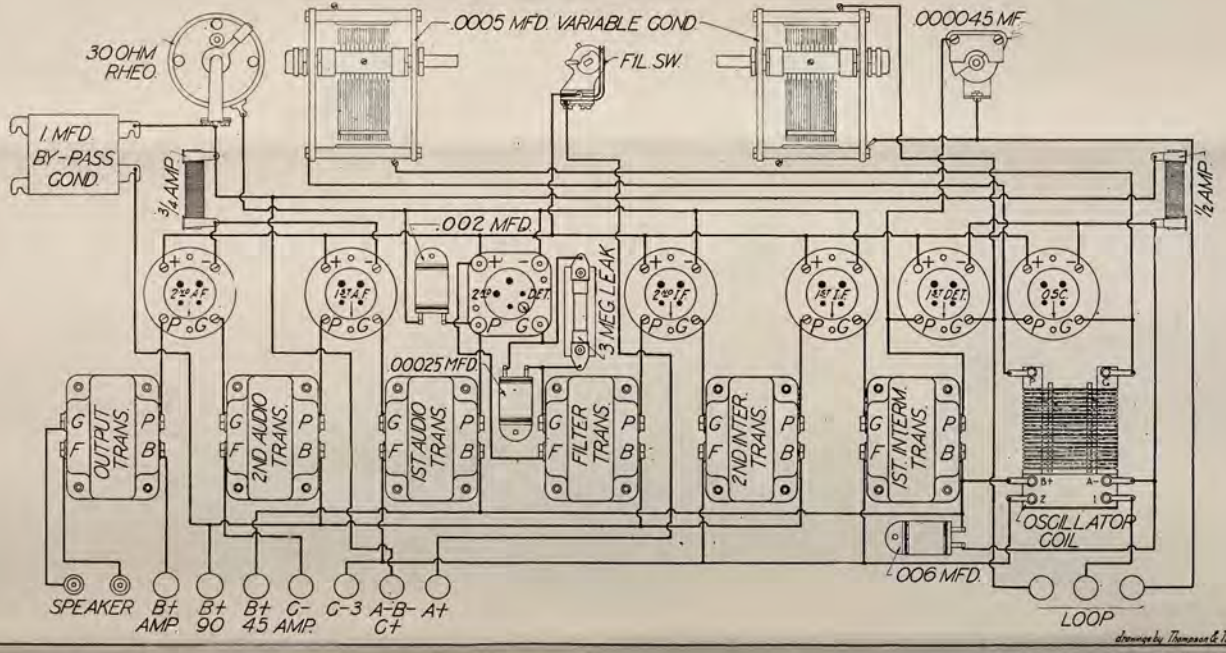
Audio amplifying systems can be developed to accentuate either high or low notes. In a great many cases it is more pleasing to accentuate, for instance, the low base notes. To some this accentuation gives a soft deep tone that is rather pleasing. Other tastes for music frequently vary the other way, preference being given to accentuation of the higher notes. Obviously, neither one of these systems can produce perfect reproduction of the original broadcast and neither one would satisfy a trained musician.

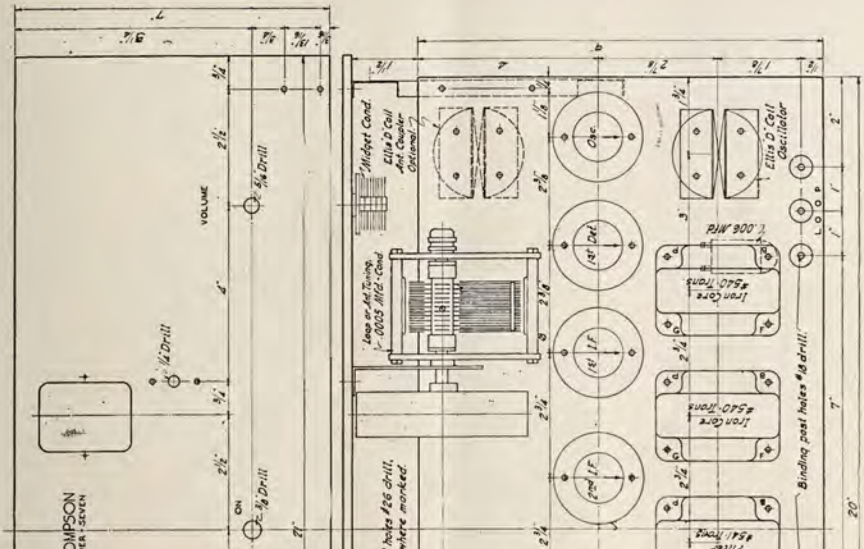
The perfect audio system then would be one wherein the loud speaker and the Audio Transformers were so balanced that a flat amplification curve is obtained not for the Audio system alone nor for the loud speaker, but for the entire combination of receiving set and speaker.

The output from the loud speaker should represent, in other words, a perfectly flat



THOMPSON SUPER SEVEN




THOMPSON
SUPER-SEVEN
VOLUME
GAIN
ON
OFF
NOTE: Drill window as per template furnished with S-M drum dial.
NOTE: All holes #26 drill, except where marked.
Midget Cond.
Ellis 'D' Coil Ant. Coupler Optional
Loop or Ant. Tuning .0005 Mfd. Cond.
Oscillator Tuning Cond. = .0005 Mfd.
30 ohm Rheo.
1 Mfd. By-Pass Cond.
Ellis 'D' Coil Oscillator
Osc.
1st Det.
1st I.F.
2nd I.F.
2nd Det.
1st A.F.
2nd A.F.
Iron Core #540 Trans.
Filter #541 Trans.
1st Audio Trans.
2nd Audio Trans.
Output Trans.
Binding post holes #18 drill.
9 Spaces @ 1" = 9"
LOOP
A+
A-B-C+
C-3
C-AMP
B+45
B+90
B+AMP
SPEAKER
20"
21"
7"
2"

line giving even amplification throughout the entire audible range. This range should take in at least eight thousand cycles, for in many instances true amplification of frequencies of seven to eight thousand cycles are required. Should they be left out entirely, as is frequently the case, the result is powerful base note amplification, fair amplification of the middle register, but a suppression of the high notes with a corresponding disastrous loss in shadings and overtones of the voice.

Overtone amplification is obtained in but one manner. The ability of the Audio Transformers to produce an output energy which does not over accentuate nor suppress any frequencies. This allows full amplification of both high or low notes together with any given intermediate frequencies and the overtones are recreated. Only in this way is it possible to obtain perfect amplification accurately following the true shadings of the artist's voice.

When an Audio amplifying system over amplifies some frequencies and suppresses others, the same effect will appear in the overtones where the rich deep shadings and life of music are produced. If the amplifying system does not faithfully reproduce the weak delicate shadings of the overtones they will become entirely unlike the original, for even the faintest trace of under or over amplification on a very delicate overtone gives a false reproduction of the most important element of music.

The system of amplification used in this receiver has been worked out according to the above theory. The overtones that distinguish the work of an amateur between that of our old masters have received the greatest consideration throughout the entire receiver and the result of this consideration is truly a revelation in the faithful reproduction of music that is thrilling both to the music lover and D. X. hound alike.

Precision Selectivity

The problem of selectivity alone is somewhat easily overcome, but to obtain selectivity, tonal quality and distance combined is a decidedly different problem. To obtain selectivity and still pass a wide enough frequency requires an extremely careful balancing of the component parts of the receiver. It is necessary, in order to retain amplification over the entire audible range that we have a band of at least ten kilocycles in which to work. If we increase the selectivity beyond this point, we immediately enter the field of reproduction and begin to cut side bands of the music and loss of high audio frequencies is the result.

The problem, therefore, is to get as close as possible to the point where we do not cut side bands. When this is done we have reached what might be called the peak of selectivity. We can go no further. This point can be only obtained by precision peaking of the filter transformer to cut off on either side of the ten kilocycle band, five kilocycles each side of the peak.

We continually see glowing reports of hair splitting selectivity, knife edge selectivity, and so forth, but to the seasoned engineer and I hope eventually to the fan and set builder all of these superlative adjectives mean but one thing—"hokum" —for the very simple reason that any Super can be designed so selective that a station cannot even get through.

Yes! Knife edge and hair splitting selectivity, but is it of any value to the fellow who wants to get stations with a smooth comfortable ease without interference and maintain the finest tonal quality? This can only be done, not by freakish transformers nor freakish methods of filtering, but by precision methods of calibrating.

Sensitivity

Sensitivity is rather difficult to define. It might be likened to the acceleration of a motor car. Its chief requirement is that every part in the receiver operates at maximum efficiency. Coupled with this, of course, is the number of R. F. stages used. The number of stages, or the number of tubes as one might wish to look at it, is, however, rather poor guide as to the sensitivity of a receiver.

As an illustration of this, a set may be built using ten or twelve tubes, each tube operating perhaps only 50 per cent efficient. The over all result in sensitiveness then, we will say, would be little better than a five tube receiver. For this reason, it is far more important that the efficiency of each stage of amplification be taken into consideration more so than the number of tubes used in the receiver.

The machine described used only seven tubes but the efficiency of every tube is as high as it is possible to attain.

Constructional Details

The first step in the construction of the receiver is a careful study of the different diagrams.

On page 8 is the schematic from which a bird's-eye view of the receiver and circuit may be obtained.

On page 8 is the pictorial wiring diagram. A study of this diagram before beginning the wiring is advised. All parts have been marked on this drawing to conform as closely as possible with the general layout plan and no trouble should be experienced in wiring the receiver from this drawing.

On page 9 is the layout and drilling plan. Again every instrument has been marked to indicate its location in the receiver. From these drawings the builder may if he wishes build the set on a wooden baseboard, for the arrangement of parts allows sufficient room to place all parts above the sub-panel.

While the use of a wooden baseboard will decrease the cost somewhat the slight extra cost for a bakelite sub-panel is well worth while from a standpoint of appearance.

The sub-panel is not mounted directly against the front panel but should be one and one-half inches from the front to allow room for the rheostat.

Looking at the diagram on page 9 The left hand condenser is the oscillator and the right hand one the antenna or loop.

Volume and Oscillation Control

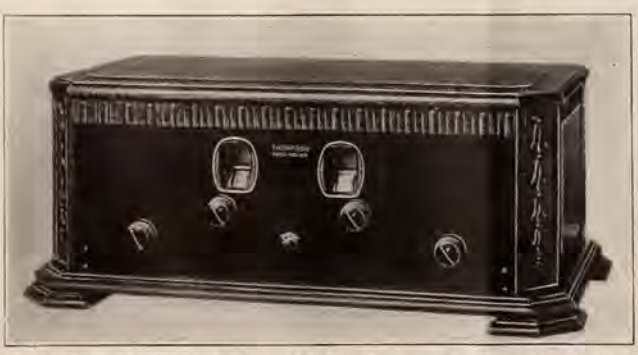
There is only one rheostat in the entire receiver; this controls the volume and also any tendency of the R. F. tubes to oscillate. This rheostat being used in the R. F. tubes alone does not effect the tonal quality of the receiver when the volume is decreased and at the same time allows control of volume from a whisper to maximum with smooth variation.

For the sake of simplicity binding posts have been used throughout the entire receiver. A Yaxley cable could very nicely be worked in, however, at the rear of the panel and the leads all brought direct to the cable.

Antenna or Loop Operation

Either an antenna or a loop may be used. The loop will give somewhat better selectivity on local stations but of course does not have quite the range of the aerial and ground. When a straight wire antenna is used the additional coupling coil is required and should be connected as shown in the schematic diagram of page 8, however, if the set is to be operated on a loop antenna the Ellis antenna coupler may be left off the sub-panel.

The pictorial wiring does not show the connection of the antenna coupler. When this is used it should be mounted directly behind the first detector tube socket. The few simple connections required will be seen on the schematic diagram. The G. A.



The handsome simplicity of the completed receiver as enclosed in cabinet is shown above

and P. leads of the coupler are connected to the loop binding posts or if an antenna will be used regularly the loop binding posts may be used for the antenna and ground and the coupler connections made in the receiver permanently.

Oscillator Condensers

Care should be taken to connect the rotor plates of the oscillator condenser to the plate terminal of the tube, and the stator plates to the grid. This will eliminate body capacity.

C Battery

The use of a C battery has been very liberal, a C bias being used on the R. F. tubes in preference to the usual potentiometer. This method is slightly more efficient and due to the fact that it decreases the B battery consumption there is practically no danger of the set motor boating on a B eliminator.

Intermediate Stages

One point that will probably strike the fan as being contrary to the general trend is the use of two iron core transformers and one filter. It was mentioned earlier that the sensitivity of a super depended primarily upon the efficiency of each R. F. stage. By using two long wave iron core transformers with a very high R. F. gain the efficiency or amplification is brought up very high. In order to obtain the desired selectivity with this system the filter transformer carefully designed by precision methods. Its amplification cuts off very sharp on either side of a ten kilocycle band.

Beginning the Construction

The foregoing points have been covered in order that the builder may have a more general idea of the points to watch for in the construction of the receiver. The list of parts should now be procured and then carefully examined to see that all parts are in good order. Construction can now be begun.

The front panel should be started first. The condensers should be mounted then the rheostat, filament switch and regenerative condenser. If both condensers are the same it will be necessary to reverse the shaft in one of the Camfield condensers first. This can be done by removing the cover nut at the back of the condenser, loosening up the set screw that holds the shaft and then pushing the shaft through to the other side. Tighten up the set screw again and replace the nut on the reverse side.

After the front panel has been assembled lay it aside and proceed with the assembly of the baseboard. By following the layout diagram this operation will be very simple and should not take more than an hour. The Ellis oscillator coupler should be left until the last so that it will not be damaged. When the parts are all mounted on the base board wiring can be started.

Wiring the Receiver

It is advisable to wire the baseboard first, without the front panel attached. The wiring can be done in progressive stages beginning with the first detector. The leads for the front panel must be left quite long. When the subpaned is fully wired mount the front panel and connect the leads to the controls on the front panel, and the receiver is then ready to test.

Cloyd Clevenger, world war ace and now pilot of the Alexander Airport, Denver, who gives aviation lessons to radio listeners

Tubes

U. X. 201 A tubes or their equivalent should be used throughout the entire receiver with the exception of the last stage where a 171 power tube is recommended.

If the wiring has been carefully done, there is no reason why the set should not operate perfectly from the very start. It may be necessary to vary slightly the "C" battery voltage but it will be found in most cases, if the tubes used are O. K., that the three volt "C" bias for the radio frequency tubes as shown on the diagram will be correct.

Should a "B" battery eliminator be used, one of sufficient output should be obtained, capable of delivering at least one hundred and eighty volts at about forty mills, since this is what the Thompson Super Seven will draw when a 171 power tube is used on the last stage.

The fact that almost every tube in the receiver is biased with a "C" battery reduces the battery current consumption considerably and practically prevents any danger of the set motor boating with a "B" eliminator. Should this difficulty arise, as it might in the case of some eliminators with a high internal resistance, it can be eliminated by by-passing the output of the eliminator with from two to ten Mfd. by-pass condensers.

An eliminator that was found to work exceptionally well on the new Thompson Super Seven was the Silver Marshall Reservoir B. It delivers ample current and is silent in the operation. A distinct advance forward has been made in the Silver Marshall Eliminator by the use of a glow tube to maintain the output voltage constant. The glow tube eliminates entirely the necessity for any variable adjustments, as it automatically delivers the correct voltage regardless of the current drawn by the Receiver.

Accessories

A six volt storage battery will be needed to light the filaments of the tubes. If a Trickle charger is to be used, a battery of eighty amperes capacity will be sufficient, otherwise, it would be advisable to get a little larger storage battery.

The cabinet in which the set is pictured is the well known "Fritts." It needs no introduction to set builders; it is known to all for its distinguished appearance.

"1928 Infradyne" Presents Attractive New Features

AMONG the new radio receivers and equipment for the 1928 radio season we find the "1928 Infradyne" one of the most distinctive. Here is a radio set embodying really new features; interesting alike to the man who builds his own set and to the professional set builder. All the difficulties a man encounters in building, such as the tedious alignment of the tuned radio frequency stages, stabilizing, preventing inter-stage coupling, etc., have been removed before the parts for the set reach him, and he has a much better chance of immediately getting perfect and gratifying results; still there is the satisfaction which every radio fan knows, derived from having constructed one's own set. The assembly of parts and wiring is a matter of two or three hours of interesting work and the result is a receiver which not only has the appearance of the finest factory built set, costing considerably more money, but also performs like the best of them. The creation of this set is certainly a progressive step in the industry.

Ten tubes are used throughout the set, two CX301As in the first two stages of tuned radio, one in the first detector socket, one as the second detector, and also one in the first stage of audio; three CX399 tubes are used in the Infradyne Amplifier unit and one more in the oscillator socket. Either a CX112 or CX371 is recommended for the last stage of audio.

The photo, Figure 1, shows the set as it looks completely assembled and housed in an all-metal cabinet, which provides an effective shield against picking up radio frequency and other electrical disturbances by the coils and associated wiring in the set, permitting only energy which is picked up on the antenna and going through the tuned channels to be amplified. Through the efficient shielding and very selective circuits all but the desired signals are rejected. The tuning controls or selectors are the two upper knobs on either side of the voltmeter, connecting with the two drum indicators which are mounted, one on the three-in-line Remler gang condenser to the left, and the other on the single

Figure 3—Radio frequency amplifier with the metal case removed

Remler condenser to the right. A filament control is directly beneath the voltmeter, the voltage applied to the tubes being indicated on the meter. A volume control is on one side and "sensitivity" control on the other, both of these are rheostats mounted behind the condensers; extension shafts connect the rheostats with the knobs on the front panel.

A switch at the bottom of the front panel controls all the filaments. When the switch is at the "OFF" position all the filaments are out; when it is turned to "LOCAL" position the Infradyne amplifier is out of the circuit and only the radio frequency tube and audio frequency tubes are lighted, and when the switch is turned to "Distance" all the tubes are lighted and the Infradyne Amplifier is automatically put into operation.

Just above the base and to the left of the central control panel is a supplementary bronze shield carrying the antenna compensator control. The antenna compensator control knob is double, the larger part operating a three-point switch permitting variable antenna coupling and the smaller part controlling a small variometer connected in series with the secondary of the input radio frequency transformer or antenna coupler. Adjustment of the antenna compensator is made when the set is first put into operation after which the antenna circuit will stay in line with the remaining circuits over the entire wavelength band. A very slight adjustment of the antenna compensator might be desirable as a last step in obtaining the best possible reception of a distant station but under ordinary conditions it can be forgotten when it has once been correctly set. In the rear of the cabinet, at the end nearest the antenna compensator controls, are the "Antenna" and "Ground" binding posts, the battery cable and the jack for the loud speaker.

Figure 1—The receiver as it looks completely assembled and housed in an all-metal cabinet

The whole receiver is made up of several units which are easily assembled. One of the most interesting features is the all metal base, with holes already drilled, and the completely assembled radio frequency amplifier which constitutes the front part of the set. The photo, Fig. 2, shows the complete layout of parts and the photo, Fig. 3, the radio frequency amplifier with the metal case removed. The r.f. amplifier is unique in many respects, and shows real engineering on the part of the designers. The three transformers are tuned with the single Remler three-in-line condenser to which is mechanically connected a shaft having the primaries of the transformers mounted thereto; as the capacity of the condenser is increased the coupling between primary and secondary of the transformers is increased, in a relation which tends to keep the greatest sensitivity without oscillation over the whole wavelength range; also, provision is made for two degrees of primary to secondary coupling so that the amplifier is readily adaptable to various broadcast conditions.

The coupling can also be changed by moving the secondary coils which are mounted on brass rods extending up through the center of the coils, up or down, thus changing the relation of the secondary to the primary coils. The coils are matched with the gang condenser at the factory, this eliminating trimmer condensers to compensate for deviations in the coils as the wavelength range is covered. For greater selectivity the coils are moved upward and for less selective tuning the coils are moved down.

Shields between stages minimize interstage coupling; together with the automatic coupling scheme, the amplifier is very stable over the whole wavelength range, and also at maximum sensitivity over the whole range. The front part, or radio frequency amplifier, of last year's infradyne was in some cases rather difficult to handle. In the new Infradyne this complication is eliminated.

At the rear of the set is mounted the Infradyne Amplifier. This is the same amplifier which has become so well known during the past year for its ability to sharpen tuning and to build up volume of signal without an annoying increase in background noise. In construction and per-

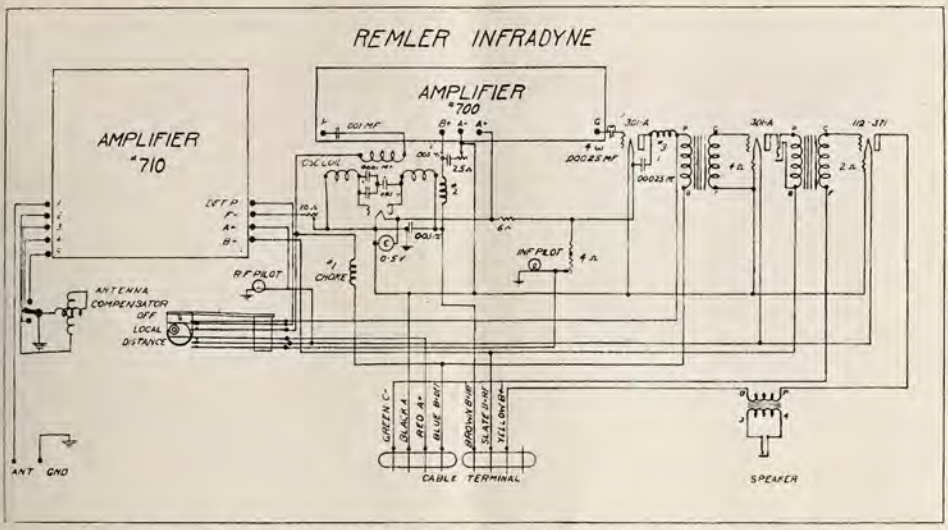


Figure 5—Wiring diagram of the "1928 Infradyne," showing also the color scheme for the battery cables

formance this amplifier has not been changed in any respect from that of last year.

Back of the bronze panel carrying the instrument controls is a pressed steel panel upon which are mounted the voltmeter, Infradyne Amplifier rheostat, two drum dials, and the oscillator tuning condenser. Located directly in back of the drums are the two rheostats for volume and sensitivity control. From the layout it is obvious that the assembly of this receiver is far from complicated, and perfectly symmetrical.

The bottom of the pressed steel base is illustrated in the photograph, Figure 4. Since the holes are already drilled for mounting the instruments and running the wires the job of building the set is greatly simplified.

All the small parts used in the Infradyne receiver, including nuts and screws, wire, etc., comprise the Infradyne Foundation Kit, saving a lot of troublesome shopping for these odds and ends. The parts are as follows:

Infradyne Foundation Kit—Parts List.

1 Pressed Steel base
1 Pressed steel instrument panel
2 Bronze control panels
1 Remler No. 110 Drum Dial (Right-hand) with brace and lamp
1 Remler No. 110 Drum Dial (Left-hand) with lamp
1 Remler Type 659 Condenser
4 Remler No. 50 Sockets
3 Remler No. 35 Choke Coils with special spacers
1 Special coil and spacer
1 10 ohm rheostat, extension shaft and bushing (Frost)
1 2½ ohm rheostat, extension shaft and bushing (Frost)
1 4 ohm rheostat (Frost)
1 2 ohm fixed resistor
1 4 ohm fixed resistor
1 6 ohm fixed resistor
1 Electrad Type GS .00025 mfd. condenser
1 Electrad Type P .00025 mfd. condenser
1 Electrad Type P .001 mfd. condenser
3 Electrad Type P .005 mfd. condensers
1 Special adjustable condenser

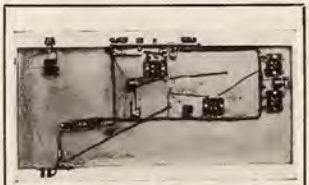


Figure 4—Bottom of the pressed steel base of the "1928 Infradyne"

1 4 megohm grid leak
1 Frost No. 953 Jack
1 Frost No. 954 Jack
1 Yaxley No. 69 Switch
1 "Antenna" binding post
1 "Ground" binding post
1 Bakelite terminal strip 4" x ¾" x⅛"
2 Special bakelite terminal blocks
1 Battery cable
12 Lengths wire (colored as per code)

Necessary screws, nuts, washers, soldering lugs, spacers and brackets. The rest of the units are the Remler No. 710 Radio Frequency amplifier and Antenna Compensator, two Silver-Marshall Type 220 Audio Transformers, one Silver-Marshall Type 221 Output Transformer, and a Western Model 506 or Jewell Pattern 135 O-5 volt voltmeter.

A simple plan has been devised by the manufacturers for making up a cable harness. A full sized template is furnished showing the positions for the various nails on which the wires are wound to make up the panel. The plan is so simple that even a man who has had almost no experience whatever can easily complete the job.

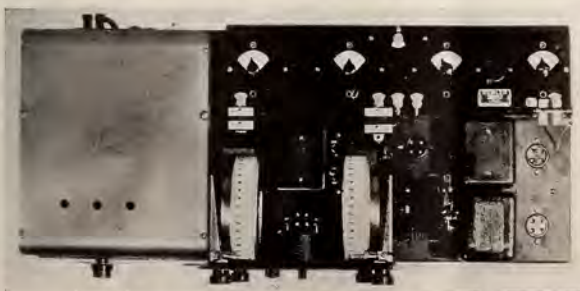


Figure 2—Layout of parts in the "1928 Infradyne"

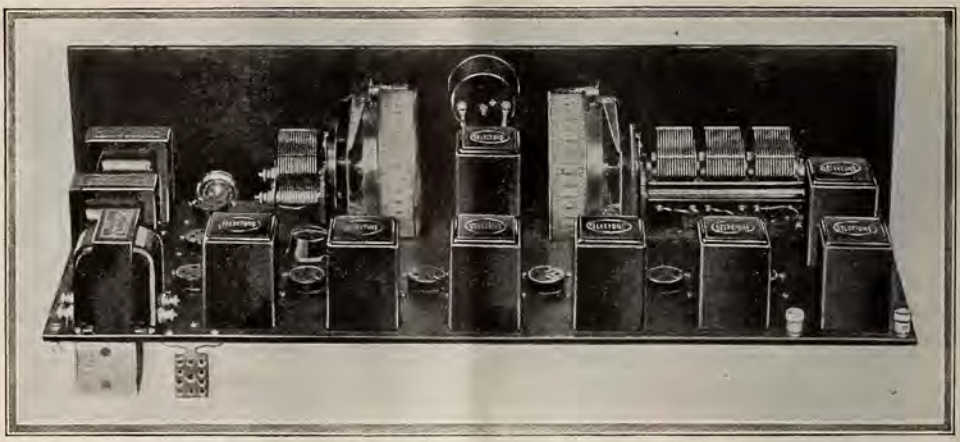


Fig. 2. Rear View of World's Record Super 10. Binding posts for a. c. filament not shown. Three by-pass condensers are mounted together beneath the sub-panel instead of two as shown in this cut

The New World's Record Super Ten

An Unusually Powerful and Selective Receiver with Great Volume and Fine Tone

THROUGH the courtesy of Mr. E. H. Scott of the Scott Transformer Company, we are able to present herewith an authentic and accurate description of the new World's Record Super 10, which has just made its appearance in the autumn displays of radio dealers. We forecast that this receiver will be one of the leading contenders for the favor of the set building public this season because it includes so many unusual and worth-while features in design. We are particularly pleased over the opportunity to present to our readers this description, as we have followed the activities of Mr. Scott and his organization very closely, printing from time to time photos and descriptions of models previous to the new World's Record Super 10. We believe that Mr. Scott has an unusually fine receiver, we know that he is making a good transformer, and we know that you will like this story of a super-radio, its peculiarities, advantages and performance.

The Editor.

By FELIX ANDERSON

IN enumerating some of the advantages of the New World's Record Super 10, it is probably simplest to first discuss those most prominent, and then consider other departures of interest as they occur in our review. While there are several super-hetrodyne receivers now available, which use radio frequency preceding the first detector, the new World's Record differs from these in a number of respects, and each dissimilarity is based upon intelligent thought and thorough research. It is the purpose of this description to acquaint the reader with the New World's Record Super and such orginal characteristics as set it apart from other receivers of the same general class.

The first impression upon viewing the World's Record Super 10 is that it is a truly pretty bit of radio design. Striking in appearance, the front panel controls kept down to a minimum consistent with efficiency, the receiver as a whole has that finished business-like appearance that all set builders strive to attain. The back panel is equally neat in appearance, having a symmetrical and systematic arrangement of the parts, so intriguing that even the most sophisticated radio engineer will stop to admire the effect.

The setting of the dials is easily observed through two portholes, the variation of the drums whereon the dials are located being accomplished by the rotation of two knobs slightly offset and below the portholes. These two controls form the main tuning adjustments, and are the ones most actively used. The left hand major control is that of the RF amplifier input circuit, and serves to rotate the sections of a Remled 3-In-Line-Condenser, which are all operated by the adjustment of the common shaft. This ingenious arrangement obviates the necessity of seperate adjustment of each of the RF secondaries, and simplifies operation.

The right hand major control is the condenser varying the beat frequency, and is the key, figuratively speaking, to the Intermediate Frequency Amplifier which follows the first detector and RF train:

The three refining controls on the panel are non-active in actual operation, the adjustments being made when operation is begun and then left unattended, slight adjustments being made at times when tuning for long distances. No filament switch appears on the panel, this having been built into a special Carter rheostat directly under the 0-8 volt Jewell filament voltmeter. This rheostat automatically opens the filament circuit when in the off position, cutting out the filament current to the tubes in the set. The knob on the extreme left of the panel is a Silver-Marshall No. 340 Midget Condenser (.000025 mfd) which is used to balance off any inequalities in the input tuning circuitcaused by antennae of unusual characteristics. It is not a critical adjustment. The knob on the right end of the panel is the potentiometer, a Carter 400 ohm, and is labled Modifier. A scaled drawing from which a drilling template can be made is illustrated in the blueprints.

The back panel is equally as good looking as the front, especially to radio enthusiasts who admire conservative workmanship and sub-panel mounting. The base mounting Selectone Units, which appear on the market new this season, have several advantages that are readily apparent. All connections to these units are made under the sub-panel, and such connections are inconceivably short and direct. Wiring is eliminated, and the construction of the New World's Record Super 10 is greatly facilitated, even to the extent of being more simple than any other previous model. A bottom view of the receiver (Figure 3) gives an idea of the ease with which the set may be wired. The layout lends itself to the use of either bus-bar, flexible cable or Celatsite as the assembler may prefer.

Study of the back panel photo (Figure2) will disclose the use of Benjamin base

mounting sockets, which directly become a part of the sub-base. These sockets and the Selectone units are so spaced as to make the plate and grid leads very short and convenient.

Eight Selectone series B units comprise the essential of this receiver, and these units can be identified as the Selectone B-530 Antenna-Coupler (looking from left to right on the photograph Figure 2) directly followed by the two Selectone B-520 RF Units, next a Selectone B-500 Intermediate Frequency Transformer, a Selectone B-510 Filter, another B-500 followed by a second B-510, which feeds the second dectector with amplified signal. These new units are the heart of the World's Record Super 10, and are the result of more than five years of constant test and experiment in an effort to obtain optimum in efficiency, appearance and sensitivity. Housed in highly polished bakelite casings, all of the same appearance, they stand majestically like soldiers in a row, each of them designed to do their utmost in intercepting and amplifying faithfully weak and distant signals as well as those of local transmitters. The oscillator unit designated as Selectone B-540, sets between the two Remler drum controlled condensers. The selectivity enables the operator to tune in stations far away through heavy local interference, with ten kilocycle separation on all but the nearest ones, when a slightly greater margin must be allowed to avoid background noise.

All these new units are laboratory matched products. While the World's Record Super 10 is a receiver made of laboratory equipment, it must not be considered as an experiment. Each unit is closely matched and peaked, and every Selectone unit is held to a rigid standard of performance, uniformity and efficiency. The assembly of such units into a working component is obviously rewarded with crowning and brilliant result.

The New Selectone B-530 and B-520 RF Couplers are manufactured with as much precision and care as though each were going to be used in a highly important piece of test equipment. The winding of the coils is done in the most careful manner as to insure high efficiency and amplification. The assembly into cases is supervised closely by engineers to detect irregularities and defects, and when completed, the units are subjected to the gruelling test of a device that detects inequalities of more than one third of a turn of wire on the coil. In this test the coils are matched to a uniformity of less than one turn, and so that the secondary inductance is practically the same. The Lorenz type of winding, is used in the RF Couplers, and the cases are so placed that losses are at a minimum. Referring to the circuit diagram, in blueprint, it will be noted that the RF Couplers are stabilized by the voltage drop across the rheostat, limiting the electronic emission from filament to plate, that is, increasing or decreasing the working efficiency of the tubes. The coils themselves are proportioned and designed to adapt themselves to this method of control so that no difficulty is experienced in obtaining stability with good tone and maximum efficiency.

The pickup coil of the oscillator is located in the grid lead of the first detector, where it has been found most efficient. A grid leak and detector is used in the frequency changer, and a proper adjustment of this detector tube avails great sensitivity for the pickup stages. One of the departures from accepted procedure is evident in the grid return of the frequency changing tube (first detector). This has been made negative instead of positive as is customary, research disclosing that this is the best connection. A Remler RF Choke in the plate lead of the tube keeps RF strays from filtering into the Intermediate train where they might be troublesome.

This brings us to the Selectone B-500 Intermediate Frequency transformer, the first in the IF train, then to the Selectone B-510 and thus on to the second detector tube, which is activated by the secondary of the B-510 connected to its grid circuit. The intermediate stages themselves are not radical in their connections, the refinements having been restricted to the Intermediate Transformers themselves. The tubes are kept at the exact amplification point by the proper ratio of primary to secondary, and the relative spacing of the coils which governs stability, amplification and tone. The amplifier in entirety is stabilized by the 400 ohm Carter potentiometer which is connected in the usual fashion across the A negative and A positive filament potential.

Many radio enthusiasts fail to fully appreciate the importance of good intermediate frequency transformers, which explains generally why the super-hetrodyne has been long considered as a complicated and difficult receiver to construct and operate satisfactorily. This erroneous conception is far from true. If the Intermediate Frequency transformers are really matched for peak frequency, regeneration and amplification, and if they are intelligently designed and wound to give

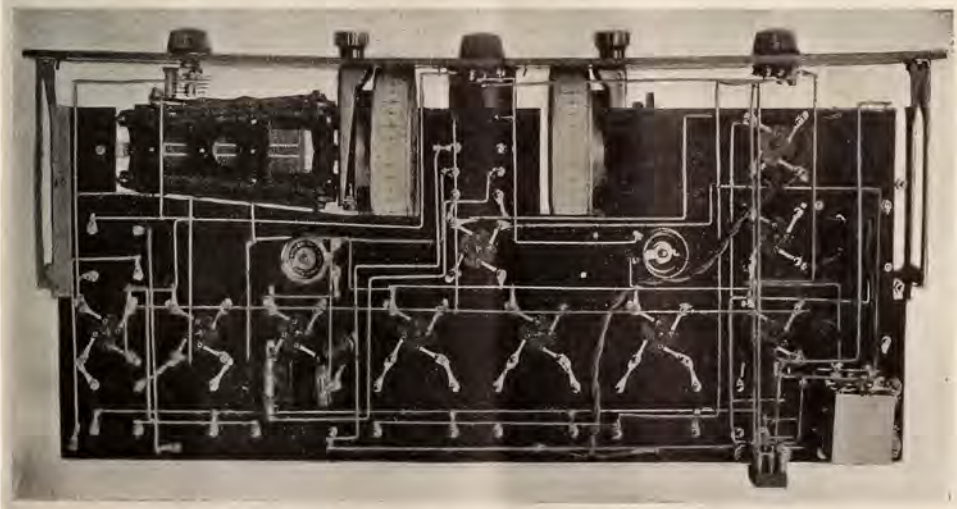


Fig. 3. Bottom view of the superheterodyne showing simplicity and neatness of wiring

the greatest sensitivity and selectivity with tone quality, the super-heterodyne becomes only a matter of the assembly of a few more pieces of equipment than the ordinary receiver, with considerably greater efficiency and enjoyment.

Just how the Selectone Intermediate Units are kept at a uniform standard is an interesting procedure. The coils of the transformers are tested before assembly onto bobbins for open windings and short circuited turns using two oscillators driving at about 100 kc with a common plate supply and headset so included in the circuit that changes can be readily detected.

One of the oscillators is adjusted slightly below or above the 100 kc oscillator so as to give a beat note of 500 cycles, easily readable in the phones. The coil is then plugged in the test circuit and variations in the frequency of the beat note are listened for, if there are such. A change in the tone of the beat note indicates imperfect winding and such are unsuitable for use in the Selectone IF Units.

The condensers used to peak the transformers are carefully tested with a stabilized oscillator and a vacuum tube voltmeter on a standard transformer. Changes in capacity differing greater than five per cent above or below standard reject the condenser.

Under the close scrutiny of expert engineers, skillful assemblers put the coils on the bobbins, and affix thereto the condensers which peak the transformers. The terminals are then carefully soldered into place on the new style bases, and the transformers undergo their first tests for amplification, peak frequency and spillover point. If the units conform to the standards demanded by the specifications of design, they are removed to the impregnating and mounting department where they are dipped swiftly and skillfully in a special compound and mounted in the new highly finished bakelite housings. The impregnating operation is one of the most important of all, as a special compond is required and the mixture must be kept at the proper temperature so as not to alter the characteristics of the transformer. This operation seals the windings, the condenser and the bobbins against atmospheric influences and further serves to lock all leads and windings into place so that the characteristics cannot alter, due to dropping or handling.

The transformers are then ready for matching into sets. The apparatus used for this consists of a special stabilized oscillator with a uniform output over the entire scale of its variable capacity and an ultra-sensitive vacuum tube voltmeter. Great pains and precautions are taken to keep this oscillator stable and uniform, and the finest precision meters obtainable are used in the vacuum tube voltmeter which is also of special circuit and construction. The oscillator and voltmeter are heavily shielded to prevent pick-up of energy other than that obtained from the voltage drop across a resistor in the oscillator unit. The vacuum tube voltmeter is connected across the secondary of the transformer to be tested, the primary of the same transformer being coupled to a standardized 201A tube, operating under actual load conditions. The signal generated by the oscillator is impressed on the grid of the test stage or first tube, and the gain between the test tube and the vacuum tube voltmeter is then observed on the very senitive milliammeter in the plate circuit of the vacuum tube voltmeter. When resonance is effected, that is, when the oscillator is driving at the peak frequency or point of maximum effciency and amplification of the transformer, the operator reads the setting of the oscillator, and with the aid of a powerful microscope observes the exact maximum deflection of the milliammeter in the vacuum tube voltmeter. The deflection of the meter is recorded as well as the setting of the oscillator condenser. The latter reading represents the peak frequency of the transformer, and the milliammeter reading gives the gain of the transformer.

The transformers are then sorted into sets having the same oscillator reading (peak frequency) and are then sorted into sets consisting of two B-510 and two B-500 transformers having the same reading on the vacuum tube voltmeter.

The tests do not stop here however, as Mr. Scott feels that the one final and certain method to use, to absolutely prevent any defective units from leaving the laboratory, is to give them an actual air test on a standard receiver. A set of transformers can be dropped into their proper places on the special test set in less time than it takes to insert a set of tubes in their sockets. Every transformer is thus tested for selectivity, distance and tone quality before leaving the laboratory.

To continue with the description of the receiver. Grid bias rectification is used in the second detector for the very apparent reason that the heavily amplified signal impressed on the grid would overload the tube and cause distortion. Better tone quality is thus obtainable. The second detector is also outfitted with a Remler RF Choke and bypass Condenser, to block and bypass IF strays in the plate circuit, so that only the direct current component passes into the audio amplifier transformer winding.

The audio amplifier is standard in design with the departure that the last stage employs a CX-310 power tube in order to handle the tremendous amplitudes delivered by the RF, IF and first audio stages. Thordarson R-200 Audio transformers are used in the usual cascade circuit in conjunction with an R-76 Output Speaker Coupling Transformer which protects the speaker windings from the 400 volt plate current used to actuate the CX-310. The tonal quality obtainable with this widely known amplifier is now a tradition among radio enthusiasts, and needs no further description.

Battery connections are made with a Jones Cable, having 10 leads coded as follows: A positive red, A negative green, B negative yellow, B positive 45 volts blue, B positive 90 volts pink, B positive 400 volts brown, C positive black, C 6-9 volts negative orange. The filament current for the UX-210 power tube, which is taken off the Eliminator is carried by twisted leads to two binding posts, and twisted leads connect the filaments of the 310 tube to the socket.

One of the unusual features of the New World's Record Super 10 is the specially designed eliminator to suit the receiver and its various load. Mr. Scott strongly recommends that this eliminator be used with the New Super 10 and will ensure the very finest results.

The construction of the eleminator is simple, in fact is decidedly less involved than the usual type of B power supply. The New Carter bypass condensers, (which are guaranteed to stand continuous operation at 1.000 Volts D. C.) and resistances are used in this circuit in connection with Thordarson T-2098 Power Transformer and T-2099 Choke Coil. Two CX-316 B Rectron Tubes are used, one on each side of the AC cycle so that full wave rectification is effected with ample current for all the loads required with the receiver. The circuit of connections appears in the blueprint and requires no additional mention.

The CX-301A tubes are used throughout the receiver, except as has been noted, the last stage which requires the CX-310. The filament current is from the usual storage battery. While considering this part of the circuit, it is strongly advised that a relay switch be used for automatic control of the A & B power supply. In actual practice this is almost a necessity because of the precautions that must be taken with heavy current surges in the B Power Supply if the filament current is shut off before the eliminator is disconnected. It is well to remember that good quality and sensitivity do not keep company with dead A batteries.

This generally describes the most

List of Parts

1 Remler .00035 mfd Variable Condenser
1 Remler 3-gang .00035 mfd. Variable Condenser
2 Remler Universal Drum Dials
2 Remler R. F. Chokes No. 35.
2 Selectone Transformers B-500
2 Selectone Transformers B-510
2 Selectone R. R. Transformers B-520
1 Selectone R. F. Transformer B-530
1 Selectone Oscillator B-540
2 Thordarson Audio Transformers R-200
1 Thordarson Out-put Transformer R-76
1 Carter 400 ohm Potentiometer
1 Carter Heavy Duty one ohm Rheostat
1 Carter 15 ohm rheostate with filament switch
2 Carter Tip Jacks
2 Carter .00025 Grid Condensers
1 Carter .002 Fixed Condensers
1 Carter .0001 Fixed Condenser
1 Silver-Marshall Type 340 Midget Condenser
10 Benjamin sockets
1 Pair Benjamin No. 8629 Brackets
4 Tobe 1-mfd. By-pass Condensers
1 Tobe 3 megohm Grid Leak
1 Jones Multiplug, 10 contact
1 Jewell Pattern 135 0-8 Voltmeter
1 Pkg. Kester Radio Solder
1 Formica 26x7x3/16 inch Drilled and Engraved Panel
1 Formica 25x10x3/16 inch Drilled Sub-panel
60 Kellogg Soldering Lugs
40 Ft. Acme Flexible Celestite Wire
2 X-L Binding Posts

prominent features of the new World's Record Super 10, with the exception of the filament circuit of the nine A tubes. Referring to diagrams, it will be noted that the receiver is practically master controlled, all the tubes exclusive to the two RF tubes, being fed through the Carter 1 ohm Heavy Duty rheostat. The RF tubes are operated on a separate 15 ohm rheostat in order to furnish control of oscillation. A separate rheostat located on sub panel is provided for the first detector in order to avail greater sensitivity and finer adjustment, but as this and the 1 ohm are not critical once they have been set, it has been found convenient to mount them on the sub-panel where they are less apt to be disturbed once the proper setting has been attained. The detector rheostat is a Carter 30 ohm and is connected in series with the master, as the blueprint indicates. The 0-8 Volt Jewell Filament Voltmeter facilitates the setting of the master rheostat, the proper adjustment being between 4½ and 5 on the scale.

The foregoing description explains to some extent just why the World's Record Super 10 differs from other radio frequency-superheterodyne combination, but hardly explains the excellent range and pickup characteristic of this new superradio. A general summary of the World's Record Super 10 is helpful in obtaining an accurate idea of what the receiver can accomplish. This is best explained by first inspecting the input circuit of the set. Here he we have two stages of RF amplification, making possible the use of a short indoor antenna of from 25 to 30 feet as the pickup medium, even for the most distant stations. This eliminates the loop antenna, provides greater sensitivity, reduces harmonics and heterodyning, and because of the amplification of the tubes and transformers, extends the range of the set, simultaneously increasing its volume. The RF pickup stages deliver to the detector of the set a greatly amplified input signal, assisting the work of the detector in producing a much better beat frequency for the IF stages to amplify. The selectivity of the set is due to the action of the RF stages in conjunction with the oscillator. Ten kilocycle separation is no longer a dream—having become a reality with the Super 10, The average radio enthusiast appreciates the sharpness of the superheterodyne as well as the popular radio frequency system and when both are combined into one working component without the loss of efficiency in either system, it can be readily appreciated that super selectivity is the result. In the World's Record Super 10, the RF and Hetrohyne systems of reception are so combined that the total output is much greater, than if one theoretically added the signal intensity of either system operated independently. Radio frequency pickup, and superheterodyne amplification when combined, actually improve each other in efficiency and in results.

Granting that we have delivered an input signal of already considerable amplitude to the first detector, the Selectone IF amplifier boosts the signals to the point where second detection becomes a serious problem. The general sharpness of tuning, retained and aided by the careful manufacture and design of the Selectone units, is maintained throughout the amplifier bp the proper setting of the potentiometer, without loss of tone due to the transformers being peaked too abruptly. The second detector with its grid bias rectification and radio frequency blocking system delivers to the audio system a wonderful signal to amplify, which the audio amplifier truly accomplishes. The net result is a thundering signal in the loudspeaker, yet beautiful in tone and depth, delicately controlled from a whisper to full volume by the manipulation of smoothly operating, non-critical controls on the panel. Even the most distant stations roar in with a mighty punch.

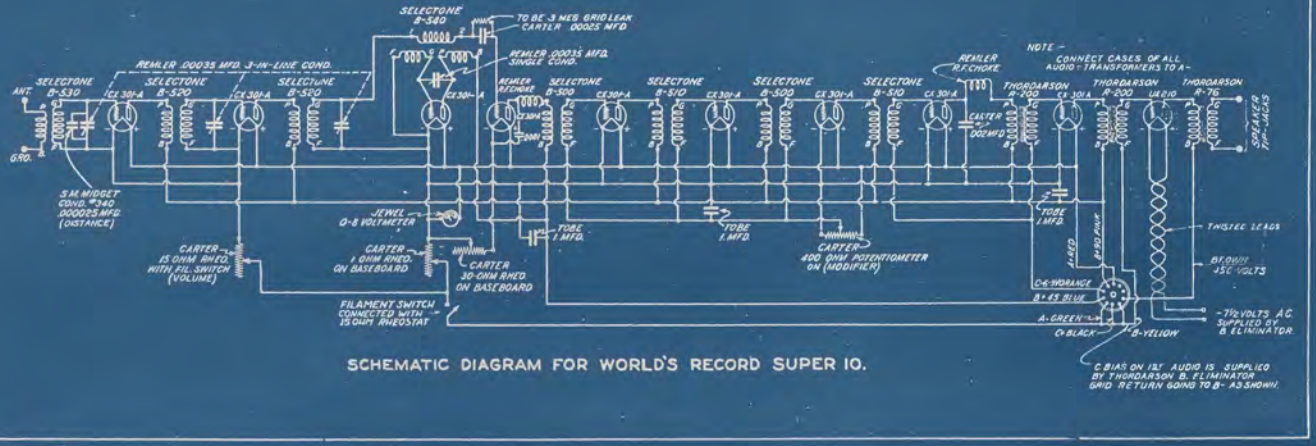
Fig. 1. The symmetrical arrangement of parts comprising the World's Record Super 10 gives the receiver this attractive appearance

Performance is the clinching argument in any receiver. That being the case, let us turn to the file of verified receptions and notate for you just what the set will accomplish.

The laboratory where the World's Record Super 10 was developed is located on the north side of Chicago, and every radio enthusiast knows that Chicago has plenty of broadcasting stations. WBBM has its home just two blocks west of the laboratory location. It operates on 1000 watts. WEBH, a 1500 watt station is just two miles south. WIBO, with 1000 is about 1½ miles distant, WMAQ, KYW, WGES, WMBI, WGN, WSBC, WLTS, WENR, WTAS, WCFL, WAAF, all not less than 500 watts (and in most cases 1000) are located not less than 10 miles air line, and cover the entire broadcast spectrum on the average five tube radio frequency receiver. Within a range of 50 miles we have WLIB, WHT, WLS, WCBD, WJAZ, and numerous others, ranging from small fry to heavy power. What the Chicago stations miss in the ambition to smear the dial with local signals, these stations usually accomplish when everything is going full blast between 8 and 10 p. m.

Yet the World's Record Super 10 tunes between them! Using a 25 ft. antenna, on the ground floor of the building, this amazing radio receiver accomplished tuning that can only be duplicated with another World's Record Super 10. Between WENR and WTMJ (Milwaukee, Wisconsin 80 miles distant) The Super 10 brought in CJBC of Toronto, Canada. Twenty kilocycle separation—that is, WENR 10 kc above CJBC and WTMJ 10 kc below. Between WGN on 990 kc and WLS (870 kc) it was possible to tune in WGR (970) KDKA (950), WGHP (940), WRRS (930), WABC (920), and WBZ (900). On each side of WLS (870) a 20 kilocycle separation brought in WHB (890) and WOC (850) the former Kansas City, the latter Davenport, Iowa. The dials, when tuned to WSAI (830), completely exclude WOC (850). WEBH, two miles away and only 10 kc below (820) does not interfere even to the extent of background noise.

WGY transmitting on 790 kc rolls in with the familiar punch and power, while WBBM, two blocks distant and 20 kc below is operating with 1000 watts. Twenty kilocycles below WBBM (770) WTAM is tuned in with ample volume, good tone, and no background interference. WTAM operates on 750 kc. Through WIBO or WHT (splitting time on 720 kc) and WMAQ or WQJ (splitting time on 670 kc) the World's Record Super 10 tuned WSUI (710), WLW (700), WJR (680), and WJZ (660). WJZ was so well received that it was possible to remove the antenna and hear the signals on the speaker with such volume that it could be heard 200 feet distant. At the upper end of the broadcast spectrum, WEAF was easily separated from WCFL. These stations operate on a 10 kc separation, and WCFL is only 10 miles away. WHO (560) can be pried off the frequency of KYW (570) with comfortable margin, KYW being about 10 miles south.



SCHEMATIC DIAGRAM FOR WORLD'S RECORD SUPER 10.

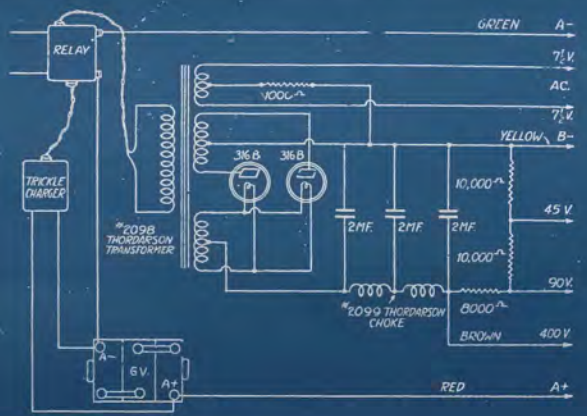
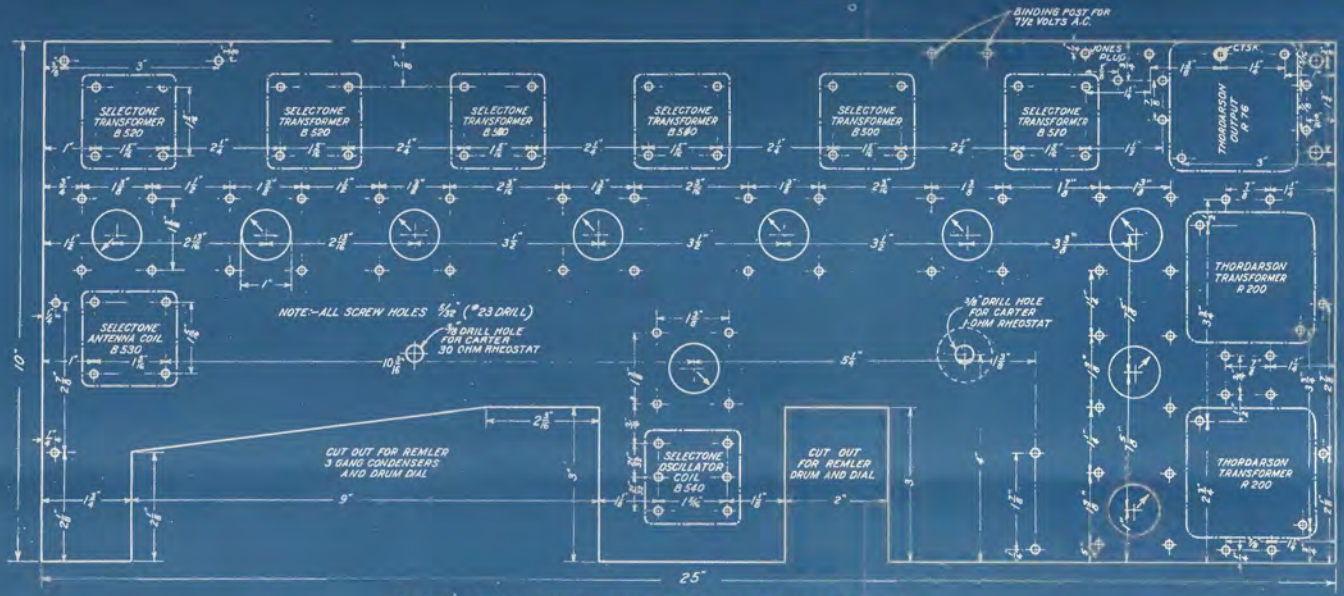
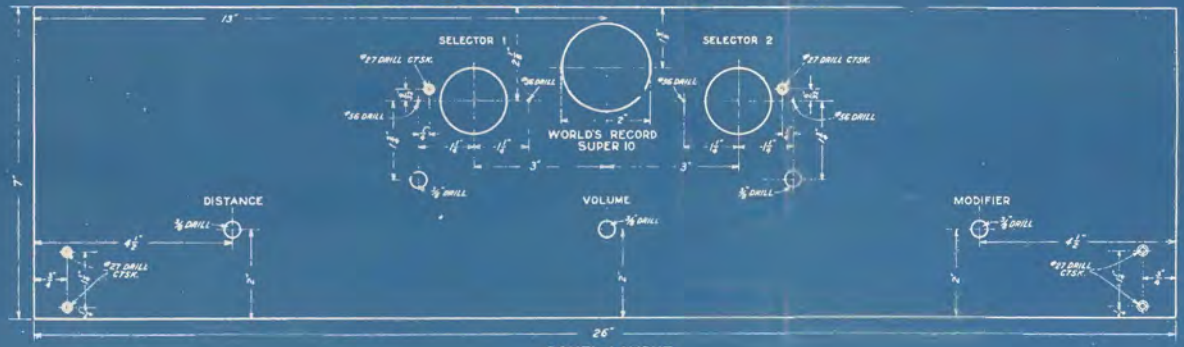


Diagram showing hook-up of heavy duty B eliminator, Trickle-charger, A battery, and Relay which automatically controls B eliminator and trickle charger. This eliminator is specified for the World's Record Super 10.



BASEBOARD LAYOUT FOR WORLD'S RECORD SUPER 10



PANEL LAYOUT

Amateur Radio

DX Reception Record

We have an interesting and convincing letter from Mr. John White who believes he holds the world's record for DX reception on regular broadcast frequencies. He has submitted for our examination a photograph of letters and cards varifying his reception of broadcasts from 4QG, Queensland Radio Service station at Brisbane Australia on 385 meters, 3AR at Melbourne, Australia, broadcasting on 484 meters and using a power output of less than one kilowatt (the station output, according to Mr. Whites letter of varification which he received from Australia, is now five kilowatts. This should be good game for DX hunters); 2FC Sydney, Australia, on 442 meters, EAJ7 at Madrid, Spain, on 372 meters, OAX, Lima, Peru, in South America, broadcasting on 380 meters, and of course the west coast stations. All the stations were picked up in Brooklyn, N. Y., where Mr. Whites lives, during the winter of 1926 and 27. He writes, "2FC, Sydney, Australia, was picked up by me the second time on Sunday morning, June 5, 1927. Held him from 3:07 a. m. to 3:20, then from 3:40 till 3:58." The letter of acknowledgement from 2FC varified the part of the program picked up.

Mr. White attributes his successful DX reception to the efficiency of his receiver which is an ordinary tuned radio frequency type. Four stages of tuned r. f. and a detector and two stages of transformer coupled audio frequency amplification comprise the set. However, each stage of r. f. is well shielded in rolled copper cans measuring 9x6x6 inches each. Every precaution was taken to minimize interstage coupling and to keep the resistance of the coils low. In each can is a variable condenser, a tube, r. f. transformer, and two by-pass condensers, 1 m. f. each. One by-pass condenser is connected across the filament and the other from the B side of the transformer to neg. filament which is grounded to the can. It is pointed out in Mr. Whites letter that absolute shielding is important in making the set highly efficient, not a single opening should be in the cans to permit any leakage of energy; also the r. f. transformers should be at least 1½ inches away from any part of the can. A variable resistance in the B battery supply lead to control the current to the r. f. tubes is used as a volume and oscillation control in the set. Mr. White stresses the fact that his receiver employes nothing unusual, only care in building the set has made it perform so remarkably.

If anyone has a better record than Mr. White for DX reception in the United States or Canada it will be interesting to hear about it. With much of the former congestion removed and the excellent stations recently installed in different parts of the world there are new possibilities for receiving foreign stations here in North America.

Three New Radio Books

Several new books treating different phases of radio and the industry, have been published recently. Among them is the Drake's Radio Cyclopedia by Handly, a volume to provide the non-technical man with ready reference work of practical usefulness in solving their problems with radio receivers and reception. The arrangement is alphabetic, each article being complete in itself with cross references to all related subjects. The subjects are treated in a manner easily understood by the layman, with material that is useful to any experimenter or set builder. Practically every phrase and term in the radio category may be found in the reference tables. Subjects such as rejuvenating vacuum tubes, locating trouble in a receiver, etc., are treated with completeness, as well as instructions for building equipment and receiving sets. The book covers more than 1,500 subjects, with illustrations, circuit diagrams, constructional layouts and graphic curves.

Another book is "Principles of Modern Radio Receiving," by L. Grant Hector, Ph. D., Assistant Professor of Physics, University of Buffalo. Modern theories on the propagation of radio waves through space, the electron theory and the theories of practically all of the new circuits and methods of receiving radio intelligence, are discussed in a technical but simple fashion which can be understood by most people interested in the business and technical progress of radio. None of the subjects is treated mathematically, except for a few simple algebraic equations. New circuits and theories about which there has been much controversy in the past are stated in an authoritative and convincing manner. The contents of this book were compiled by a physicist who has gone into extensive research to obtain accurate facts, and the material is not mere quotation of general beliefs. Every circuit from simple tuned detector circuits to superheterodyne and the most complicated of balanced r. f. circuits are described in detail. The Burton Publishing Co. put out this text.

A book dealing with an entirely different phase of radio is that written by Stephen Davis of the Department of Commerce—namely The Law of Radio Communication. Since the present radio laws are so new the discussion is of abstract principles. Cases paralleling those which might arise in radio broadcasting litigations are cited to illustrate the judgment of the law. The book explains clearly the rights of the broadcaster and the listener from the view point of the judge and logical reasoning. The Linthicum Foundation prize by the Faculty of Law of Northwestern University was awarded to the author who was formerly Associate Justice in the Supreme Court of New Mexico. The publishers are the McGraw-Hill Book Co., Inc.

Radio Warns of Quakes

A New Jersey radio amateur, Mr. William Andrew Mackay, believes that he has discovered an advance indicator of earthquakes in the form of some internal disturbance of the earth's crust evidenced by an alteration of radio conditions. Mr. Mackay's radio receiving apparatus is located on top of the Palisades of the Hudson, the high cliff of basaltic rock that borders the Hudson River opposite to New York City. This basaltic rock contains a high percentage of iron and is more highly conducting for radio waves than are ordinary rocks. Mr. Mackay finds that occasionally the tuning constants of his radio receiver alter unexpectedly, in much the same way as they might if the electric condition of the rock beneath were changed.

This alteration of radio conditions is invariably followed within a few hours, Mr. Mackay reports, by a severe earthquake somewhere on earth. His radio apparatus served this kind of advance notice, he states, of the unusually severe earthquake in western China in May, of the Jerusalem earthquake in July and of five other severe shocks within the past six months.

The warning is not invariable, some severe earthquakes having occurred without any detected alteration of the radio conditions. Certain common rock minerals, notably quartz which is the commonest of all, alter their electrical conditions when compressed or stretched. Geologists do not consider it impossible, therefore, that the state of stress in the earth's crust preceding a severe earthquake might have an effect on earth electricity, perhaps detectable in the way that Mr. Mackay has noticed.

Everyday Mechanics

Are You Fit To Drive An Airplane?

By GLADYS MOON JONES

Science Service Staff Writer

HOW often have you said, "If this old bus just had wings I would fly over this torn-up street." It seems difficult to manage an automobile through the city's bottle-necks. It takes physical and moral stamina.

Suppose your automobile should begin to fly. Could you pilot it? Could you handle an airplane? You could learn how to drive one perhaps, but have you the physical and mental qualifications essential in a competent flyer?

Specialists in aviation medicine have come to know more definitely just what an A1 pilot must be. Several opinions held during the war have been modified. Most important of these are the age and ear requirements. It was formerly thought that only young men could fly successfuly. Twenty-four was old in aviation. Now, however, you may be as old as thirty-five and still make a good flyer.

If you can negotiate communication with your co-pilot or co-passenger, you may be deaf and still make a good aviator.

Aviation hygiene is an important new subject. Today's physician is studying the matter. Tomorrow's will advise us before we hop off and prevent our suffering from physical causes as well as from aerial diseases, dope poisoning, deafness, altitude faintness and other troubles. Day-before-yesterday's country doctor, who drove around with his horse and buggy at eight miles an hour, picked up those who had fallen from the higher plane of perfect health. More often than not, he was too late. However, he went out of fashion with his equipage. Medical men have long since seen that warnings before the fall were simpler and more efficacious than mending the troubles afterward.

Flight Surgeons New Specialists

When flight surgeons came along with the development of aviation during and since the World War, they too, at first, gave most of their attention to those who crashed. Now with their confreres, general and special practitioners, they are preaching prevention. They have proved that from the very first pilot test, preventive hygiene means a great reduction of danger to man and plane. They have found that people who walk the earth untroubled by minor variations from the normal encounter aggravated conditions in rarefied air and rapidly changing temperatures.

Would-be pilots are of two general classes with respect to altitude: fainters and non-fainters. The Army knows its unrestricted men, those who can go safely only to 15,000 feet and those who are still restricted to 8,000 feet. All flying above 18,000 feet must be done with oxygen. The limit of consciousness without oxygen is about 25,000 feet. This is because the effects of altitude depend not on oxygen percentage, but on oxygen pressure. If pure oxygen is breathed we may still get so high that its pressure is too low to sustain life.

If Lieut. James H. Doolittle of the Army can do an outside loop at about 350 miles an hour causing his eyeballs to become so extended that they touch his goggles, it does not follow that every one should try it. The best pilots "go black" at 250 miles an hour on a turn.

Just what per cent of the youth of this country is potentially Lindberghian is a question of intelligence tests and physical tests. Out of 547 midshipmen of the class of 1927 at Annapolis, 353 passed the Navy's pilot tests. An official estimate is that fifty per cent of those who apply for training at Pensacola get there. Of these thirty per cent pass the pilot tests. And of this thirty per cent approximately twenty per cent make A1 pilots. From these estimates the ambitious boy can figure for himself that he has about one in twenty-

Photo by Science Service

The Ruggles orientator in which the candidate is whirled and tested. William Guy Ruggles is sitting at the lower right

five chances to succeed in aviation.

A flier does not have to go into the air to learn what the pilot testers call his reaction times or how his coordination is effected by overwork, loss of sleep, exposure, digestive disturbances and alcohol.

Lindbergh, the pioneer, learned much about his remarkable physical machine by trying it out on his mail route, but many a good man has crashed to his death trying to know what could have been told on the ground after a few physiological and psychological tests. Medical officers would have us get over calling those "heroes" who unnecessarily expose themselves to mortal danger.

The hypersensitive individual is easily confused by rapid changes in position in respect to his environment. The tested pilot becomes immunized to rapid changes in motion. He is able to interpret his sensations so that he shows little reaction to rotation or other rapid changes in position. An apparatus was developed during the war known as the Ruggles orientator. Some one wrote in to the army asking for a picture of "that whirling bath tub." And that is what it looks like. An experiment is being conducted now in the Navy Bureau of Aeronautics, which predicts even more accurate success for this orientator. Attached to the Ruggles "tub" is an instrument, operated electrically, which will make a graphic record of the testee's reaction times. Eight different pens are set to make the graphs on paper marked off in tenths of seconds. The resulting graphic demonstration shows the automaticity of the man being tested.

Aviation medicine is practiced in three directions: the selection, the classification, and the care of the flyer. As a result of this specialization in the Army and Navy, the percentage of aviation accidents due to physical causes has decreased in a surprising manner. Since we have had well trained flight surgeons and soundly based and conducted examinations, the fatalities per flying hour have been reduced in a period of four years from one fatality to every 950 hours to one for every 3,460 hours.

Visual Judgment Necessary

According to Comm. Robert G. Davis, Medical Corps, U. S. Navy, the eyes are the most important factor of flying physical requirements. The flyer must see out sidewise when he is looking straight ahead.

Visual acuity alone will not suffice as there must be a perfect balance of each extrinsic muscle allowing the maximum of binocular vision with no tendencies to diplopia or nystagmus. Dust, oil, wind and glare are prone to produce congestion of the lids and conjunctivae, which if allowed to progress may greatly impair visual judgment in depth perception for landings or formations in the air.

Everyone who has learned to drive even the slow old automobile knows how important visual judgment is. It may be impaired by an attack of influenza, prolonged application of the eyes to close technical problems and by general staleness.

A typical stale flyer complains of having lost some of his keenness and flying judgment. He is discouraged, not sure of him-

Science Service Photo

Altitude classification test. Making electrocardiograms during test. Official Photograph U. S. Army Corps

self in the air, has lost his appetite and dreams of unpleasant flying experiences. He is irritable, short of breath and attributes his condition to trivial causes. If his condition becomes worse he must be permanently grounded. His symptoms are those of neurocirculatory asthenia or effort syndrome.

Edward C. Schneider, of Wesleyan University, Middletown, Conn., who years ago made experiments on Pike's Peak in a study of altitude, is one of the authoritative physiologists who have been researching in aviation medicine. He defines staleness as "a neural condition founded on chemical changes within the body."

Ear Considered Less Important

The inner ear was originally considered most important in this country, but not according to the present theory. Equilibrium is important, but it is a function of vision, deep muscle sense, sensations from bones, joints and tendons, gravity effects, and tactile sensations as well as the inner ear.

However, the ears of the flyer demand constant attention. The necessity of equal air pressure on each side of the drum is thoroughly appreciated by the aviator. Equalization of pressure can be obtained in a measure by swallowing. Experienced flyers carry out the practice on rapid descents. Unless the eustachian tubes are easily opened the flyer should be kept out of the air. Marked unequal drum pressures produce severe pains and probable perforation. Scarred or congested drums are disqualifying on selective examinations. Some

(Continued on page 37)

Lightning's Odd Trick

One of the few recorded instances in which a person was within a few feet of a lightning flash without being killed or rendered instantly unconscious has been described by the victim herself to Mr. F. M. Delano, of Paris. About noon of July 12, 1927, a thunderstorm crossed Paris. One bolt fell in a small park near the Bon Marche department store. Striking the flagstones of a small court yard, the bolt broke one of these and disappeared.

Miss Ella Dodt, a Danish woman, was less than ten feet from the landing place of the bolt. Her description of the event is that she saw the flash, was deafened by the noise and showered with fragments of stone and masses of soil. She began to run, being perfectly conscious and unhurt. Within a few yards, however, she began to feel weak and collapsed, still without losing consciousness. Later symptoms included nausea, violent headache and a tingling sensation in the hands and feet, which last persisted for over two days.

It is probable, physiologists report, that the fortunate woman was not affected by the lightning at all, the bolt passing instantly into the ground. The weakness and other symptoms were probably due to the effect of terror on the gland system, not to any electric force. Miss Dodt reports, also, that her face, hands and clothing were covered instantly with a coating of fine black dust. This dust was not analyzed but may have been powdered stone from flagstones disintegrated by the bolt.

The Romance of Cotton

Photo by COOVERT

Above—Typical scene in Southern cotton field. Circle—Men waiting their turn at the cotton gin.

Cotton! The very word brings to mind pictures of many centuries and countries: India, land of gorgeous potentates and many religions, where the white and yellow flowers and snow-white bolls of the cotton plant have colored the landscape for fifty or sixty or seventy centuries; Egypt, home of the finest cotton in the world; ancient America, land of Aztecs and Incas and of tobacco, potatoes, sunflowers—and cotton.

Cotton scenes of today are no less scattered. The sunny land of negroes, sunshine and song calls it king. Thousands of spindles and looms hum in New England, New York, Pennsylvania and in Southern states, transforming it into yarn and goods. Ships ply along our Atlantic coast and cross the seas to England carrying bales of the fluffy down. Ships set sail from Egyptian and British Indian coast towns for England and America laden with this fruit of their soil. And from our country and from England other ships with finished cotton cloths and goods clear port bound for all places that ships go.

This great movement of cotton and cotton goods received its first impetus in 1733, when an Englishman, John Kay, invented a flying shuttle. This machine enabled the weavers to turn out goods faster than the spinners could make the yarn. Hargreaves then came to the relief of the spinners and invented the spinning jenny. This made the mill race even, but created a demand for a supply of raw cotton greater than the growers could meet.

This time an American came to the rescue, and with the invention of Eli Whitney's cotton gin in 1793, cotton became the poor man's as well as the rich man's cloth. Under old methods one man was able to free sufficient lint from seed to produce one bale of cotton every two days. Now a cotton gin produces fifteen bales in a day.

As to its uses today—they are as numerous as stars on a summer's night.

(Continued on page 26)

Build Radio's New

Mr. E. H. Scott, himself, will tell you how he designed the original DX receiver, with which he made the four World's Records described on the opposite page—how that set has been duplicated hundreds of times, each one performing as well as the original—how later developments and refinements have enabled him to improve on the original in the New World's Record Super 10—and how you can, even without any previous experience, build a World's Record Super 10 for yourself.

DISTANCE—Here is the receiver for the man who wants the most powerful and sensitive set it is possible to build. Many claim to have received far distant stations once or twice, but Mr. Scott with his World's Record Super proved his claims to record honors by bringing in consistently, night after night, stations distant six thousand miles or more. The new World's Record Super 10, in actual comparative tests with the original receiver on which the records were made, has proved that it is even more powerful and brings in the far distant stations with almost unbelievable volume.

No other receiver has approached the marvelous DX records that the World's Record Super has established, and it is safe to say none will for years to come.

REMARKABLE SELECTIVITY—Here is a receiver for today's conditions. In Chicago, where there are about forty broadcasting stations, the New World's Record Super 10 cuts through with the greatest of ease. It brings in distant stations only a few meters apart with such volume that you think you have a local station until you hear the call letters and find you are listening to a station hundreds of miles away.

NATURAL TONE QUALITY—A receiver may have great DX ability and wonderful selectivity, but what good is it if the tone is raspy or distorted? When you hear the New World's Record Super 10, you will realize that here at last is a receiver that it is a pleasure to listen to.

EASY TO BUILD—With the parts here listed, any one can build an exact duplicate of the New World's Record Super 10. The only tools required are a screw driver, pliers, and soldering iron. The building instructions and full size blue prints show exactly where to place each part and how to run every connection, and are so simple and easy to follow that any one, even without previous experience in building a radio receiver, can duplicate this marvelous receiver and own the finest radio set available today.

— LIST OF PARTS —

1 Formica panel drilled and engraved 26x7x3/16	$ 6.70
1 Formica sub panel drilled 25x10x3/16	7.00
1 Remler 3-in-line condenser No. 633 00035	15.00
1 Remler condenser No. 638 00035	5.00
2 Remler drum dials No. 110	9.00
2 Remler R. F. choke coils No 35	1.80
2 Thordarson audio transformers R200	16.00
1 Thordarson output transformer No. 76	6.00
2 Selectone L. W. transformers No. B500	12.00
2 Selectone L. W. transformers No. B510	12.00
2 Selectone R. F. transformers No. 520	10.00
1 Selectone Antenna coupler No. 530	5.00
1 Selectone Oscillator coupler No. 540	5.00
10 Benjamin sockets No. 9044	5.00
1 pr. Benjamin brackets No. 8629	.75
1 Carter Imp. rheostat 1R-15S ohms	1.50
1 S. M. balancing condenser No. 340	1.50
1 Carter power rheostat MW-1 ohm	.75
1 Carter Imp. pot. 1R-400 ohms	1.25
1 Carter fixed condenser 00025 with grid clips	.50
1 Carter fixed condenser 002	.50
1 pr. No. 10 Carter pin jacks	.20
1 Jewel Voltmeter 0.8v Pat. 135	7.00
4 Tobe Bypass condensers 1 Mfd	3.60
1 Tobe grid leak	.50
1 Jones 10 contact multi-plug and 4 ft. cable type BM	3.50
40 Kellog soldering lugs	.25
30 ft. rubber covered hook-up wire	.50

Here's your chance to build a radio set that will give you all that radio has to give—distance, selectivity, clear and natural tone. Experience is not required, for full instructions will be sent you by Mr. Scott himself. Don't hesitate—don't delay. Send *now* for full details. Then you can't forget it, and you'll never regret it.

Greatest "DX" Receiver

World's Record Super 10

Selectone Transformers cut through the local stations with ease, and their tremendous amplification brings in the distant stations with great volume.

They are supplied in perfectly matched sets, insuring maximum amplification and the finest tone quality.

The new Remler Three-in-Line Condenser with the Remler Drum Dial represents the last word in gang condenser construction. Balancing condensers are integral with the main unit, and are easily and quickly adjusted. A special staggered connection of plates makes it self-shielding, preventing interstage coupling.

All insulation is of genuine Bakelite.

Thordarson Amplifying Transformers were used in the original World's Record Super, designed by Mr. Scott. Because of the unusual tone quality obtained Thordarson apparatus is again selected. Two Thordarson R-200 Amplifying Transformers and one R-76 Output Transformer are used in this receiver.

If you enjoy good music, insist on Thordarson amplification.

The famous Benjamin Spring Cushioned Shock Absorbing Socket was the choice of Mr. E. H. Scott in his original World's Record Super.

Mr. Scott has paid the very highest tribute to the efficiency of Benjamin Shock Absorbing Sockets by again selecting them for this newest and greatest of radio receivers.

Tobe Condensers. Only the highest grade parts were selected by Mr. Scott for the World's Record Super 10, and the fact that Tobe parts are specified is one more proof of their claim for leadership in the condenser field.

Here Are the Verified Records

The authenticity of the startling achievements of the World's Record Super (as listed below) is based upon hundreds of verifications by leading Broadcasting Stations and Publications from Coast to Coast.

1 On March 17th established new World's Record for *loop aerial reception*—8,375 miles with Loud Speaker Volume.

2 On the night of March 29th established new World's Record with the reception of *six foreign stations* distant 6,000 miles or more.

3 Established new World's Record for *greatest number of broadcasting stations* heard that are located 6,000 or more miles away.

4 Established new World's Record for *most consistent reception*, night after night, of Stations 6,000 miles or more distant—117 programmes from 19 different Foreign Stations, heard between December 27th and April 10th.

In the careful selection of parts and accessories for the New World's Record Super 10, it is quite natural that a Jewell Pattern No. 135 Radio Voltmeter should be chosen. The black enameled case encloses a fine, D'Arsonval, moving coil type movement having silvered parts and equipped with a zero adjuster. The scale is silver etched with black characters. A special mounting arrangement makes it easy to mount in a radio panel. It is the ideal instrument for filament control.

Jones Ten Contact Multiplug and 4 ft. Cable enable all batteries to be placed out of sight and simplify wiring. Now used on over one million receivers; endorsed by leading radio engineers.

Half Size

Carter Rheostats are so designed that they are self-cooling and contact arm shaped so that it provides smooth contact with constant pressure at all times, making control of filaments noiseless.

Send Coupon for Full Details

MR. E. H. SCOTT,
7624 Eastlake Terrace,
Chicago, Ill.

Without obligation, please send me details of the World's Records you made with your Super 9, and full instructions for building your NEW World's Record Super 10.

Name .....

Address .....

ROMANCE OF COTTON

(Continued from page 23)

One, however, might be singled out as being rather unusually ingenious. That is the use of cotton in the cords attached to telephones. These cords present an unique problem. Copper has to be used to carry the current. But copper wire breaks when bent, and these cords, of course, are bent many times in the course of a busy day of telephoning. In manufacturing these cords the Western Electric Company, the largest manufacturer of telephones, winds flat ribbons of copper no thicker than a hair spirally around a cotton thread. In this way they make cottton threads give strength to copper wires.

Other present-day uses involve the cotton seed and the waste from the gin, which formerly were thrown away. From the cotton seed is made cotton seed oil, substitutes for lard, oil cake and oil meal.

Tiniest Motor

A motor so small its rotor could be wrapped in a postage stamp is used by the Westinghouse Electric and Manufacturing Company, for timing the OB watthour meter demand register. It is the smallest synchronous motor ever manufactured for practical use. Four million of these complete motors, together with their reduction gears, would be required

Flyweight motor held between the fingers of a man, showing minute construction as compared to that of the human hand.

to balance a large 8,000 hp. motor recently built in the Westinghouse shops. The diameters of their shafts are in the ratio of 512 to 1. The rotors are still smaller in proportion as 37 million are required to equal the weight of the large one. While two men, one on the other's shoulders, could stand upright in the circular opening for the rotor in the 8,000 hp. motor, the rotor of this motor could be worn, set in a ring, on a man's little finger.

Fine Measuring

In the manufacture of certain telephone parts, machinery of an almost unbelievable accuracy is required. One piece in operation in the works of the Western Electric Company is a measuring machine that is capable of measurements within one-one-hundred-thousandth of an inch.

Kiddie Car Enters Rough Sports

E. T. Trombly of the Western Electric team demonstrating perfect scooter polo poise. Above—An exciting mêlée in which heads might easily have served for the ball.

If wishes were horses, beggars might ride. And if the horses don't materialize—and horses are scarce these days—the thing now is to wish for kiddie cars.

For if you are equipped with one of those push and hop machines you can join in the new game of scooter polo. And it's great sport, as mounted on your kiddie steed, with mallet set, you charge down the field—or, rather, the gymnasium floor—for a long drive to the net and tally.

Even pony polo is scarcely fraught with more excitement or danger than was the game of scooter polo played at the sports carnival held recently in the auditorium of Oakland, California, by the Industrial Athletic Association of that city. Equipped with croquet balls and mallets and rubber-tired scooters, the crack teams of the Western Electric Company and Montgomery Ward gave an indoor exhibition of two chukkers of as exiting polo as ever was fought on field. Aside from a few skinned shins, a number of broken mallets and many spills from mounts, you could say there were no casualties at all. Mêlées were stiff and the teams so evenly matched that the game resulted in a tie.

The only drawback that can be seen to the new game is when both father and child insist on using the family scooter at the same time.

Learn to Fly by Radio

Here is an absolutely new wrinkle in radio programs—a broadcast of practical lessons in airplane flying!

KOA, the Rocky Mountain broacasting station at Denver, Colo., is to put them on the air. Cloyd Clevenger, World War ace and now pilot at the Alexander Airport, is to give them.

Clevenger has had great success as a test flyer and instructor in flying. There is much that a student pilot must learn before he takes his first flight, Clevenger says. It is this preliminary instruction he will give his radio flying class.

Lessons began Sept. 9. They will be continued for 10 weeks, going on the air each Friday night from 8 to 8:15 p. m., mountain standard time.

Clevenger's student flyers will sit in their own homes with perhaps electric fans blowing wind in their faces. They can set a broomstick between their knees to take the place of a "joy stick." A genuine airplane motor will be set up in the KOA studio to add greater realism to the lessons. See picture on page 11.

Current Science

Venus Now Visible in Daylight!

By JAMES STOKLEY

Science Service Staff Writer

LOOK for Venus in the daytime! Ordinarily, the only astronomical body that we are privileged to observe during daylight is the nearest of all the stars, the sun. Sometimes, when the moon is near first or last quarter we see it, in the former case in the afternoon, in the latter in the morning.

But to these two this month is added the planet Venus. Brightest of all the planets when it is brightest, the brilliancy of Venus this month is inferior only to the sun and moon. On October 17, it attains its greatest magnitude, and for perhaps a week or more either side of that date it will be easily visible in the morning sky, if you know where to look for it.

One way of finding it in the day time would be to get up before sunrise. Then it will be blazing in the east, and there will be no doubt of its identity. By watching it carefully until the run rises, you can easily see it in day light. But a simpler method, and one not requiring such early rising, is to use the celestial guide, the moon, on October 21.

On that date the moon and Venus are in conjunction. That means that they will be as close together as they will get on this particular circuit of the moon around its orbit. At 8:00 a. m., eastern standard time, Venus will be about seven and a half degrees south of the moon. The moon itself is about half a degree in diameter, so if you find the moon in the south on the morning of the twenty-first, and then look about fifteen times its diameter to the south, there you will see Venus. On the 15th of the month, Venus will be directly south at 9:17 a. m. local time, so that will also help you to find it.

Invisible Light Shows Star in Day

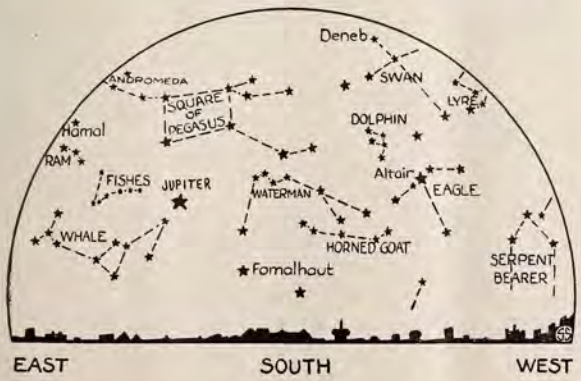
Of course, Venus is not a star. It is a planet. The only star that can be seen in the day, as was said before, is the sun. But with the aid of the photographic plate and invisible light, the stars can be photographed in full daylight.

If we were on the moon, the stars would all be visible even if the sun were above the horizon. The sky would look black, either at day or night. The reason why the earth's sky doesn't look black is because, unlike the moon, we are surrounded by a gaseous atmosphere. It is the atmosphere that reflects the short waves of light, the blue ones, and makes the sky look blue.

All day, the stars are in the sky above us, just as at night. If you look to the north, about 40 degrees above the horizon, you are looking at the pole star just as when you look at the same part of the sky at night. But in the daytime, the blue light from the sky enters your eye also. It is much more intense than the light from Polaris. The star is therefore invisible.

But the sky light consists predominantly of the short waves of light—the blue, and ultraviolet ones. The light from the star contains these rays, but it also contains a large proportion of longer waves, the wave that we call the infra red. These are invisible, because the retina of the human eye is not affected by their relatively slow vibrations, but a photographic plate can be treated so that it will record their impressions. And a dyed filter can be made that

(Continued on page 30)



WITH THE SUPER SEVEN

J Fitzgerald, Chicago, Ill., writes:
On Monday night August 29 I logged 35 stations in two hours and the next night when all powerful locals were on the air went back and pulled in 18 of the same stations. The THOMPSON SUPER SEVEN is some receiver.

Henry Stuerzl, Chicago, Ill., Says:
I have owned many supers but the Thompson Super seven for tonal quality and distance has everything beat. I can cover the country from coast to coast almost every evening. The tonal quality and volume on distance stations is uncanny. Precision built apparatus sure make a big difference.

And now on top of all the good news comes still more praise, Louis Buck, Winnipeg, Canada, adds the final proof
Have had the THOMPSON SUPER SEVEN working now for about 3 weeks and have had several stations over three thousand miles regular. Can set the dials at ten o'clock (eight o'clock Pacific Time.) and KFI comes through with enough volume to dance to. Can always pick up PWX, Havana, Cuba, when they are on the air and have also had CTX, Mexico City two or three times. Even up here where reception is fairly good I have never heard a receiver perform the way this one will.

Halldorson Precision Long Wave Transformers each $6.00

Camfield Equaltune Condensers

SPECIFIED FOR THOMPSON SUPER 7

THEY ARE MANUFACTURED IN ALL POPULAR CAPACITIES AND IN UNITS OF ONE TO FIVE GANGS.

Type		Capacity	Price
151	(Single)	.00015	$ 5.00
251	(Single)	.00025	5.50
252	(Two Gang)	.00025	10.00
253	(Three Gang)	.00025	14.00
351	(Single)	.00035	5.75
352	(Two Gang)	.00035	10.50
353	(Three Gang)	.00035	15.00
354	(Four Gang)	.00035	18.00
355	(Five Gang)	.00035	21.00
501	(Single)	.0005	6.00
502	(Two Gang)	.0005	11.50
503	(Three Gang)	.0005	16.00
11	Mounting Brackets (per pair)		

A Universal Condenser designed to give better operation in any radio set

CAMFIELD CONDENSERS UNEQUALED FOR ACCURACY, MECHANICAL DESIGN, ELECTRICAL EFFICIENCY, WORKMANSHIP APPEARANCE AND GENERAL UTILITY.

WRITE FOR LITERATURE ON COMPLETE LINE OF CAMFIELD RADIO PRODUCTS.

CAMFIELD RADIO MFG. CO. Member R. M. A. **35 E. Wacker Drive, Chicago**

FOR BEST RESULTS

With the Thompson Super-Heterodyne

use the Bodine Deluxe Loop

The characteristics of this loop meet perfectly the requirements of the Thompson hookup described in this issue, and all other super-heterodyne sets. It has remarkable pick-up ability, high tuning efficiency, and surprising volume.
The Bodine DeLuxe Loop is only 28 inches high, with a turning radius of 6 inches. Its superbly balanced frame of hand-rubbed walnut adds to the beauty of the most attractively furnished room. The exclusive plug and jack mounting eliminates trailing wires and a unique device keeps the wires taut.

Order model L-500 for .0005 mfd., and L-350 for .00035 mfd. condensers. Either model $12.00.

MAIL THIS COUPON!

BODINE ELECTRIC COMPANY,
2258 W. Ohio St., Chicago.

Send me full information on the Bodine DeLuxe Loop for super-heterodyne sets.

Name .....

Address .....

Immediate Delivery of Complete Parts

For the New

THOMPSON SUPER SEVEN

Write Today

For your cost on this receiver and a copy of our latest big radio catalog. Listing everything in radio at big savings.

WESTERN RADIO MFG. CO.
128 W. Lake St., Chicago, Ill.
"Dept. A"

Exclusively Specified

For the

Thompson Super Seven

TOBE

CONDENSERS

The smallest details in Tobe Condensers have been studied to make them the choice of every engineer. *If you want to be sure you have the best use Tobe Condensers.*

TOBE DEUTSCHMANN CO.
Cambridge Mass.

ELLIS "D" COILS

Give that last ounce of efficiency. Write for data on all Ellis "D" Coils.
Ellis Electrical Laboratories, 607 Brooks Bldg., Chicago, Ill.

Fritts Radio Cabinets

Are Masterpieces in Solid Walnut
Send for catalog and prices.
D. H. FRITTS & COMPANY
604 Hearst Bldg. Chicago, Ill.

Write for circulars covering all Halldorson products

	Each
Halldorson Overtone Audio Transformers	$6.00
Halldorson Overtone Output Transformers	6.00
Halldorson Precision Long Wave Transformers	
Type 540 L. C.	6.00
Type 541 Filter	6.00
Full size blue prints covering construction of THOMPSON SUPER SEVEN complete set	1.00

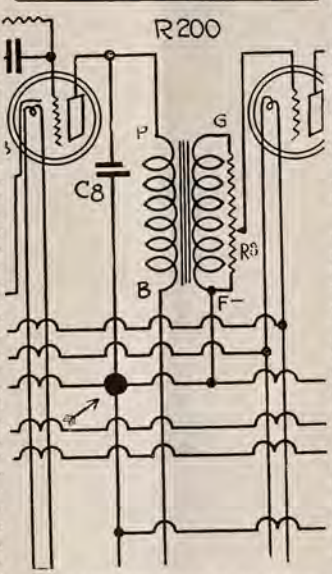
All technical letters regarding the Thompson Super Seven will be forwarded to Mr. Thompson for his personal attention. He will be glad to tell you about the receiver and to assist you in obtaining the maximum results from your set. He will also send free to those who enclose 2 cents return postage a complete constructional leaflet with all drawings for the easy building of this wonderful receiver.

THE HALLDORSON CO.
Chicago, Ill.
Factory 4745 N. Western Ave. Sales Office 223 W. Jackson Blvd, Dept. A

Electricity For Colds

A new way of curing colds by applying electric heat to the inflamed interior of the nose is advocated by Dr. H. Bordier, of Lyons, France. The method is credited to a physician of Athens, Greece, Dr. Tsinoukas, but Dr. Bordier has improved and perfected it and has subjected it, he reports, to extensive trial. The method depends upon the electric treatment called diathermy. This is really the application of heat, not of electricity, but electricity is used to generate the heat. High-frequency electric currents, not unlike the currents used in radio, are sent through the body or parts of it and are so controlled that a part of their electric energy is converted into heat just where the physician wishes that heat to be applied. A hot poultice or a hot water bottle applies the heat chiefly at the surface of the skin. Interior tissues are heated only by inward conduction of the heat. The diathermic methods, on the other hand, can apply internal heat without heating the outer skin at all. In Dr. Bordier's method of treating colds metal plates are applied at either side of the nose and the diathermic current is sent between them so that the inner membranes of the nose, not the skin, receive the major part of the heat produced. The Lyons physician reports remarkable successes from a few minutes of such treatment. As might be expected, the treatment is more successful when a cold is just beginning than after it is well on its way. Physicians now regard the common cold as one of the most dangerous diseases, because of the more serious troubles for which it may open the way. The new treatment will probably be tried widely and soon.

Correction



In the blue print section of the September issue, page 19, the circuit diagram of the Radio Age 6-Tube A C Receiver does not show the grid returns connecting to negative B lead. The correction is illustrated in the accompanying section of the original circuit lay-out.

VENUS NOW VISIBLE IN DAYLIGHT

(Continued from page 23)

will stop the blue waves, but will pass the slow infra red ones.

This gives the means of photographing stars in full sunlight. A photographic telescope, which is nothing but a huge camera, is employed. At the end opposite the lens is placed a plate sensitized to the infra red. Over the plate is placed a filter that stops all the sky light. Then the star's light, or at least a large part of it, gets through, and leaves its impression on the sensitive emulsion.

At best, however, infra red plates are not very sensitive compared to ordinary plates, and so long exposures are required to record even the brightest stars. During this exposure, the telescope is driven by clockwork to follow their motion. Faint stars can hardly be recorded at all, so the method of photographing stars in the daytime is principally of interest as an interesting stunt. As long as we have dark nights, astronomers will continue to take most of their star pictures between sunset and sunrise.

Jupiter Also Visible

Jupiter, largest of the planets, is also visible this month, but in the evening sky, as it has been for many weeks. It is directly south about ten o'clock. If one were to watch it night by night, as it moves among the stars, and note its position carefully, a peculiar feature of its motion would be apparent. Jupiter, like all the planets, moves around the sun from west to east. But this month it seems to move from east to west. It is in the constellation of Pisces, the fishes, and at the end of the month it will be about three and a half degrees to the west of its position at the beginning of the month. Yet a few months ago, it could have been seen moving from west to east, and in November it will seem to turn around and start moving east again.

How is this? Four centuries ago, as for two thousand years previously, it was interpreted as an actual change in the motion of the planet. According to the Ptolemaic theory, which was then universally accepted, Jupiter moved in a small circle. This was called the epicycle, and its center moved in a larger circle around the earth. Though the motion of the center of the epicycle was always from west to east, the motion of the planet itself was sometimes in the opposite direction.

Explained by Copernicus

In 1543, with the publication of the theory of Copernicus that the sun was at the center of the solar system, and that the earth, like the other planets, revolved around it, a new explanation was offered. This is the one which we now know to be true.

Copernicus showed that we do not observe Jupiter from a stationary object. The earth, and we with it, are moving. The combination of the motion of the earth and the motion of Jupiter is to be blamed for the backsliding of that orb. Anyone who has been on a train in a station when another came in on the adjoining track can appreciate the situation. Often, it is impossible to tell whether the train we are on, or the other one, is moving. Frequently we are greatly surprised, when we have been quite sure that our journey had started, to look out the other side, and find ourselves still in the station.

The situation with Jupiter is the same. This month Jupiter, as always, is moving from west to east. So is the earth. But we are moving faster than Jupiter, and so we leave it behind. We are not aware of the motion of the earth and so the effect is that Jupiter moves backwards.

Square in Pegasus Conspicuous

As for the stars this month, the "Great Square" in Pegasus is conspicuous and is indicated on the map. This figure is one of the most familiar in the autumn and early winter sky. Over to the west, the "Northern Cross," or Cygnus, the swan, is now magnificent in its upright position, with the brilliant Deneb at the top.

Below Deneb, and to the North, is the bright Vega, in Lyra, the lyre. To the south is Altair, in Aquila, the eagle. Like the great square, the triangle formed by Deneb, Altair and Vega, is a useful guidepost in finding stellar objects. Low in the east there appears the ruddy Aldebaran, the eye of Taurus, the Bull, which in the coming months will be a prominent constellation in the evening sky.

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Why pay profits to several middlemen? A Marwood in any retail store would cost practically three times our low direct-from-the-factory price. Our policy is highest quality plus small profit and enormous sales. You get the benefit. Marwood is a pioneer, responsible Radio, with a good reputation to guard. We insist on the best—and we charge the least. If you want next year's improvements NOW—you must get a Marwood —the Radio that's a year ahead.

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This is the Marwood 6 Tube, 1 Control for BATTERY or ALL ELECTRIC operation. Gets coast to coast on loud speaker with great volume. Only $47.00 retail. Big discounts to Agents. Comes in handsome walnut cabinets and consoles. This low price cannot be equalled by any other high grade 6 tube Radio. Has the volume of any 7 tube set. If you want a 6 tube Radio you can't beat a Marwood and you can't touch our low price.

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AGENTS

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Get your own Radio at wholesale price. It's easy to get orders for the Marwood from your friends and nabors. Folks buy quick when they compare Marwood quality and low prices. We want local agents and dealers in each territory to handle the enormous business created by our national advertising. Make $100 a week or more in spare time demonstrating at home. No experience or capital needed. We show you how. This is the biggest season in Radio history. Everybody wants a Radio. Get in now. Rush coupon for 30 Days Free Trial, beautiful Catalog, Agents' Confidential Prices and Agents' New Plan.

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Has Complete A-B Power Unit

A REAL ALL ELECTRIC Radio with one of the best A-B power units on the market—no batteries needed—at the world's lowest price. This Marwood can't be excelled at ANY price. If you have electricity in your home, just plug into the light socket and forget batteries. No more battery trouble and expense. Costs less than 2c a day to operate. Always have 100% volume. ALL ELECTRIC Radios are high priced because they are new. We cut profit to the bone and offer a $250.00 outfit for $98.00 retail price. Big discount to Agents. Don't buy any Radio 'til you get details of this sensational new ALL ELECTRIC Marwood.

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Uncle Sam Needs More Radio Reports from Ships to Aid Fliers

TOWARD the end of April, when preparations were started for trans-atlantic flights by airplane, the number of ocean weather reports received by the Weather Bureau of the United States Department of Agriculture from ships plying the north Atlantic steamer lanes took a jump. It increased from four or five a day to twenty-five or thirty when interest in the flight projects was at its height. As a result, it was possible to keep the flyers well advised as to the winds, storms and fogs they would be likely to encounter.

This weather service, without which the hazards of the flights would have been enormously increased, was made possible largely by the voluntary co-operation of shipmasters and of the radio companies, which collected ocean weather information twice daily and delivered it to the Weather Bureau for charting and analysis. In future transatlatic flying, such voluntary co-operation will hardly be as readily forthcoming, since the novelty of the enterprise will be gone and public interest in it less keen.

Officials of the Weather Bureau are accordingly figuring out what can be done to stimulate interest in ocean weather reports, which are valuable in forecasting weather conditions on land as well as in adding to the safety of flying and of navigation. It is their hope that shipmasters who have been sending out weather reports in the last two months will have formed the habit and will continue the work when the present flying season is over. Nevertheless, something more permanently dependable is essential.

One obstacle is the cost of taking observations and making them available by radio and telegraph to the weather forecasters. This cost has to be met by someone, even if it is voluntarily assumed and widely distributed as it was during the period in which weather service was maintained for the transatlatic flyers. The Weather Bureau's funds do not suffice for payment of observer services and radio tolls from all ships.

That a more complete and extensive organization of ship service is necessary is shown by the fact that on some days while the flyers were waiting for favorable conditions the Weather Bureau did not get a single ship report from areas a thousand miles wide in the Atlantic. Even on May 18, two days before Lindbergh made his successful flight, no report was received from any ship between longitude 40 west and the Irish coast. It was not until he had started that weather reports from ships became nearly adequate. When Chamberlin made his flight the amount of information coming in was more abundant than in any previous period and continued so even after his successful landing in Germany.

Although the cost of getting ocean weather reports is a difficulty, perhaps a greater one is the fact that often there are no ships in areas where dangerous conditions exist. Moreover, when ships are warned of storm areas they avoid them. The hurricane that struck Florida last year, for example, was forecast by the Weather Bureau, and ships in the hurricane area were advised of its approach. They got out of the way so promptly that for twenty-four hours before the storm struck the coast not a single weather report was received from a ship in the hurricane area, for the good reason that none were there. Another difficulty is heavy competition for the use of Atlantic radio facilities. Ships on the regular traffic lanes in the Pacific much more commonly and regularly send weather reports than those on the New York to Europe routes in the Atlantic.

Apparently, moreover, the value of weather forecasts to Atlantic shipmasters is not a sufficient inducement to them to make regular weather reports, since most ocean liners are well able to cope with ordinary storm conditions. Nevertheless, information of big blows would be of value to ocean liners.

Eventually, when funds and facilities permit, the Weather Bureau hopes to get reports twice daily from all the ships in

Ensign S. V. Edwards, U. S. N., seen at the radio set he will operate in the huge Sikorsky plane recently built for trans-Atlantic flights. The set is designed to be capable of sending and receiving messages from France or the United States as soon as it takes the air, having both a low and long wave length. The set weighs 125 pounds and was built by the Washington Navy Yard.—*Photo copyright by Henry Miller.*

the Atlantic lanes. Such reports, supplemented by reports from land stations in this country, in Canada, in Greenland and Iceland, and also in Europe would make possible the preparation of complete ocean weather charts and dependable forecasts every day.

It is easy for shipmasters to give the required information. They are asked merely to state the position of their vessel, the barometric pressure, the barometric change in the preceding two hours, the force and direction of the wind, the kind, quantity, and movement of clouds, the presence or absence of fog, and brief remarks on any unusual weather conditions that may prevail, such as squalls, storms, or heavy seas. Radio transmission is simplified by the use of a code.

Loud Speakers a Thief Trap

A new burglar alarm which will call for help if the wall of a bank vault is merely tapped once or twice with a hammer has been perfected by the Bell Telephone Laboratories and is described in a recent issue of the Bell Laboratories Record, circulated privately by that institution. The device does not respond to the sound of the blow, as an ordinary telephone would, but to the vibration set up by the hammer-stroke in the steel or concrete of the vault. This vibration is made to move a delicate electric apparatus, first developed during the war for the purpose of detecting enemy submarines. This device then operates a second instrument which is a modification of the unit used in radio loud-speakers. This, in turn, sends an alarm signal over a wire to a central office, from which help is sent. The vibrations set up in the vault by drilling into it or even by the sputtering of the steel while being melted with an oxy-hydrogen torch or with an electric arc, will also be detected by the apparatus. On the other hand, the vibration-detector is so constructed that it does not respond to vibrations caused by persons walking nearby or by railway trains or passing vehicles. The device is "tuned" only to those particular vibrations which indicate danger, just as a string of a violin is tuned to one particular note. The new system has been installed by the Holmes Electric Protective Company in two cities, New York and Philadelphia.

Radio's Acute Ear

The superiority of modern radio apparatus to the human ear, considered as a listening device, was demonstrated recently in England during an attempt to broadcast the song of that seldom-heard bird, the nightingale. A feathered songster far off in the distance burst into song while the experiment was going on. The engineers at the microphone heard nothing. The distant song was too faint and the engineers were trying to hear and to broadcast the song of another bird, believed to be near at hand but silent. However, the distant song, missed by the human ears that were on the spot, was picked up by the specially sensitive microphone that was being used and was broadcast, without the knowledge of the engineers directing the experiment. Radio listeners many miles away heard it perfectly, although the sounds themselves seem to have been quite inaudible to the nearby ears. Modern radio apparatus can act as a magnifier for sounds, much as a microscope can magnify objects too small to be visible to the naked eye.

Radio's Record Order

The largest order for radio sets ever written was recently given to John L. Limes, assistant sales manager of the Crosley Radio Corporation, by R. B. Austrian and R. B. Rose of the R. B. Rose Company, New York City. The order called for $1,000,000 worth of Crosley radio sets to be sold through radio departments operated by the Rose Company in stores throughout the country. Forty-eight radio departments were included in the contract in twenty-eight large cities extending from coast to coast.

According to Limes, in taking this order the Crosley Radio Corporation acted only as agent for its distributors. The sets will be delivered to the Rose retail departments by local Crosley distributors and the orders handled through them.

Independent Radio Manufacturers Start Battle

By **OSWALD F. SCHUETTE,**
Executive Secretary, Radio Protective Association

THE case of the so-called "independent" radio manufacturers against the Radio Corporation of America rests upon a vital and fundamental principle that is important to all American industry. Ever since the Sherman Anti-Trust law passed in 1890, attempts have been made to evade its purpose by private corporations, under the pretext of patent ownership. The fundamental social doctrine of the United States, guarded zealously by its statutes and its courts, is that monopoly destroys both industry and democracy.

There is voluminous evidence in the archives of Congress and in such text compilations as Vaughn's "Economics of our Patent System" (MacMillan, 1925) that the concentration of control over an industry under one balance sheet stifles and suppresses the art of the industry. Developments which threaten to make existing assets obsolete are placed on the shelf and inventors find it useless to deal with the one existing customer.

Under the Constitution of the United States, the patent laws are written to promote the progress of science and the useful arts. The patent statutes are designed to stimulate invention and the use of patents to obtain a contrary effect is a perversion of these laws. Furthermore, the courts have held that patents do not give a license to any one to escape the prohibitious of the Sherman and Clayton Anti-Trust statutes, and have held therefore that the pooling of competing patents, resulting in the restraint of trade, is illegal.

In this light, let us examine the position of the Radio Corporation of America and the independent radio manufacturers. Almost a year after the Armistice, in the turmoil still existing in the Washington departments of the government, the Radio Corporation of America came into being, and now the Radio Corporation claims it was created "at the request of the government." As a matter of fact, the report of the Federal Trade Commission on the Radio Industry, made in 1923 (page 16) reveals that Secretary Daniels refused to sanction the Radio Corporation plan, stating that he believed in government ownership of radio and that only Congress could sanction such a move. Apparently the officials of the War Department also refused to sanction this plan.

According to this report, when the formation of the Radio Corporation of America was first discussed with navy officials in the spring of 1919 it was planned only to authorize the General Electric Company to buy existing Marconi patents and pool them with the General Electric Company's inventions. This was actually accomplished in October, 1919, and the Radio Corporation was incorporated. It was not until July, 1920, that the patents of the American Telephone and Telegraph Company and its subsidiary, the Western Electric Company, were put into the pool, and another year—in June, 1921—that the patents of the Westinghouse Electric and Manufacturing Company and its subsidiary, the International Radio Telegraph Company, were absorbed under a series of agreements which practically divided the ownership and control of the Radio Corporation among the General Electric Company, the Westinghouse Company and the American Telephone and Telegraph Company.

As a result, there were pooled in the hands of the Radio Corporation approximately 1,000 radio patents and the parent companies entered into a series of agreements with the Radio Corporation and with each other that are of the greatest significance and importance to the radio industry, and to which we will refer, in detail, hereafter.

With reference to whether the patents so pooled were competing patents, let us consider here only a few radio circuit patents. The alleged superheterodyne, the tuned radio frequency, and the regenerative patents were among those pooled. David A. Sarnoff, Vice President of the Radio Corporation of America, in referring to the superheterodyne sets in a public statement declared that "it is the one element of our line that most distinguishes it from *competitive* radio equipment. Judge Thacher, in the Atwater Kent case, in supporting the contention of the Radio Corporation, held that the Westinghouse Company's Armstrong circuit, alleged to cover regeneration, was "utterly different" from the Alexanderson patent, owned by the General Electric Company, alleged to cover tuned radio frequency.

It certainly should not be difficult for radio engineers to conclude that among 1,000 patents there must be a number of similarly interesting examples of competitive inventions.

As conclusive evidence of the total disregard by the Radio Corporation of America and its parent companies of this fundamental and far-reaching principle of our anti-trust laws, we point to the clause recurring with startling and significant emphasis in all the agreements between the R. C. A. and the parent companies and between the parent companies themselves, providing for the pooling of "all future inventions." It is hard to imagine any future radio invention which would not be competitive with what has already been developed.

Another important detail in these agreements was the careful division in the activities of the parent companies, whereby they eliminated competition among themselves. To the General Electric Company was apportioned 60 per cent of all the manufacture of commercial receiving apparatus, including tubes. To the Westinghouse Company was allotted 40 per cent. The American Telephone and Telegraph Company was given the exclusive right to all commercial activity in wireless telephony. What does this promise for the development of wireless telephony in the United States? We are still using telephone apparatus developed thirty years ago, although many improvements have been made in the art and have long been in use in Europe. Wireless telephone service is already installed on fast German trains for the use of passengers.

Now, after all these steps toward a monopoly, we find the Radio Corporation, according to Mr. Sarnoff's statement, "licensing competitors under patents necessary for the type and character of set upon which they (the competitors) have built their business." Mr. Sarnoff has announced also that "it is the policy of the Radio Corporation to encourage legitimate competition."

Mr. Sarnoff says that the terms of the licensing agreement are well known to the radio trade. What are they? In substance, a licensee agrees to pay a royalty of 7½ per cent of his invoice price of radio sets, including cabinets, speakers, socket power equipment or batteries, and other accessories, with a minimum guarantee of $100,000 for a period of four and one-half years; this, for the privilege only —and this is of the utmost importance— of making tuned radio frequency receivers. They are licensed to use only their present manufacturing facilities and the license agreement cannot inure to the benefit of assigns, successors or legal representatives of the licensee without the written consent of the R. C. A. In other words, consolidation and amalgamation by a licensee are at the option of the R. C. A. Mr. Sarnoff has said he intends to control the entrance of any new aggregation of capital into the radio business, and that is the meaning of this particular paragraph.

The licensees, further, must license the Radio Corporation of America, or any of the parent companies, under any patents they may have or may obtain, in any field, during the term of agreement, at a reasonable price. And if one cannot be agreed upon, the value is to be fixed by the *New York* Statute of Arbitration.

Another clause requires the licensee to purchase sufficient tubes from the Radio Corporation of America initially to actuate all the sets made by the licensee. In defending this clause, Mr. Sarnoff points out the importance of tubes in the operation of sets and adds that "the tube is the neck of the bottle in the modern radio set." Mr. Sarnoff's metaphor is a particularly happy one: No bottle can rise higher than its neck! Under this clause in the license agreement, the Radio Corporation of America will control the type and efficiency of the sets manufactured by the licensee. Under this clause, the development and engineering of the sets of the

licensees will be dictated by the R. C. A. Furthermore, although Mr. Sarnoff concedes, undoubtedly by advice of counsel, the right to other manufacturers "not infringing patents" to compete for the replacement market, it needs no argument in a magazine read by the radio trade to prove that this clause is intended to assure to the Radio Corporation a complete monopoly of the tube business.

Mr. Sarnoff may claim that this is fostering "legitimate competition," and it is probably true that this fostering has been carefully guided by his legal department because it is obviously designed to give the Radio Corporation control of its competitors and to keep them in subservience. How many radio manufacturers in the past three years could have met an additional 7½ per cent cash outlay at the end of each radio season? How many could have paid the $100,000 a year minimum? Each year the ranks would have decreased. All the commercial uncertainties of the past are still with us, and now the licensees have the additional one of making the public pay the increased price necessitated by these royalties. No one knows better than Mr. Sarnoff the financial vicissitudes

Best Hookups—Thirty Cents Each!

We have laid aside a limited number of back issues of RADIO AGE for your use. Below are listed the best hookups and diagrams to be found in them. Select the ones you want and enclose 30 cents in stamps for each one desired

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—How to Make a Wavemeter—Blueprint.

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—Simplifying Battery Charging.
—Protecting Your Inventions.

June, 1926
—Simple Srystal Set.
—Golden Rule Receiver—Blueprints.

August, 1926
—Receiver, Transmitter and Wavemeter.
—Beginners 200 mile Crystal Set.
—Changing to Single Control.

September, 1926
—How to Make a Grid Meter Driver.
—Short Wave Wavemeter.
—Power Amplifier for Quality (Blueprint)

October, 1926
—Crystal Control Low Power Transmitter (Blueprint.)
—Raytheon Design for A B C Elimination
—What Type Loud Speaker to Use.
—Nine Tube Super Brings Back Faith.

November, 1926
—Blueprints of the Henry-Lyford.
—Worlds Record Super With Large Tubes.
—How to Use a Power Tube in Your Set.

December, 1926
—Starting Radio with Crystal Set.
—Six Tube Shielded Receiver.
—Types of Rectifiers Discussed.

January, 1927
—Full Data on Worlds Record Set.
—Dual TC Receiver.
—Clough Super Design.

February, 1927
—Building the Hammarlund-Roberts.
—Making a 36 Inch Cone Speaker.
—Browning Drake Power Operated.

March, 1927
—Ideal Model Worlds Record Super.
—Building the Hammarlund-Roberts.
—Ridding Supers of Repeat Points.
—Loop and Four Tubes.

April, 1927
—Inexpensive B. Eliminator.
—One Spot Superhet.

May-June, 1927
—Complete Trouble Shooter for Supers.
—9 Tubes for Worlds Record Super.

July-August, 1927
—Building Vacuum Tube Voltmeter
—Low Power Crystal Control Transmitter.

September, 1927
—New A. C. Tubes in a Six-Tube R. F. Receiver (blue prints.)

Radio Age, Inc., 500-510 N. Dearborn St., Chicago

9 27

of the manufacture of radio sets. He must therefore know of the power which the Radio Corporation of America will gain over the radio industry by its position as a creditor under these license agreements with its competitors.

In other words, how can the Radio Corporation of America claim that it is fostering competition by placing its competitors in a frame of mind where they must be ever conscious that they have to meet a fixed cash liability of 7½ per cent of their billings with $100,000 as the annual minimum; that their engineering must be built around the R. C. A. tube characteristics and their production around R. C. A. tube deliveries; that if they desire to consider their business as a realizeable or negotiable asset they must keep themselves in good standing with the Radio Corporation of America?

And at all times, every signatory of one of these licensing agreements must have before him the possibility that new inventions may destroy the commercial value of the ruined radio frequency circuit. But the $100,000 a year minimum would remain in force. Even the R. C. A. might embarass its licensees by such an invention or it might put the invention on the shelf and keep the royalty income, is another evidence of the power which a monopoly has to throttle the development of an in-industry.

So we have the picture of three of America's greatest corporations in the electrical field pooling their patents to build a radio monopoly. That is the Goliath which the independent manufacturers are called upon to meet. It has licensed such as it chooses among its competitors, and if it can carry out its program it will condemn to death by far the largest majority numerically of the manufacturers of receiving sets, as well as 75 per cent of the manufacturers of tubes, accessories and parts. And the few it permits to remain will be compelled to live in the same subservience which it now imposes by its license agreements upon those of its competitors who pay their loyalties, into its treasury. If the Radio Corporation is allowed to carry out these plans, the independent dealer will be forced to go the same way as the independent manufacturer, for it is the history monopoly that the destruction of competition makes the few dealers that remain mere hired salesmen of the trust.

So far as the listening public is concerned, the consummation of this monopoly will mean higher prices for sets. Under the battle-cry of "stabilization" there will be stagnation in the development of the radio industry; under the pretense of the patent laws there will be a stifled art; in defiance of the anti-trust laws, there will be the destruction of competition.

The future of radio is still untouched. Before us there opens a broad vista of partially explored fields of radio science —television, wireless telephony, telephotography, broadcasting of power, the breaking down and building up of the electrons in food, the transmission of the life-giving ultra-violet rays, and the many ramifications that lead from these. Yet in all of these there is to be no commercial basis for independent or competitive development.

It was to meet this crisis in the radio industry that the Radio Protective Association was formed by outstanding representatives among the independent manufacturers to secure the protection of the laws for this great and growing industry; to mobilize public opinion on behalf of a free art; to appeal to Congress and the other federal authorities at Washington as well as the courts against the menace which threatens them. The Federal Trade Commission is already investigating the Radio Corporation of America. Resolutions are pending in the Senate to investigate the great aggregations of capital in holding companies in the electrical industry and it will not be difficult to broaden these to cover the power which such an aggregation of capital could obtain, through monopoly of the radio industry, over the welfare, the happiness and even the politics of the American people.

Sandstorms Affect Aerials

That the sandstorms which occasionally annoy the residents of western Texas are remarkably good generators of electricity as well as of discomfort was announced to the recent meeting of the American Physical Society, in Reno, Nevada, by Messrs. E. F. George, W. M. Young and Harry Hill, of the Texas Technological College, at Lubbock, Texas. Persons caught in these storms have frequently experienced, the Texas physicists report, severe electric manifestations. Sharp shocks may be felt from radio antennas, fence wires or other metal objects. The electric ignition systems of automobiles sometimes refuse to work while such a storm is going on. Using the antenna wire of a large radio station, the three scientists have made actual measurements of the amounts of electricity involved. Voltages as high as 40,000 volts have been observed; amply high enough to cause death if the amount of current obtained were sufficient. Fortunately, the current discharged by the storm into such a single wire is too small, in most cases at least, to be dangerous to life, although it may reach a hundred million times the electric current normally present in the atmosphere. The source of the electricity generated by standstorms is supposed to be the friction between the flying grains of sand in the air and between these sand grains and stationary objects. The air of western Texas is usually so dry that this frictional electricity is not dissipated, as it would be in moist air.

Independents Organize

The battle against radio monopoly in the United States has been brought nearer to a crisis by the organization of the Radio Protective Association, with headquarters in Chicago. That conflict promises to be of decisive importance to the future of the entire radio industry—not only to manufacturers and dealers, but to the listening public as well.

Representatives of about thirty manufacturers, from all parts of the country, took the initial steps in the formation of this anti-trust organization early in August by obtaining a charter of incorporation from the Secretary of State of the state of Illionis. This charter declared the purpose of the association to be "to promote the progress of science and the useful arts insofar as they apply to radio and to preserve the freedom of said science and useful arts."

The following were named as the original board of directors:

Harvey Cory, Neutrowound Radio Manufacturing Company, Homewood, Ill.

Fred S. Armstrong, Vesta Battery Company, Chicago, Ill.

R. W. Augustine, Joy-Kelsey Corporation, Chicago, Ill.

Allen G. Messick, Indiana Manufacturing and Electric Company, Marion, Ind.

Harry Sparks, Sparks-Withington Company, Jackson, Mich.

Oswald F. Schuette of Chicago was elected executive secretary and offices have been opened at 134 South LaSalle Street, Chicago, as the headquarters for the fighting.

Organized opposition to all efforts to create a radio monopoly under the pretense of an alleged patent situation will be carried on vigorously and in all quarters, say sponsers for the new organization. The battle is to be taken to Congress, to the Department of Justice, and to the Courts. The Radio Corporation of America and the testimony which it is taking promises startling revelations when it is made public.

As one of the first steps in the progress of the Radio Protective Association, it has carried the fight direct to the 33,000 radio dealers of the United States. These dealers occupy a vital position in the coming battlefield for they must stand between the radio manufacturers and the purchasing public. Anything that increases the price of radio sets will be reflected in the business of these dealers, declare the independent leaders. And anything which destroys competition in the industry by eliminating independent manufacturers will destroy the business lives of the independent dealers as well, and leave those who survive at the mercy of the monopoly.

British Invent Radio Game

A new outdoor sport for radio fans enlivened the recent field day of the Golders Green and Hendon Radio Society, in England. Instead of hunt-the-button it was hunt the radio set. A small radio broadcasting station was set up in secret in the buildings of a farm house. At intervals this station sent out radio signals. Members of the Society mobilized in the neighborhood and attempted to find the secret station, much as radio scouts in wartime might hunt for the secret radio transmitter of a spy. Mr. Maurice Child, using an apparatus to detect the direction from which radio waves were arriving, made three readings of this direction at different points a few miles apart combined these on a map according to the well-known surveyor's method of "triangulation" and was thus the first to locate the hidden station winning a prize offered by the British radio magazine, the *Wireless World*. Four other contestants succeeded in finding the secret station within the time limit set by the rules.

Are You Fit to Be an Aviator?

(Continued from page 23)

aviators have found protection in a powder puff sewed in each flap of the helmet.

Sound Nervous System Necessary

Defects of nerves constitute the commonest causes of accidents and removal from flying status. Army and Navy fliers are subjected to a psychoanalytic test. By a complete study of the personality and a review of the entire life, the tendencies, resistances and potentialities of the nervous system can be determined.

Therefore, when you go for your examination a conversation like this will be in order:

"What is the first, the very first memory you have?"

"I remember falling off the garden fence," answers the would-be aviator.

"Do you find yourself thinking of falling when you are on high places?" asks the examiner anxious to follow up and unearth a possible complex.

"No, never."

"Well, how about your early life in school? Did you enter into all games? Did you engage in fist fights with your playmates?"

So the questions go. The trends and reactions to stresses in the past life form the basis of a prophecy of the probable reactions to the stress of flying.

Much has been written about the abstinent, non-drinking, non-smoking life of Lindbergh. His cool-headedness was proved long before he hopped the Atlantic by no less than four parachute jumps from unmanageable planes. Such quick reaction time is essential in a flyer. There is often a situation where almost automatic reaction is necessary. Reaction includes coordination of complicated arm and leg movements.

Chilling Must Be Prevented

It is necessary to prevent body chilling. Clothing is a most essential consideration. It varies according to the flight undertaken. Altitude, weather conditions and the degree of protection afforded by the type of plane are all to be considered. The temperature drops five degrees Fahrenheit for 1,000 feet of altitude. At thirty to forty thousand feet a temperature of seventy below zero is encountered. The body must be kept surrounded with warm layers of air between several layers of loose-fitting wool or silk. The mesh and not thickness prevents heat loss. Freedom of movement is essential and ready removability must be insured by a metallic rip arrangement. A thin layer of cold cream on the face is a marked protection.

Adequate physical exercise is necessary for every one and indispensable for fliers. During the war physical trainers were attached to all aviation units and sports and games were part of the daily routine. A good athlete has much toward becoming a good aviator. Eye and limb coordination mental alertness, high efficiency in respiration and circulation and morale are all to be gained by enjoyable exercise. The tone of thoracic and abdominal muscles is increased and metabolic activity of the tissues stimulated by swimming, rowing, golf,

Correct List of Broadcast Stations

KDKA	Westinghouse Electric & Mfg. Co.	E. Pittsburgh, Pa.	315
KDLR	Radio Electric Co.	Devils Lake, N. D.	206
KDYL	Intermountain Bdcstg Corp.	Salt Lake City, Utah	258
KELW	Earl L. White	Burbank, Calif.	229
KEX	Western Broadcasting Company	Portland, Ore.	222
KFAB	Nebraska Buick Auto Co.	Lincoln, Neb.	309
KFAD	Electrical Equipment Co.	Phoenix, Ariz.	273
KFAU	Independent School Dist.	Boise, Idaho	285
KFBB	F. A. Buttrey & Co.	Havre, Mont.	275
KFBC	W. Z. Azbill	San Diego, Calif.	248
KFBK	Sacramento Bee	Sacramento, Calif.	535
KFBL	Leese Bros.	Everett, Wash.	224
KFBS	School District No. One	Trinidad, Colo.	238
KFBU	Bishop N. S. Thomas	Laramie, Wyo.	428
KFCB	Nielson Radio Supply Co.	Phoenix, Ariz.	244
KFCR	Santa Barbara Broadcasting Co.	Santa Barbara, Calif.	211
KFDM	Magnolia Petroleum Co.	Beaumont, Texas	375
KFDX	First Baptist Church	Shreveport, La.	236
KFDY	South Dakota State College	Brookings, S. D.	394
KFDZ	Harry O. Iverson	Minneapolis, Minn.	216
KFEC	Meier & Frank	Portland, Ore.	214
KFEL	Eugene P. O'Fallon, Inc.	Denver, Colo.	248
KFEQ	Scroggin & Co.	St. Joseph, Neb.	206
KFEY	Bunker Hill & Sullivan	Kellogg, Idaho	233
KFGQ	Boone Biblical College	Boone, Iowa	210
KFH	Hotel Lassen	Wichita, Kans.	246
KFHA	Western State College of Colo.	Gunnison, Colo.	254
KFHL	Penn. College	Oskaloosa, Iowa	212
KFI	E. C. Anthony, Inc.	Los Angeles, Calif.	468
KFIF	Benson Polytechnic Institute	Portland, Ore.	214
KFIO	North Central High School	Spokane, Wash.	246
KFIU	Alaska Electric Light & Power Co.	Juneau, Alaska	226
KFIZ	Commonwealth Reporter	Fond du Lac, Wis.	268
KFJB	Marshall Electric Co.	Marshalltown, Iowa	248
KFJF	National Radio Mfg. Co.	Oklahoma City, Okla.	272
KFJI	E. E. Marsh	Astoria, Ore.	250
KFJM	University of North Dakota	Grand Forks, N. D.	331
KFJR	Ashley C. Dixon & Son	Portland, Ore.	283
KFJY	Tunwall Radio Co.	Fort Dodge, Iowa	240
KFJZ	W. E. Branch	Ft. Worth, Tex.	250
KFKA	Colo. State Teachers College	Greeley, Colo.	400
KFKB	J. R. Brinkley	Milford, Kan.	242
KFKU	The University of Kansas	Lawrence, Kans.	254
KFKZ	State Teachers College	Kirksville, Mo.	225
KFLR	University of New Mexico	Albuquerque, N. M.	416
KFLU	San Benito Radio Club	San Benito, Texas	236
KFLV	Swedish Evangelist Church	Rockford, Ill.	268
KFLX	George Roy Clough	Galveston, Texas	270
KFMR	Morningside College	Sioux City, Iowa	441
KFMX	Carlton College	Northfield, Minn.	337
KFNF	Henry Field Seed Co.	Shenandoah, Iowa	270
KFOA	Rhodes Department Store	Seattle, Wash.	447
KFOB	KFOB, Inc.	Burlingame, Calif.	225
KFON	Nicholas & Warriner, Inc.	Long Beach, Calif.	242
KFOR	Tire & Electric Co.	David City, Neb.	217
KFOX	Tech. High School	Omaha, Nebr.	258
KFOY	Beacon Radio Service	St. Paul, Minn.	285
KFPL	C. C. Baxter	Dublin, Texas	275
KFPM	The New Furniture Co.	Greenville, Texas	231
KFPR	Los Angeles County Forestry Dept.	Los Angeles, Cal.	232
KFPW	St. Johns M. E. Church	Carterville, Mo.	263
KFPY	Symons Investment Co.	Spokane, Wash.	246
KFQA	The Principia	St. Louis, Mo.	322
KFQB	Lone Star Bdcast Co.	Fort Worth, Texas	261
KFQD	Anchorage Radio Club	Anchorage, Alaska	345
KFQU	W. E. Riker	Holy City, Calif.	250
KFQW	C. F. Knierim	Seattle, Wash.	217
KFQZ	Taft Products Co.	Hollywood, Calif.	232
KFRC	Don Lee, Inc.	San Francisco, Calif.	254
KFRU	Stephens College	Columbia, Mo.	250
KFSD	Airfan Radip Corp.	San Diego, Calif.	441
KFSG	Echo Park Evan. Assn.	Los Angeles, Calif.	275
KFTL	C. C. Baxter	Dublin, Tex.	252
KFUL	Thomas Groggan & Bros.	Galveston, Texas	258
KFUM	W. D. Corley	Colorado Springs, Colo.	236
KFUO	Concordia Seminary	St. Louis, Mo.	545
KFUP	Fitzsimmons General Hospital	Denver, Colo.	227
KFUR	Peery Bldg. Co., Inc.	Ogden, Utah	225
KFUS	Louis L. Sherman	Oakland, Calif.	256
KFUT	University of Utah	Salt Lake City, Utah	500
KFVD	Chas. & W. J. McWhinnie	Venice, Calif.	208
KFVE	Benson Broadcasting Corp.	St. Louis, Mo.	234
KFVG	First M. E. Church	Independence, Kans	225
KFVI	KFVI Broadcasting Co.	Houston, Texas	238
KFVS	Cape Girardeau Battery Sta.	Cape Girardeau, Mo.	224
KFWB	Warner Bros. Pictures	Hollywood, Calif.	261
KFWC	L. E. Wall	San Bernardino, Calif.	222
KFWF	St. Louis Truth Center	St. Louis, Mo.	214
KFWI	Radio Entertainments, Inc.	San Francisco, Calif.	268
KFWM	Oakland Educational Society	Oakland, Calif.	236
KFWO	Lawrence Mott	Avalon, Calif.	218
KFWV	KFWV Studios	Portland, Ore.	229
KFXB	Bertram C. Heller	Los Angeles, Calif.	353
KFXF	Colorado Radio Corp.	Denver, Colo.	283
KFXJ	Mt. States Radio Dis., Inc.	(Portable) Colorado	216
KFXR	Classen Film Finishing Co.	Oklahoma City, Okla.	224
KFXY	Harry M. Costigan	Flagstaff, Ariz.	205
KFYF	Carl's Radio Den	Oxnard, Calif.	238
KFYR	Koskins-Meyer, Inc.	Bismarck, N. D.	240
KGA	Northwest Radio Service Co.	Spokane, Wash.	261
KGAR	Tucson Citizen	Tucson, Ariz.	234
KGBS	A. C. Dailey	Seattle, Wash.	203
KGBU	Alaska Radio Co.	Ketchikan, Alaska	229
KGBX	Foster Hall Tire Co.	St. Joseph, Mo.	288
KGBY	Dunning & Taddikon	Shelby, Nebr.	203
KGBZ	George R. Miller	York, Nebr.	213
KGCA	C. W. Greenley	Decorah, Iowa	248
KGCB	Wallace Radio Institute	Oklahoma, Okla.	216
KGCG	Moore Motor Co.	Newark, Ark.	224
KGCH	Wayne Hospital	Wayne, Nebr.	294
KGCI	Liberty Radio Sales	San Antonio, Texas	220
KGCL	Louis Wasmer	Seattle, Wash.	231
KGGN	Concordia Bdcstg. Co.	Concordia, Kans.	208
KGCR	Cutler's Broadcasting Service	Brookings, S. D.	208
KGCU	Mandan Radio Assn.	Mandan, N. D.	208
KGCX	First State Bank	Vida, Mont.	225
KGDA	Home Auto Co.	Dell Rapids, S. D.	234
KGDE	Jaren Drug Co.	Barrett, Minn.	205
KGDJ	R. Rathert	Cresco, Iowa	203
KGDM	V. G. Koping	Stockton, Calif.	217
KGDP	Boy Scouts of America	Pueblo, Colo.	224
KGDR	Radio Engineers	San Antonio, Tex.	203
KGDX	William Erwin Antony	Shreveport, La.	213
KGDY	J. Albert Loesch	Oldham, S. D.	207
KGDW	Frank J. Rist	Humboldt, Nebr.	207
KGEF	Trinity Methodist Church	Los Angeles, Calif.	263
KGEH	Eugene Broadcast Station	Eugene, Ore.	201
KGEK	Beehler Elect. Equipment Co.	Yuma, Colo.	263
KGEN	E. R. Irey & F. M. Bowles	El Centro, Calif.	225
KGEO	Raymond D. Chamberlain	Grand Island, Nebr.	205
KGEQ	Fred W. Herrmann	Minneapolis, Minn.	203
KGER	C. Merwin Dobyns	Long Beach, Calif.	216
KGEU	L. W. Clement	Lower Lake, Calif.	227
KGEW	City of Fort Morgan	Fort Morgan, Colo.	219
KGEY	J. W. Dietz	Denver, Colo.	201
KGEZ	Flathead Broadcasting Ass'n.	Kalispell, Mont.	205
KGFB	A. G. Dunkel	Iowa City, Iowa	224
KGFF	Earl E. Hampshire	Alva, Okla.	205
KGFG	Full Gospel Church	Oklahoma City, Okla.	216
KGFH	Frederick Robinson	La Crescenta, Calif.	224
KGFI	M. L. Eaves	Fort Stockton, Texas	220
KGFJ	Ben S. McGlashan	Los Angeles, Calif.	208
KGFK	Kittson County Enterprise	Hallock, Minn.	224
KGFL	Trinidad Broadcasting Co.	Trinidad, Colo.	222
KGFM	Geo. W. Johnson	Yuba City, Calif.	211
KGFN	Haraldson & Thingstad	Aneta, North Dakota	200
KGFP	Mitchell Broadcast Co.	Mitchell, South Dakota	212
KGO	General Electric Co.	Oakland, Calif.	384
KGRC	Gene Roth & Co.	San Antonio, Texas	220
KGRS	Gish Radio Service	Amarillo, Tex.	244
KGTT	Glad Tidings Tabernacle, Inc.	San Francisco, Cal.	207

tennis, handball and other favorite recreations. A body kept hard by outdoor life, covered with loose clothing and given sufficient rest has the greatest known preventives against a tendency to circulatory asthenia. Before making a flight dietary indiscretions must be avoided and liquids limited to reduce kidney stimulation from cold.

Poisoning by dope presents a health hazard. Amyl and butyl acetate, gasoline, denatured alcohol and cellulose make up the standard dope used on the surface of fabrics, covering the wings and bodies of airplanes. These are dangerous chemicals. Their concentrated fumes produce headaches and nausea. Death may occur suddenly with symptoms of vertigo. Soluble dope reaching the bowels is best eliminated by a persistent milk diet.

Another recent addition to aviation hazards has resulted from the employment of ethyl fluid which has as its base tetraethyl lead. Danger of lead poisoning requires the usual precautions taken in the lead trades.

Aeronautics in its progress is incorporating the modern equipment of technology and psychology, as well as preventive medical principles. The flight surgeon should keep him men physically and mentally fit to fly. He should know his men intimately and be quick to recognize any condition which the flyer himself may not think important.

Length of Flying Life

Every aviator should be examined every six months and after every illness. This will greatly prolong his usefulness. The English found during the early part of the war that stress of work at the front meant a limited amount of work in the air; that the limit of every flyer was approximately 150 to 300 hours. At the end of the war these figures were greatly improved and now they are better still. Lindbergh has spent around 2,000 hours in the air.

The International Medical Requirements for Air Navigation have been adopted by practically all countries except the United States. The requirements of our Army and Navy are along the same lines. The medical requirements are stricter for pilots engaged in public transport. They are all required to be examined every six months.

The civil flight surgeon is the man of tomorrow. Aviation medicine is a specialty and only those with special training are qualified to make special examinations. With civilian transport companies carrying both passengers and freight; with the air full of commuters, the civilian physician will need to know aviation medicine. There are opportunities now for him.

There is no doubt that we shall all want to fly. Ernest L. Smith, Emory B. Bronte and Lieuts. Lester J. Maitland and Albert F. Hegenberger tested the radio beacon as a guide to a diminutive goal in the sea to prove that we can fly anywhere. The trans-Atlantic fliers tested engine-endurance to prove it. Lieut. Al Williams is trying to show how fast we can do it, and Lieut. James Doolittle, by his amazing outside loop, has shown how sportively we can fly.

The world is moving on at a great rate toward our getting up over the traffic-

KGU	Marion A. Mulrony	Honolulu, Hawaii	270
KGW	Oregonian Publishing Co	Portland, Ore.	491
KGY	St. Martins College	Lacey, Wash.	244
KHJ	Times-Mirror Co.	Los Angeles, Calif.	405
KHQ	Louis Wasmer	Spokane, Wash.	370
KICK	Atlantic Automobile Co.	Anita, Iowa	461
KJBS	J. Brunton & Sons Co.	San Francisco, Calif.	220
KJR	Northwest Radio Service Co.	Seattle, Wash.	348
KKP	City of Seattle, Harbor Dept.	Seattle, Wash.	265
KLDS	Reorganized Ch. of Jesus Christ, Independence, Mo.		238
KLIT	Lewis Irvine Thompson	Portland, Ore.	207
KLS	Warner Brothers	Oakland, Calif.	246
KLX	Tribune Publishing Co.	Oakland, Calif.	508
KLZ	Reynolds Radio Co.	Denver, Colo.	268
KMA	May Seed & Nursery	Shenandoah, Iowa	270
KMED	W. J. Virgin	Medford, Ore.	268
KMIC	J. R. Fouch	Inglewood, Calif.	224
KMJ	Fresno Bee	Fresno, Calif.	366
KMMJ	M. M. Johnson Co.	Clay Center, Nebr.	379
KMO	Love Electric Co.	Tacoma, Wash.	254
KMOX	Voice of St. Louis	St. Louis, Mo.	300
KMTR	Radio Corp.	Hollywood, Calif.	526
KNRC	C. B. Juneau	Santa Monica, Calif.	375
KNX	Los Angeles Express	Los Angeles, Calif.	337
KOA	General Electric Co.	Denver, Colo.	326
KOAC	Oregon Agriculture College	Corvallis, Oreg.	326
KOB	N. Mex. College of Agric.	State College, N. Mex.	394
KOCH	Oamaha Central High School	Omaha, Neb.	258
KOCW	Oklahoma College for Women	Chickasha, Okla.	252
KOIL	Mona Motor Oil Co.	Council Bluffs, Iowa	278
KOIN	KOIN, Inc.	Portland, Ore.	319
KOMO	Fisher's Blend Station, Inc.	Seattle, Wash.	307
KOWW	Frank A. Moore	Walla, Walla Wash.	300
KPCB	Pacific Coast Biscuit Co.	Seattle, Wash.	231
KPJM	Wilburn Radio Service	Prescott, Ariz.	214
KPNP	Central Radio Co.	Muscatine, Iowa	211
KPO	Hale Bros., Inc.	San Francisco, Calif.	422
KPPC	Pasadena Presbyterian Church	Pasadena, Calif.	229
KPRC	Houston Printing Co.	Houston, Texas	294
KPSN	Star-News	Pasadena, Calif.	316
KQW	First Baptist Church	San Jose, Calif.	297
KQV	Doubleday-Hill Electric Co.	Pittsburgh, Pa.	270
KRAC	Caddo Radio Club	Shreveport, La.	220
KRE	Berkeley Daily Gazette	Berkeley, Calif.	256
KRLD	Dallas Rado Laboratories	Dallas, Tex.	461
KRLO	Freeman Lang & A. B. Scott	Los Angeles, Calif.	216
KROX	N. D. Brown	Seattle, Wash.	211
KRSC	Radio Sales Corp.	Seattle, Wash.	211
KSAC	Kansas State Agricultural College	Manhattan, Kans.	333
KSBA	W. G. Patterson	Shreveport, La.	268
KSD	Pulitzer Publishing Co.	St. Louis, Mo.	545
KSCJ	The Journal	Sioux City, Iowa	244
KSEI	Broadcasting Association	Pocatello, Idaho	333
KSL	Radio Service Corp.	Salt Lake City, Utah	303
KSMR	Santa Maria Valley Railroad	Santa Maria, Calif.	273
KSO	Berry Seed Co.	Clarinda, Iowa	227
KSOO	Sioux Falls Bdcst. Ass'n	Sioux Falls, S. D.	210
KTAB	Associated Broadcasters	Oakland, Calif.	280
KTAP	Robert B. Bridge	San Antonio, Texas	229
KTBI	Bible Institute	Los Angeles, Calif.	283
KTBR	M. E. Brown	Portland, Ore.	283
KTCL	Amer. Radio Tel. Co.	Seattle, Wash.	278
KTHS	New Arlington Hotel	Hot Springs, Ark.	384
KTNT	N. Baker	Muscatine, Iowa	256
KTUE	Uhalt Electric	Houston, Texas	213
KTW	First Presbyterian Church	Seattle, Wash.	394
KUJ	Puget Sound Broadcasting Co.	Seattle, Wash.	200
KUOA	University of Arkansas	Fayetteville, Ark.	297
KUOM	University of Montana	Missoula, Mont.	375
KUSD	University of South Dakota	Vermillion, S. D.	484
KUT	University of Texas	Austin, Texas	232
KVI	Puget Sound Broadcasting Co.	Tacoma, Wash.	234
KVOO	Southwestern Sales Corp.	Bristow, Okla.	349
KVOS	L. Kessler	Seattle, Wash.	210
KWBS	Schaeffer Mfg. Co.	Portland, Ore.	201
KWCR	H. F. Parr	Cedar Rapids, Iowa	384
KWG	Portable Wireless Telegraph Co.	Stockton, Calif.	345
KWKC	Wilson Duncan Studios	Kansas City, Mo.	222
KWLC	Luther College	Decorah, Iowa	249
KWSC	State College of Washington	Pullman, Wash.	394
KWTC	J. W. Hancock	Santa Ana, Calif.	353
KWUC	Western Union College	Le Mars, Iowa	244
KWWG	Chamber of Commerce	Brownsville, Texas	278
KXL	KXL Broadcasters	Portland, Ore.	220
KYA	Pacific Broadcasting Corp.	San Francisco, Calif.	309
KYW	Westinghouse Electric & Mfg. Co.	Chicago, Ill.	526
KZM	Preston D. Allen	Oakland, Calif.	246
WAAD	Ohio Mechanical Institute	Cincinnati, Ohio	268
WAAF	Chicago Daily Drovers Journal	Chicago, Ill.	359
WAAM	Isaiah R. Nelson	Newark, N. J.	349
WAAT	F. V. Bremer	Jersey City, N. J.	246
WAAW	Omaha Grain Exchange	Omaha, Nebr.	375
WABC	Atlantic Broadcasting Corp.	New York, N. Y.	326
WABF	Markle Broadcasting Corp.	Pringleboro, Pa.	205
WABI	1st Universalist Church	Bangor, Me.	389
WABO	Hickson, Electric Co., Inc.	Rochester, N. Y.	232
WABQ	Keystone Broadcasting Co.	Philadelphia, Pa.	261
WABW	College of Wooster	Wooster, Ohio	248
WABY	John Magaldi, Jr.	Philadelphia, Pa.	248
WABZ	Colis Place Baptist Church	New Orleans, La.	248
WADC	Allen Theater	Akron, Ohio	297
WAFD	Albert P. Parfet	Detroit, Mich.	219
WAGM	R. L. Miller	Royal Oak, Mich.	225
WAGS	Willow Garage, Inc.	Sommerville, Mass.	216
WAIT	A. H. Waite & Co.	Taunton, Mass.	214
WAIU	American Insurance Union	Columbus, Ohio	283
WALK	Albert A. Walker	Bathayres, Pa.	204
WAMD	Raddison Radio Corp.	Minneapolis, Minn.	225
WAPI	Alabama Polytechnic Institute	Auburn, Ala.	326
WARS	Amateur Radio Specialty Co.	Brooklyn, N. Y.	227
WASH	Baxter Laundry Co.	Grand Rapids, Mich.	256
WATT	Edison Elec. Illum.	Boston, Mass.	201
WBAA	Purdee University	W. Lafayette, Ind.	273
WBAK	Pennsylvania State Police	Harrisburg, Pa.	300
WBAL	Consolidated Gas & Power Co.	Baltimore, Md.	285
WBAO	James Milliken University	Decatur, Ill.	268
WBAP	Ft. Worth Star Telegram	Ft. Worth, Texas	500
WBAW	Waldrum Drug Co.	Nashville, Tenn.	248
WBAX	John H. Stenger, Jr.	Wilkes-Barre, Pa.	250
WBBC	Brooklyn Bdcstg. Corp.	Brooklyn, N. Y.	227
WBBL	Grace Covenant Presbyterian Church	Richmond, Va.	248
WBBM	Atlass Investment	Chicago, Ill.	389
WBBP	Petoskey High School	Petoskey, Mich.	240
WBBR	People's Pulpit Assoc.	Rossville, N. Y.	256
WBBW	Ruffner Junior High School	Norfolk, Va.	236
WBBY	Washington, Light Inf.	Charleston, S. C.	500
WBBZ	C. L. Carrell	Chicago, Ill.	204
WBCN	Great Lakes Broadcasting Co.	Chicago, Ill.	288
WBES	Bliss Electrical School	Takoma Park, Md.	297
WBET	Boston Transcript Co.	Boston, Mass.	265
WBKN	Arthur Faske	Brooklyn, N. Y.	268
WBMH	Braun's Music House	Detroit, Mich.	211
WBMS	G. J. Schowerer	North Bergen, N. J.	268
WBNY	Baruschrome Corp.	New York, N. Y.	236
WBOQ	Atlantic Bdcst. Corp.	Richmond Hill, N. Y.	326
WBRC	Birmingham Broadcasting Co.	Birmingham, Ala.	244
WBRE	Baltimore Radio Exchange	Wilkes-Barre, Pa.	250
WBRL	Booth Radio Laboratories	Tilton, N. H.	232
WBRS	Universal Radio Mfg. Co.	Brooklyn, N. Y.	211
WBSO	Babson's Statistical Org.	Wellesley Hills, Mass.	384
WBT	Charlotte Chamber of Commerce	Charlotte, N. C.	258
WBZ	Westinghouse Elect. & Mfg. Co.	Springfield, Mass.	333
WBZA	Westinghouse Elect. & Mfg. Co.	Boston, Mass.	333
WCAC	Connecticut Agricultural College	Mansfield, Conn.	275
WCAD	St. Lawrence University	Canton, N. Y.	366
WCAE	Pittsburgh Press	Pittsburgh, Pa.	517
WCAH	C. A. Entrekin	Columbus, Ohio	535
WCAJ	Nebraska Wesleyan University	University Pl., Nebr.	379
WCAL	St. Olaf College	Northfield, Minn.	236
WCAM	City of Camden	Camden, N. J.	224
WCAO	Monumental Radio Inc.	Baltimore, Md.	384
WCAT	School of Mines	Rapid City, S. D.	248
WCAU	Universal Broadcasting Co.	Philadelphia, Pa.	278
WCAX	University of Vermont	Burlington, Vt.	254
WCAZ	Carthage College	Carthage, Ill.	341
WCBA	Queen City Radio Station	Allentown, Pa.	222
WCBD	Wilbur Glenn Voliva	Zion, Ill.	345
WCBE	Uhalt Radio Co.	New Orleans, La.	227
WCBM	Hotel Chateau	Baltimore, Md.	384
WCBR	C. H. Messter	Providence, R. I.	201

choked streets, where there is more room. Our children are going to consider travel by air as safe, perhaps safer, than travel on foot. Moreover health, airships and flying sanatoriums are going to be afloat.

The Telephone's Progeny

The telephone, most widely used of communication devices, has become the father of an illustrious family of communication instruments. These include the Vitaphone which furnishes a voice to the motion picture screen; an audiometer to test hearing; an audiphone to aid the hard of hearing; an electrical stethoscope which amplifies the faintest heart sounds; a public address system which carries a speaker's voice to crowds of thousands and tens of thousands; and the microphone—the heart of the radio.

Electric Darts

A tree trunk actually blown to bits by lighting, as though by a dynamite bomb placed inside it, is described by Dr. N. Ernest Dorsey, of Washington, D. C., in a recent issue of the Monthly Weather Review, official publication of the United States Weather Bureau. The tree was struck by a lightning bolt in Jacksonville, Illinois, on the afternoon of April 13, 1927. Photographs made immediately were submitted to Dr. Dorsey by Mr. Frank P. Norbury, a cooperative observer of the Weather Bureau at Jacksonville. The lightning did not strip off the bark or knock off a limb or two; it literally blew the tree to bits. The incident supplies, Dr. Dorsey believes, support for his theory that lightning does not consist of ordinary electric sparks but of "darts" of concentrated electricity, shot down from the clouds like bullets from a gun. Ordinary electric sparks would merely follow the outside of the tree into the ground. The imagined dart of lightning, on the other hand, might penetrate the trunk, just as a bullet would do. Inside the wet wood this electric bullet would cause a powerful steam explosion, disrupting the trunk exactly as did happen in this instance.

Airplanes of the Future

That the airplane of the future will be large enough to carry a hundred passengers; able to land almost vertically, so that any field will serve for emergency landings; capable of taking off or landing on the roofs of city buildings; fireproof, and equipped for flying at a speed of three hundred miles an hour and at a height of 30,000 feet above the ground, are predictions made by Professor Alexander Klemin, head of the Daniel Guggenheim School of Aeronautics, in a statement issued by New York University.

Air planes as large as ocean liners, Professor Klemin considers improbable, as the theory of the support of aircraft in the air calls for a limit of size at about the point of a fifty-ton machine with the hundred-passenger capacity. The higher speed at high altitudes will be attained by the super-charger, a device already in use to compress the air before supplying it to the engine.

WCBS	H. L. Lewing	Springfield, Ill.	210
WCCO	Washburn-Crosby Co.	Anoka, Minn.	405
WCFL	Chicago Fed. of Labor	Chicago, Ill.	484
WCGU	C. G. Under	Lakewood, N. J.	211
WCLO	C. E. Whitmore	Camp Lake, Wis.	227
WCLS	WCLS, Inc.	Joliet, Ill.	216
WCMA	Culver Military Academy	Culver, Ind.	258
WCOA	City of Pensacola	Pensacola, Fla.	250
WCOC	Crystal Oil Co.	Columbus, Miss.	231
WCOT	Jacob Conn	Olneyville, R. I.	225
WCRW	Clinton R. White	Chicago, Ill.	224
WCSH	Congress Square Hotel Co.	Portland, Maine	361
WCSO	Wittenberg College	Springfield, Ohio	256
WCWK	Chester W. Keen	Fort Wayne, Ind.	229
WCWS	Bridgeport Bdcst. Sta.	Bridgeport, Conn.	214
WCX	Detroit Free Press	Pontiac, Mich.	441
WDAD	Dad's Auto Accessories, Inc.	Nashville, Tenn.	225
WDAE	Tampa Daily T mes	Tampa, Fla.	268
WDAF	Kansas City Stair	Kansas City, Mo.	370
WDAG	J. Laurence Martin	Amarillo, Texas	263
WDAH	Trinity Methodist Church	El Paso, Texas	234
WDAY	Radio Equipment Corp.	Fargo, N. D.	361
WDBJ	Richardson Wayland Elec. Corp.	Roanoke, Va.	231
WDBO	Orlando Broadcasting Co.	Orlando, Fla.	288
WDBZ	Boy Scouts of America	Kingston, N. Y.	216
WDEL	Wilmington Elec. Specialty Co.	Wilmington, Del.	265
WDGY	Dr. George W. Young	Minneapolis, Minn.	263
WDOD	Chattanooga Radio Co., Inc.	Chattanooga, Tenn.	246
WDRC	Doolittle Radio Corp.	New Haven, Conn.	275
WDWF	Dutee Wilcox Flint, Inc.	Cranston, R. I.	375
WDWM	Radio Industries Broadcast Co.	Newark, N. J.	361
WDZ	J. L. Bush	Tuscola, Ill.	278
WEAF	National Broadcasting Co.	New York, N. Y.	491
WEAM	Bor. of N. Plainfield	North Plainfield, N. J.	240
WEAN	The Shepard Co.	Providence, R. I.	319
WEAO	Ohio State University	Columbus, Ohio	283
WEAR	Willard Storage Battery Co.	Cleveland, Ohio	400
WEBC	Head-of-the-Lakes Radio Station	Superior, Wis.	242
WEBE	Roy W. Waller	Cambridge, Ohio	248
WEBH	Edgewater Beach Hotel	Chicago, Ill.	366
WEBJ	Third Avenue Railway Co.	New York, N. Y.	256
WEBQ	Tate Radio Corp.	Harrisburg, Ill.	225
WEBR	H. H. Howell	Buffalo, N. Y.	242
WEBW	Beloit College	Beloit, Wis.	259
WEDC	E. Denemark Station	Chicago, Ill.	242
WEEI	The Edison Elec. Illuminating Co.	Boston, Mass.	448
WEHS	A. T. Becker	Evanston, Ill.	216
WEMC	Emanuel Missionary College	Berrien Springs, Mich.	238
WENR	Great Lakes Broadcasting Co.	Chicago, Ill.	288
WEPS	Matheson Radio Co., Inc.	Gloucester, Mass.	297
WEW	St. Louis University	St. Louis, Mo.	353
WFAA	Dallas News & Dallas Journal	Dallas, Texas	500
WFAM	Times Publishing Co.	St. Cloud, Minn.	252
WFBC	First Baptist Church	Knoxville, Tenn.	234
WFBE	Garfield Place Hotel Co.	Cincinnati, Ohio	246
WFBG	The Wm. F. Gable Co.	Altoona, Pa.	280
WFBJ	St. John's University	Collegeville, Minn.	273
WFBL	The Onondaga Co.	Syracuse, N. Y.	259
WFBM	Indianapolis Power & Light Co.	Indianapolis, Ind.	225
WFBR	Fifth Infantry National Guard	Baltimore, Md.	225
WFBZ	Knox College	Galesburg, Ill.	248
WFCI	Frank Crook, Inc.	Pawtucket, R. I.	225
WFDF	F. D. Fallain	Flint, Mich.	349
WFHH	Chamber of Commerce	Clearwater, Fla.	366
WFI	Strawbridge and Clothier	Philadelphia, Pa.	405
WFIW	The Acme Mills, Inc.	Hopkinsville, Ky.	280
WFKB	Vesta Battery Corp.	Chicago, Ill.	224
WFLA	Boca Raton Radio Corp.	Boca Raton, Fla.	213
WFRL	Flatbush Radio Labs.	Brooklyn, N. Y.	219
WGAL	Lancaster Elec. Supply & Const. Co.	Lancaster, Pa.	252
WGBB	H. H. Carman	Freeport, N. Y.	246
WGBC	First Baptist Church	Memphis, Tenn.	278
WGBF	Fink Furniture Co.	Evansville, Ind.	236
WGBI	Scranton Broadcasters, Inc.	Scranton, Pa.	231
WGBS	Gimbel Brothers	Astoria, L. I., N. Y.	349
WGCP	Lanter Piano Co.	Newark, N. J.	280
WGES	Oak Leaves Broadcasting Corp.	Chicago, Ill.	242
WGHP	G. H. Phelps	Detroit, Mich.	319
WGL	International Broadcasting Corp.	Secaucus, N. Y.	294
WGM	Verne and Elton Spencer	Jeanette, Pa.	208
WGMU	Atlantic Bdcst. Co.	New York, N. Y.	201
WGN	The Tribune	Chicago, Ill.	306
WGR	Federal T. and T. Co.	Buffalo ,N. Y.	303
WGST	Georgia School of Technology	Atlanta, Ga.	270
WGWB	Radiocast Corporation	Milwaukee, Wis.	219
WGY	General Elec. Co.	Schenectady, N. Y.	379
WHA	University of Wisconsin	Madison, Wis.	319
WHAD	Marquette University	Milwaukee, Wis.	294
WHAM	Stromberg-Carlson Tel. Mfg. Co.	Rochester, N. Y.	278
WHAP	W. H. Taylor Finance Corp.	New York, N. Y.	236
WHAR	F. D. Cooks Sons	Atlantic City, N. J.	273
WHAS	Courier-Journal & Louisville Times	Louisville, Ky.	461
WHAZ	Rensselaer Polytechnic Institute	Troy, N. Y.	379
WHB	Sweeney School Co.	Kansas City, Mo.	337
WHBA	C. C. Shaffer	Oil City, Pa.	261
WHBC	Rev. E. P. Graham	Canton, Ohio	236
WHBD	Chamber of Commerce	Bellefontaine, Ohio	222
WHBF	Beardsley Specialty Company	Rock Island, Ill.	222
WHBL	James H. Slusser	Chicago, Ill.	204
WHBM	C. L. Carrell	Chicago, Ill.	201
WHBN	First Ave. Methodist Church	St. Petersburg, Fla.	297
WHBP	Johnstown Automobile Co.	Johnstown, Pa.	229
WHBQ	WHBQ, Inc.	Memphis, Tenn.	232
WHBU	Bings Clothing—Riviera Theater	Anderson, Ind.	219
WHBW	D. R. Kienzle	Philadelphia, Pa.	220
WHBY	St. Norbert's College	West de Pere, Wis.	250
WHDI	W. H. Dunwoody Institute	Minneapolis, Minn.	246
WHEC	Hickson Electric Co., Inc.	Rochester, N. Y.	232
WHFC	Triangle Broadcasters	Chicago, Ill.	216
WHK	The Radio Air Service Corp.	Cleveland, Ohio	265
WHN	Loew's State Broadcasting Station	New York, N. Y.	395
WHO	Banker's Life Co.	Des Moines, Ia.	535
WHT	Radiophone Broadcasting Corp.	Deerfield, Ill.	416
WIAD	Howard R. Miller	Philadelphia, Pa.	220
WIAS	Home Electric Co.	Burlington, Iowa	476
WIBA	Capital Times-Strand Theatre	Madison, Wis.	240
WIBG	St. Paul's Protestant E. Church	Elkins Park, Pa.	441
WIBI	Frederick B. Zittell, Jr.	Flushing, L. I., N. Y.	268
WIBJ	C. L. Carrell	Chicago, Ill.	201
WIBM	C. L. Carrell	Chicago, Ill.	201
WIBO	WIBO Broadcasters, Inc.	Chicago, Ill.	416
WIBS	N. J. National Guard	Elizabeth, N. J.	203
WIBU	The Electric Farm	Poynette, Wis.	217
WIBW	C. L. Carrell	Chicago, Ill.	204
WIBX	WIBX, Inc.	Utica, N. Y.	238
WIBZ	A. D. Trum	Montgomery, Ala.	231
WICC	Bridgeport Bdcst. Station	Bridgeport, Conn.	214
WIL	Benson Radio Co.	St. Louis, Mo.	258
WIOD	Earl G. Fisher Co.	Miami, Fla.	248
WIP	Gimbel Bros.	Philadelphia, Pa.	508
WJAD	Hotel Raleigh	Waco, Texas	448
WJAG	Norfolk Daily News	Norfolk, Neb.	286
WJAK	Kokomo Tribune	Kokomo, Ind.	234
WJAM	D. M. Perham	Cedar Rapids, Iowa	384
WJAR	The Outlet Co.	Providence, R. I.	484
WJAS	Pittsburgh Radio Supply House	Pittsburgh, Pa.	270
WJAX	City of Jacksonville	Jacksonville, Fla.	337
WJAY	Cleveland Broadcasting Corp.	Cleveland, O.	227
WJAZ	American Bdcast. Corp.	Mt. Prospect, Ill.	263
WJBA	D. H. Lentz, Jr.	Joliet, Ill.	322
WJBB	Financial Journal	St. Petersburg, Fla.	345
WJBC	Hummer Furniture Co.	LaSalle, Ill.	227
WJBI	Robert S. Johnson	Red Bank, N. J.	256
WJBK	E. F. Goodwin	Ypsilanti, Mich.	220
WJBL	Wm. Gushard Dry Goods Co.	Decatur, Ill.	213
WJBO	Valdemar Jensen	New Orleans, La.	263
WJBR	Gensch and Stearns	Omro, Wis.	227
WJBT	John S. Boyd	Chicago, Ill.	389
WJBU	Bucknell University	Lewisburg, Pa.	214
WJBW	C. Carlson, Jr.	New Orleans, La.	238
WJBY	Electric Construction Co.	Gadsden, Ala.	234
WJBZ	Roland G. Palmer	Chicago Heights, Ill.	208
WJJD	Supreme Lodge, L. O. of Moose	Mooseheart, Ill.	266
WJPW	J. P. Wilson	Ashtabula, Ohio	208
WJR	Station WJR, Inc.	Pontiac, Mich.	441
WJZ	Radio Corp. of America	Bound Brook, N. J.	454
WKAQ	Radio Corp. of Porto Rico	San Juan, P. R.	341
WKAR	Michigan State College	East Lansing, Mich.	285
WKAV	Laconia Radio Club	Laconia, N. H.	224
WKBB	Sanders Bros.	Joliet, Ill.	216

Announcement

IN making a report on tests of a new seven-tube super-heterodyne which has been developed in the Radio Age laboratories our technical department brought in such good news about the circuit that we decided to pass it on to our readers. Full instructions on how to build the set, with illustrations, including blueprints, will be published exclusively in the November issue of this magazine.

THE Quadrode (Four Element) Superheterodyne does not merely present something new and different in the arrangement of parts. It is not merely a modification of the reflex. It is not a reflex. It introduces an element into superheterodyne construction that has never before been used. This new method makes it possible to obtain power, selectivity and tonal quality equal to those of the best eight-tube sets. The fans will readily recognize the economy in time and effort and money in this elimination of one tube.

THE editors believe that this circuit will arouse the interest and eventually the enthusiasm of fans everywhere. Simplicity, compactness, excellent performance—those are characteristics sufficient to make the Quadrode popular, but it has *that new feature* which makes it an outstanding phase of this season's radio development.

DO not miss this illustrated article in the November Radio Age. If you are unable to obtain it at the newsstands send 30 cents in stamps and we will mail a copy direct The November issue will be on the stands Nov. 1.

WKBC	H. L. Ansley	Birmingham, Ala.	219
WKBE	K. & D. Electric Co.	Webster, Mass.	229
WKBF	N. D. Watson	Indianapolis, Ind.	252
WKBG	C. L. Carrell	Chicago, Ill.	201
WKBH	Callaway Music Co.	LaCrosse, Wis.	220
WKBI	F. L. Schoenwolf	Chicago, Ill.	322
WKBL	Monrona Radio Mfg. Co.	Monroe, Mich.	205
WKBN	Radio Electric Service Co.	Youngstown, Ohio	214
WKBO	Camith Corporation	Jersey City, N. J.	219
WKBP	Enquirer and News	Battle Creek, Mich.	213
WKBQ	Starlight Amusement Park	New York, N. Y.	219
WKBS	P. M. Nelson	Galesburg, Ill.	217
WKBT	First Baptist Church	New Orleans, La.	252
WKBV	Knox Battery and Electric Co.	Brookville, Ind.	217
WKBW	Churchill Evang. Ass'n	Buffalo, N. Y.	217
WKBZ	K. L. Ashbacker	Ludington, Mich.	200
WKDR	Edward A. Dato	Kenosha, Wis.	322
WKJC	Kirk Johnson & Co.	Lancaster, Pa.	252
WKRC	Kodel Radio Corp.	Cincinnati, Ohio	333
WKY	WKY Radio Co.	Oklahoma City, Okla.	288
WLAC	Life & Casualty Ins. Co.	Nashville, Tenn.	226
WLAP	Virginia Avenue Baptist Church	Louisville, Ky.	268
WLB	University of Minnesota	Minneapolis, Minn.	246
WLBC	D. A. Burton	Muncie, Ind.	210
WLBF	E. L. Dillard	Kansas City, Mo.	211
WLBG	R. A. Gamble	Petersburg, Va.	214
WLBH	Joseph J. Lombardi	Farmingdale, N. Y.	232
WLBI	Legion Broadcasters, Inc.	East Wenona, Ill.	238
WLBL	Wisconsin Dept. of Markets	Stevens Point, Wis.	319
WLBM	Browning Drake Corp.	Boston, Mass.	231
WLBN	William Evert Hiler	Chicago, Ill.	204
WLBO	Frederick A. Tribbe, Jr.	Galesburg, Ill.	217
WLBP	R. A. Fox	Ashland, Ohio	203
WLBQ	E. Dale Trout	Atwood, Ill.	203
WLBR	Alford Radio Company	Belvidere, Ill.	322
WLBT	Harold Wendell	Crown Point, Ind.	322
WLBV	John F. Weimer & D. A. Snick	Mansfield, Ohio	207
WLBW	Petroleum Telephone Co.	Oil City, Pa.	294
WLBX	John N. Brahy	Long Island City, N. Y.	204
WLBY	Aimone Elec.	Iron Mountain, Mich.	210
WLBZ	Thompson L. Guernsey	Dover-Foxcroft, Maine	208
WLCI	Lutheran Association	Ithaca, N. Y.	248
WLIB	Liberty Weekly, Inc.	Elgin, Ill.	306
WLIT	Lit Bros.	Philadelphia, Pa.	405
WLS	Sears Roebuck & Co.	Crete, Ill.	345
WLTS	Lane Technical High School	Chicago, Ill.	484
WLW	Crosley Radio Corp.	Harrison, Ohio	428
WLWL	Paulist Fathers	New York, N. Y.	370
WMAC	C. B. Meredith	Casenovia, N. Y.	225
WMAF	Round Hills Radio Corp.	Dartmouth, Mass.	428
WMAK	Norton Laboratories	Lockport, N. Y.	545
WMAL	M. A. Leese	Washington, D. C.	303
WMAN	First Baptist Church	Columbus, Ohio	234
WMAQ	Chicago Daily News	Chicago, Ill.	447
WMAY	Kingshighway Presbyterian Church	St. Louis, Mo.	248
WMAZ	Macon Junior Chamber of Commerce	Macon, Ga.	270
WMBA	LeRoy Joseph Beebe	Newport, R. I.	204
WMBB	American Bond & Mortgage Co.	Chicago, Ill.	252
WMBC	Michigan Broadcasting Co., Inc.	Detroit, Mich.	244
WMBD	Peoria Heights Radio Lab.	Peoria Heights, Ill.	205
WMBE	Dr. C. S. Stevens	St. Paul, Minn.	208
WMBF	Fleetwood Hotel Corp.	Miami Beach, Fla.	384
WMBG	Havens & Martin	Richmond, Va.	207
WMBH	Edwin Dudley Aber	Chicago, Ill.	204
WMBI	Moody Bible Institute	Chicago, Ill.	263
WMBJ	Wm. Roy McShaffrey	Monessen, Pa.	232
WMBL	Bonford Radio Studios	Lakeland, Fla.	229
WMBM	Seventh Day Adventist Church	Memphis, Tenn.	210
WMBO	Radio Service Laboratories	Auburn, N. Y.	220
WMBQ	Paul J. Gollhofer	Brooklyn, N. Y.	204
WMBR	Premier Electric Co.	Tampa, Fla.	252
WMBS	Mack's Battery Co.	Harrisburg, Pa.	234
WMBU	Paul J. Miller	Pittsburgh, Pa.	217
WMBW	Youngstown Bdcstg. Co., Inc.	Youngstown, O.	214
WMBY	Robert A. Isaacs	Bloomington, Ill.	200
WMC	Commercial Pub. Co.	Memphis, Tenn.	517
WMCA	Greely Sq. Hotel Co.	Hoboken, N. J.	370
WMPC	First Methodist Church	Lapeer, Mich.	234
WMRJ	Peter J. Prinz	Jamaica, N. Y.	207
WMSG	Madison Sq. Gard. Bdcast. Corp.	New York, N. Y.	236
WNAC	Shepard Stores	Boston, Mass.	353
WNAD	University of Oklahoma	Norman, Okla.	240
WNAL	Omaha Central High School	Omaha, Nebr.	258
WNAT	Lenning Brothers Co.	Philadelphia, Pa.	283
WNAX	Dakota Radio Apparatus Co.	Yankton, S. Dak.	303
WNBA	M. T. Rafferty	Forest Park, Ill.	208
WNBF	Howitt-Wood Radio Co.	Endicott, N. Y.	207
WNBH	New Bedford Hotel	New Bedford, Mass.	261
WNBJ	Lonsdale Baptist Church	Knoxville, Tenn.	207
WNBL	Gray, Trimble & Smith Electric Co.	Bloomington, Ill.	200
WNBO	John Brownlee Spriggs	Washington, Pa.	211
WNBR	Popular Radio Shop	Memphis, Tenn.	229
WNBQ	Gordon P. Brown	Rochester, N. Y.	203
WNJ	Herman Lubinsky	Newark, N. J.	280
WNOX	Peoples Tel. & Tel. Co.	Knoxville, Tenn.	265
WNRC	W. B. Nelson	Greensboro, N. C.	224
WNYC	Dept. of Plans & Structures	New York, N. Y.	535
WOAI	Southern Equipment Co.	San Antonio, Texas	303
WOAN	J. D. Vaughn	Lawrenceburg, Tenn.	286
WOAX	Franklin J. Wolff	Trenton, N. J.	240
WOC	Palmer School of Chiropractic	Davenport, Iowa	353
WOCL	A. D. Newton	Jamestown, N. Y.	224
WODA	O'Dea Temple of Music	Paterson, N. J.	294
WOI	Iowa State College	Ames, Iowa	265
WOK	Chicago Beach Hotel	Homewood, Ill.	252
WOKO	Harold E. Smith	Peekskill, N. Y.	216
WOKT	Titus-Ets Corporation	Rochester, N. Y.	210
WOMT	Mikado Theater	Manitowoc, Wis.	222
WOO	John Wanamaker	Philadelphia, Pa.	508
WOOD	Walter B. Stiles, Inc.	Fernwood, Mich.	261
WOQ	Unity School	Kansas City, Mo.	337
WOR	L. Bamberger and Co.	Newark, N. J.	422
WORD	People's Pulpit Assn.	Batavia, Ill.	275
WOS	State Market Bureau	Jefferson City, Mo.	469
WOW	Woodman of the World	Omaha, Nebr.	508
WOWO	Main Auto Supply Co.	Fort Wayne, Ind.	229
WPAP	(See WQAO)	Cliffside, N. J.	395
WPCC	North Shore Cong. Church	Chicago, Ill.	224
WPCH	People's Broadcasting Corp.	New York, N. Y.	309
WPEP	Maurice Mayer	Waukegan, Ill.	216
WPG	The Municipality of Atlantic City	Atlantic City, N. J.	273
WPRC	Wilson Printing & Radio Co.	Harrisburg, Pa.	210
WPSC	Pennsylvania State College	State College, Pa.	300
WPSW	Philadelphia School of Wireless Tel.	Philadelphia, Pa.	203
WQAA	Horace A. Beale, Jr.	Parkersburg, Pa.	216
WQAM	Electrical Equipment Co.	Miami, Fla.	322
WQAN	Scranton Times	Scranton, Pa.	261
WQAO	Calvary Baptist Church	Cliffside, N. J.	395
WQJ	Calument Rainbo Broadcasting Co.	Chicago, Ill.	448
WRAF	The Radio Club (Inc.)	LaPorte, Ind.	208
WRAH	S. N. Read	Providence, R. I.	200
WRAK	Economy Light Co.	Escanaba, Mich.	283
WRAM	Lombard College	Galesburg, Ill.	248
WRAV	Antioch College	Yellow Springs, Ohio	341
WRAW	Avenue Radio & Electric Shop	Reading, Pa.	238
WRAX	Beracah Church, Inc.	Philadelphia, Pa.	283
WRBC	Immanuel Lutheran Church	Valparaiso, Ind.	238
WRC	Radio Corp. of America	Washington, D. C.	468
WRCO	Wayne Radio Co.	Raleigh, N. C.	217
WREC	WREC, Inc.	Whitehaven, Tenn.	254
WRES	H. L. Sawyer	Woloaston, Mass.	217
WRHF	Wash. Radio Hospital Fund	Washington, D. C.	319
WRHM	Rosedale Hospital, Inc.	Minneapolis, Minn.	252
WRK	Doron Bros.	Hamilton, Ohio	205
WRM	University of Illinois	Urbana, Ill.	273
WRMU	Atlantic Bdcasting Co.	New York, N. Y.	201
WRNY	Experimenter Publishing Co.	Coyetsville, N. Y.	309
WRR	City of Dallas	Dallas, Tex.	353
WRRS	F. G. Leavenworth	Racine, Wis.	322
WRSC	The Radio Shop	Chelsea, Mass.	205
WRST	Radiotel Mfg. Co., Inc.	Bay Shore, N. Y.	211
WRVA	Larus & Brother Co., Inc.	Richmond, Va.	254
WSAI	United States Playing Card Co.	Cincinnati, Ohio	361
WSAJ	Grove City College	Grove City, Pa.	224
WSAN	Allentown Call Publishing Co. Inc.	Allentown, Pa.	222
WSAR	Daughy & Welch Electrical Co.	Fall River, Mass.	252
WSAX	Zenith Radio Corp.	Chicago, Ill.	204
WSAZ	Chase Electric Shop	Huntington, W. Va.	242
WSB	Atlanta Journal	Atlanta, Ga.	476
WSBC	World Battery Co.	Chicago, Ill.	232

Radio Industry Standards

H. B. Richmond, of the engineering division of the Radio Manufacturers Association sends the following interesting information on standardization of radio products:

"Much confusion has formerly existed in the radio industry, because of two separate technical standards set up by two organizations within the industry. Each of these standards had been set up in good faith, and represented the accepted practice of its particular group.

"Radio has been phenomenal in its growth. It is, therefore, only natural that organizations within the trade should show a similar growth. Within a period of a few years the Radio Manufacturers' Association, which is the leading trade association of the industry, has grown from a dozen to three hundred members. It now has ten times the membership of any other manufacturers' trade association within the industry.

"Inasmuch as the Association now is so nearly 100% representative of the entire industry, it feels that any standardization work it may do will be truly representative of the industry. Under the direction of the Engineering Division, meetings are being held, at which not only are members welcome, but every interested manufacturer is invited. At these meetings all previous standards, regardless of their origin, are being reconsidered. Out of this previous duplication of effort, the RMA is drawing up a new set of standards which, while sponsored by the RMA, will no longer be known simply as the RMA standards, but will be designated 'The Radio Industry Standards.'"

Chicago Radio Show

The sixth annual Chicago Radio Show, one of the most important milestones in the progress of the radio industry, will take place in the Coliseum from Monday, October 10, to Sunday, October 16, being open to the public each afternoon and evening. Jobbers and dealers will have special hours from 11 a. m. to 1 p. m.

The show will have an especial appeal to the public this year for several reasons. The Trade Show in Chicago last June gave the manufacturer the opportunity to get into contact with his distributors and the dealers. Now he can bend his every effort to make a display which will be primarily for the benefit of the general public. Coming so soon after the Dempsey-Tunney fight, when radio will reach such a height in public interest, the show will be doubly interesting to the fan.

This year, too, the display of radio apparatus staged by the manufacturers will be backed up by the "Theater of Wireless Wonders" in which will be displayed the latest achievements in scientific research. These exhibits, or at least many of them, had their first public demonstration at the Radio World's Fair in New York.

The exhibits, which will be grouped on the balcony of the main exposition hall, will include devices by which the infinitismal atom can be measured, seen and even heard. Amplifiers which build up sound to millions of times its original volume will make flowers "talk" and other devices will touch them with a wireless ray which will instantly freeze them into brittleness.

Cold heat will be transmitted through the air and a cake of ice burned up before the eyes of the spectators. Another machine using 350,000 volts of electricity will send a ray at the speed of 150,000 miles an hour. Scientists will show how they measure one-ten-millionth of an inch.

J. Elliott Jenkins, radio engineer, is installing a model broadcasting station in the ballroom of the annex from where nearly a score of Chicago stations will give special programs for the benefit of their millions of listeners. Jack Nelson, pioneer announcer and station manager, has been placed in charge of arranging the programs to be given at the show and in co-ordinating the work of the stations taking part in the hook-up.

Mayor William Hale Thompson of Chicago and Lieutenant Governor Fred Sterling of Illinois will take part in the opening exercises at the show. Miss Lois Delander, who went to Atlantic City as "Miss Illinois" and came back to her home at Joliet as "Miss America," is expected as a specially honored guest one evening during the show.

U. J. Herrmann, who started the Chicago radio show when there weren't enough sets in the entire community to fill the Coliseum, is again the managing director of the exposition, and G. Clayton Irwin, Jr., is general manager.

Many jobbers and dealers in the middle west are planning to attend the Chicago show to see what developments have been achieved since the R. M. A. trade show held in Chicago in June.

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WSBF	Broadcasters	St. Louis, Mo.	441
WSBT	South Bend Tribune	South Bend, Ind.	238
WSDA	City Temple	New York, N. Y.	227
WSEA	Virginia Beach Broadcasting Co.	Virginia Beach, Va.	219
WSIX	638 Tire & Vulc. Co.	Springfield, Tenn.	213
WSKC	World's Star Knitting Co.	Bay City, Mich.	492
WSM	Nashville Life & Accident Ins. Co.	Nashville, Tenn.	341
WSMB	Saenger Amuse. Co.	New Orleans, La.	322
WSMK	S. M. K. Radio Corp.	Dayton, Ohio	297
WSOE	School of Engineering	Milwaukee, Wis.	270
WSOM	Union Course Laboratories	Woodhaven, N. Y.	246
WSRO	Harry W. Fahrlander	Hamilton, Ohio	384
WSSH	Tremont Temple Bap. Church	Boston, Mass.	250
WSUI	State University of Iowa	Iowa City, Iowa	422
WSVS	Seneca Vocational School	Buffalo, N. Y.	205
WSYR	Clive B. Meredith	Syracuse, N. Y.	252
WTAD	Ill. Stock Medicine Corp.	Quincy, Ill.	236
WTAG	Worcester Telegram	Worcester, Mass.	517
WTAL	Toledo Broadcasting Co.	Toledo, Ohio	280
WTAM	Willard Storage Battery Co.	Cleveland, Ohio	400
WTAQ	Gillette Rubber Co.	Eau Claire, Wis.	254
WTAR	Reliance Electric Co.	Norfolk, Va.	275
WTAS	Richmond Harris & Co.	Batavia, Ill.	275
WTAW	A. & M. Coll. of Texas	College Sta., Texas	309
WTAX	Williams Hardware Co.	Streator, Ill.	322
WTIC	Travelers Insurance Co.	Hartford, Conn.	476
WTRL	Technical Radio Laboratory	Midland Park, N. J.	207
WWAE	L. J. Crowley	Chicago, Ill.	232
WWJ	Evening News Assn.	Detroit, Mich.	375
WWL	Loyola University	New Orleans, La.	275
WWNC	Chamber of Commerce	Asheville, N. C.	297
WWRL	Woodside Radio Laboratories	Woodside, N. Y.	268
WWVA	John C. Strobel, Jr.	Wheeling, W. Va.	389

Dominion of Canada

CFAC	Calgary Herald	Calgary, Alta.	434
CFCA	Toronto Star Pub. & Prtg. Co.	Toronto, Ont.	356
CFCF	Marconi Wireless Teleg. Co., (Ltd.) Ca. Mont., Que.		411
CFCH	Abitibi Power & Paper Co. (Ltd.) Iroquois Falls, Ont.		500
CFCK	Radio Supply Co.	Edmonton, Alta.	517
CFCN	W. W. Grant (Ltd.)	Calgary, Alta.	434
CFCR	Laurentide Air Service	Sudbury, Ont.	410
CFQC	The Electric Shop (Ltd.)	Saskatoon, Sask.	329
CFRC	Queens University	Kingston, Ont.	268
CFXC	Westminster Trust Co.	Westminster, B. C.	291
CFYC	Commercial Radio (Ltd.)	Vancouver, B. C.	411
CHCS	The Hamilton Spectator	Hamilton, Ont.	341
CHIC	Northern Electric Co.	Toronto, Ont.	357
CHNC	Toronto Radio Research Society	Toronto, Ont.	357
CHUC	International Bible Ass'n.	Saskatoon, Sask.	329
CHXC	R. Booth, Jr.	Ottawa, Ont.	434
CHYC	Northern Electric Co.	Montreal, Que.	411
CJCA	Edmonton Journal	Edmonton, Alta.	517
CJGC	London Free Press	London, Ont.	329
CKAC	La Presse	Montreal, Que.	411
CKCD	Vancouver Daily Province	Vancouver, B. C.	411
CKCK	Leader Pub. Co.	Regina, Sask.	312
CKCL	Dominion Battery Co.	Toronto	360
CKCO	Ottawa Radio Association	Ottawa, Ont.	434
CKCX	Int'l Bible Students Ass'n.	Toronto	291
CKFC	First Congregational Church	Vancouver, B. C.	411
CKNC	Canadian National Carbon Co.	Toronto, Ont.	357
CKOC	Wentworth Radio Supply Co.	Hamilton, Ont.	341
CKY	Manitoba Tel. System	Winnipeg, Man.	384
CNRA	Canadian National Railways	Moncton, N. B.	322
CNRC	Canadian National Railways	Calgary, Alta.	435
CNRE	Canadian National Railways	Edmonton, Alta.	517
CNRM	Canadian National Railways	Montreal, Que.	411
CNRO	Canadian National Railways	Ottawa, Ont.	434
CNRQ	Canadian National Railways	Quebec, Que.	341
CNRR	Canadian National Railways	Regina, Sask.	312
CNRS	Canadian National Railways	Saskatoon, Sask.	329
CNRT	Canadian National Railways	Toronto, Ont.	357
CNRV	Canadian National Railways	Vancouver, B. C.	291
CNRW	Canadian National Railways	Winnipeg, Man.	405

VOLUME LXXXVI—NO. 91 — 36 PAGES — PRICE TWO CENT

GASOLINE NOW 11¢

AUTO OWNERS MYSTIFIED BY NEW DEVICE

The problem of high cost gasoline has apparently been solved by a mysterious little device that can be installed in a few minutes on any car. With this device installed the saving in gasoline effected will be so great that the cost of gas, as compared with previous cost, will be even less than 11c. It is estimated that if every car were equipped with this invention, millions and millions of dollars would be saved a year. Autoists also report an immediate increase in power and pick-up when this device is installed. Instant starting is also noticed.

Motor Runs Much Smoother

Carbon forming disappears. The inventor claims that this is the outstanding automobile invention of the decade and has grounds for his claim.
Thousands of motorists have already equipped their cars. They report mileage tests that seem almost unbelievable. Thirty, forty and more miles on a gallon is nothing unusual. Motorists who have not already equipped their cars with this gas saver should get one just as soon as possible so that this season their gasoline bills will not worry them.

FREE SAMPLE

To sell the Whirlwind, you have to have one of the devices to show. We have arranged a plan that supplies you with this device free so that you can get out and take orders right off the jump. If you have a car, you can equip your own car and make the experiment first. Your experiment will make you so enthusiastic that it will make you a doubly successful salesman. If you have no car, just carry it with you.

Public Welcomes News

NEW INVENTION MAKES THIS POSSIBLE

A newly invented device has actually made it possible for automobile owners to ride on 11c gas. This device, by utilizing air, cuts down the gas consumption amazingly. 11c gas is really a conservative estimate, as in many cases bona-fide reports have been received on cars running as high as

60 Miles on a Gallon of Gas

With the high cost of gasoline, this new Whirlwind device is the greatest thing of its kind ever discovered for auto owners. It is not an experiment, but the outcome of years of accurate tests. Car after car equipped with this marvelous device has shown amazing mileage tests.

This little device is worth its weight in gold, yet costs such a minimum sum that it pays for itself in just a short time in the gasoline it saves alone, not counting the more pleasurable driving it produces.

$100 a Week Territory Open

When you sell a device that actually saves gasoline, you overcome the one big point that makes selling difficult—that is, sales resistance.

Every auto owner wants to save gasoline. The Whirlwind is so practical, so easily explained, that it does not require a high-pressure, experienced salesman to make big money introducing it. On the contrary, the less sales talk used, the more sales you make. The literature we supply and the device itself do the selling. All you do is to take the orders. Word-of-mouth advertising brings you tremendous repeat business. For those who can devote full time, this is a knock-out proposition. It means a sure road to independence with an ever increasing future. Auto registration shows the number of cars is increasing daily. Every new car in your territory is a prospect for you. We stand back of you 100% and supply constant sales helps to increase your business. When you get big enough to handle it, we then forward to you business in your territory that comes to us direct.

Even if you are not in a position to devote full time, the Whirlwind agency offers big possibilities to you. It is easily possible to make as high as $20.00 in an hour with this device. It sounds like a lot of money, but it has been done and it can be done by you if you will just push it as actively as other salesmen have done.

Big opportunities wait for no man, and this is a big opportunity. You have to decide, now, if you want to make some real money yourself supplying the demands for the livest agency item of the year. *Here is your chance. Just fill in the coupon and mail it today.*

Whirlwind Carburetor Co., 999-495-E. Third Street, Milwaukee, Wisconsin

FREE SAMPLE COUPON

WHIRLWIND CARBURETOR CO.
999-495-E. Third St., Milwaukee, Wis.

Gentlemen: I want to make big money supplying the demand for Whirlwind Carburetors. Please send me your free sample offer and full particulars of your sales proposition.

Name.....

Local.....

City.....

County.....

State.....

CLASSIFIED ADVERTISEMENTS

If you have anything to buy or sell, don't overlook RADIO AGE'S classified advertisements.

The classified advertising rates are but four cents per word for a single insertion. Liberal discounts are allowed on six and twelve-time insertions, making rate of 3 and 2 cents a word per insertion respectively. Unless placed through an accredited advertising agency, cash should accompany all orders. Name and address must be included at foregoing rates. Minimum contract charge $1.00.

All Classified ads for November issue must be sent in by Sept. 25.

AGENTS

RADIO AGENTS—Make Big Money—Easy! selling Marvelous New Sets and Accessories. Buy from factory at lowest prices. Get New Catalog with thousands of nationally advertised bargains. FREE Call Book. Write today. American Auto and Radio Co., Dept. 138, American Radio Bldg., Kansas City, Mo.

AIRPLANES

SEND FOR free illustrations and plans of our wonderful two-place, companion type, small, high lift wing monoplane, and information on how to build this ship, and be sure it will fly; also propeller literature. Crawford Airplane Manufactory, 2225 American Avenue, Long Beach, California.

BOOKS AND MAGAZINES

Judge Lindsey's "companionate marriage" hoax exposed! Rich debate! Flays other "doctrines". Exponent 15c, Orlando, Fla. Consigned: Newsdealers, Agents.

FREE—Two big New Magazines and information worth hundreds of dollars to you. Enclose 2c stamp. Salesmanager, Box 74-R, Beaver Dam, Wisconsin.

What could be better than magazine subscriptions for gifts. Send stamp for our special list of subscription bargains. Midland Products, Dept. R. A., 524 Courtland Ave., Park Ridge, Illinois.

Twentieth Century Book of Receipts, Formulas and processes, an 807 cloth bound book containing 10,000 proven formulas for the manufacturer, workshop, laboratory, office and home. Sent prepaid upon receipt of $4.00. Send dime for our 48 page catalog of latest and best practical, scientific mechanical and industrial books. Midland Products Co., Dept. RA, 524 Courtland Ave., Park Ridge, Ill.

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Boys get a three foot model aeroplane free. No selling. Write for particulars. Aero Shop, 3050 Hurlbut Ave., Detroit, Michigan.

RADIO SET FREE, form magazine clubs among friends. Club list free. Sponsorian Agencies, Los Angeles, Brentwood Heights, California.

BUSINESS OPPORTUNITIES

PECAN-Orange-Fig Groves "On the Gulf". Monthly payments. Guaranteed ours. Big, quick returns. Suburban Orchards, Dept. R, Biloxi, Mississippi.

MAKE RADIO PANEL LAMPS. Inventor can supply necessary parts. Easily assembled. Rests on top of radio cabinet. Lights dials. Information free. Sample Lamp $1.25. Postpaid. Robert Stevenson, Lancaster, Ohio.

LAND FREE If planted to bananas. Bananas bear a full crop the second year. $5.00 monthly will plant five acres, which should pay $1,500 profit annually. Reliable Companies will cultivate and market your bananas for 1-3. Bananas ripen every day and you get your check every 90 days. For particulars address Jantha Plantation Co., Empire Building, Block 980, Pittsburgh, Pa.

FOR SALE—Patent on fountain mop and duster. I have party offered to take five hundred dozen per month. Lester Doak, McMinnville, Tennessee.

DOGS

BEAUTIFUL REGISTERED BULL PUPS $15. Bulldogs, 501 Rockwood, Dallas, Texas.

ELECTRICAL

ELECTRIC FUN! Seventy stunts, 110 volts, $1. Cecutting, Campbell, Calif.

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MISCELLANEOUS

NEUTRODYNE AND HETERODYNE ARE GOOD AS FAR AS THEY GO. THE BEST ONE TUBE SET FOR PYORRHEA IS ZIP-DINE (tooth-paste). SATISFACTION GUARANTEED. FIFTY CENT TUBES BY MAIL. IODINE PRODUCTS COMPANY, LAUREL, MISS.

"MUSIC Composed" to words. Bauer Bros., (formerly of Sousa's Band). Oshkosh, Wis.

GILLETTE STYLE Razor with 10 Blades 69c Prepaid. Loud Speaker $3.89, Speaker Unit $1.10 prepaid. Transformer 25c, Male Station A, New Haven, Conn.

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SINGLE PANEL and medium quantity engraving of highest quality. Also panel drilling, meter cutouts and machine engraving on small parts. Careful attention to single panels and special work. Write for price-list. A. L. Woody, 19 S. Wells Street, Chicago.

PERSONAL

LONELY HEARTS: Exchange letters; make interesting new friends in our jolly club. Particulars free. Eva Moore, Box 908, Jacksonville, Florida.

RADIO

EXTRA HEAVY Antenna wire 7 No. 18 $1.50 100 feet. 17 No. 22 braided 3/8" wide $2.00 100 feet all prepaid. George Schulz, Calumet, Michigan.

Radio Books—Construction of a modern Super Heterodyne Type Receiver including Testing and Operation $1.00; Henley's 222 Radio Circuit Designs, 267 pages, $1.00; The ABC of Vacuum Tubes used in Radio Reception 132 pages, 75 cents; Henley's Workable Radio Receivers 196 pages $1.00; Experimental Wireless Stations 392 pages $2.00; Wireless Telegraphy and Telephony Simply Explained 154 pages $1.00. Sent prepaid on receipt of price. Send dime for our 48 page catalog of latest and best practical, scientific, mechanical and industrial books. Midland Products Co., Dept. RA, 524 Courtland Ave., Park Ridge, Illinois.

SILICON Transformer Steel cut to order .014", 10 lbs. 25 cents, 5 lbs. 30 cents, less than 5 lbs. 35 cents per lb., 4 cubic inches to the lb. postage extra. At least ½ cash with order—balance C. O. D. Geo. Schulz, Calumet, Michigan.

PURE ALUMINUM and lead rectifier elements, holes drilled, with brass screws and nuts per pair 1-1/8", 1"x4", 13c, 1x6, 15c, 1¼x8, 17c, 1½x8, 19c, single elements half price. Sheet aluminum 1-1/8", $1.00, 1-8" $1.50. Lead $1.00 square foot all prepaid. Geo. Schulz, Calumet, Michigan.

CONDENSERS. 800 VOLT FILTER, .1 mfd 45c, .25 51c, .5 60c, 1. 75c, 2. $1.20, 3. $1.80, 4. $2.40, 1500 VOLT FILTER, .1 51c, .25 60c, .5 75c, 1. $1.05, 2. $1.65, 3. $2.70, 4. $3.60. ELIMINATOR BLOCKS, 2, 2, and 8 $5.70, 2, 2, 8 and 1 $8.15, 2, 2, 8, 1 and 1 $6.60, .1 and .1 in series 90c. Many other capacities. Acme transformers and chokes. THE RADIO CLUB, INC., La Porte, Ind.

Large Core 3-1 Audio Transformers $1.50. Raytheon "BH" Kit $16.75, 50H—125 MA choke $5.75, 30H—60MA shielded choke $2.25, 30H—85 MA choke $2.50, 110V—550V Raytheon Transformer $3.50. Write for special lists chokes, Transformers, Meters, etc. Radio Parts Sales Co., Orange, N. J.

Genuine RCA UV 202 5 watters, brand new in original cartons. Can be used as transmitting tubes or power tube. Only $2.25 each prepaid. Mitchell Radio Co., 3520 Sheridan Road, Chicago, Ill.

IVORY RADIO PANEL beats them all. Write for FREE Sample. Ivorylite Radio Panel Co., 3330 Ave. G, Fort Worth, Texas.

Complete kit for S-M 7 tube Super including every part —Panel, dials, etc. Guarantee new and perfect. First $41.50. P. E. Chapman, 841 Preston, Philadelphia, Pa.

10% off all standard radio apparatus laboratory tested radiotron UV 201A's at only $1.70. Postage prepaid. Petste Radio Laborstories, Wauwatosa, Wisconsin.

METERS—CONDENSERS—"B" eliminator parts. Power transformers $2.00 up. High grade chokes $2.25 up. Write for lists of specials. We can quote prices on any material you require. Radio Parts Sales Co., Orange, N. J.

CHOKES 100,—50, or 30 Henry 125 M. A, $5.75, 30H, 50H, 85 M. A, $2.75, 420V and 6V transformers $4.00, 550V $3.50, 280V—$2.00. 5-1 Ratio Audio Transformers 10 for $5.00. Write for lists. Radio Parts Sales Co., Orange, New Jersey.

RUBBER STAMPS

RUBBER STAMPS and supplies. 20c per line. Cushion Mounted. Catalog for stamp. Newman & Son, Auburn, Nebraska.

RUBBER STAMPS! Name, Address, two lines 25c. Three Lines 35c. C. Brush Company, Auburn, Nebraska.

SALESMEN WANTED

75 MILES ON 1 GALLON—New Moisture Gas Saver. All Cars. 1 Free. CRITCHLOW, A2-91, Wheaton, Ill.

STAMPS

1000 different $1.00, 500 different 50c, 50 French colonials 14c. Koehler, 642 Meredith St., Dayton, Ohio.

100 foreign stamps & hinges free to approval applicants; postage four cents. Bats, 1135 Riverview Ave., Dayton, Ohio.

TYPEWRITERS

TYPEWRITERS, all standard makes, $10 up. Fully Guaranteed. Free Trial. Write for COMPLETE illustrated lists. Northwestern Typewriter Exchange, 121 N. Francisco Ave., Chicago.

WANTED TO BUY

Full value paid for old GOLD Jewelry, silver or platinum. Packages returned if our offer not satisfactory. Elaine Specialty Company, 3330 Ave. G, Fort Worth, Texas.

Radio Age Classified Ads Bring Results

SM

87% at 30 Cycles!

AT 30 cycles, an S-M 220 audio transformer in a standard amplifier circuit gives 87% of the amplification obtained at 1000 cycles, while its curve is substantially flat from 100 to 1000 cycles. Above 2000 cycles, the curve for a single stage falls off gradually, while in a standard two stage amplifier circuit, the curve is substantially flat up to 5000 cycles above which frequency it falls off rapidly to keep static, heterodyne squeals and "set noise" at a minimum.

The above paragraph sums up at once the desirable characteristics of an audio amplifier for realistic recreation of broadcast programs, and the actual performance of S-M audio transformers. It is just this fact that has made 220's the choice of over half of the designers of the new 1927-28 circuits, for engineers know that the short cut to the finest of quality is to use S-M audios. Experienced fans know this too, as is proven by the fact that 220's have outsold every other transformer in their class by a wide margin for over a year. And S-M audios are signally favored by being used in more broadcasting stations than any other types. WCAE, WBBM, WEBH, KFCR, WTAQ, KGDJ, WLBF and many others. WCFL, the "Voice of Labor", checks quality of all programs with them. Nathaniel Baldwin, Inc., famous speaker experts, test with 220's and 221's.

Your guarantee of quality is to use S-M 220's and 221's in every circuit you build, and you'll find that over half the popular 1927 and 1928 circuits will give you just this same guarantee of quality. But S-M promises unconditionally that you can improve any set by using 220's and 221's, and backs the promise by the offer of your money back if 220's and 221's don't give you more satisfactory quality than you've ever heard before.

The 220 audio is the biggest value on the market, and its performance measures up to its 4 pound size. It contains more steel and copper than any other transformer—the measure of transformer merit. Price $8.00.

221 output transformer not only protects loud speakers against power tube plate currents, but compensate low frequencies for all loud speakers. Price $7.50, or with cord and tip jacks, No. 222, $8.00

230 push-pull input and 231 push-pull output transformers are priced at $10.00 each.

In this standardized black shielding case are housed the famous 220 audio and 221 output transformers, 222 output, 230 push-pull input, 231 push-pull output, 325 filament, 329, 329A and 330 power transformers, 331 Unichoke and 332 condenser bank. And a new super-power full wave ABC supply transformer is on the way—type 328, at $18.00, for one or two 216B or 281 tubes.

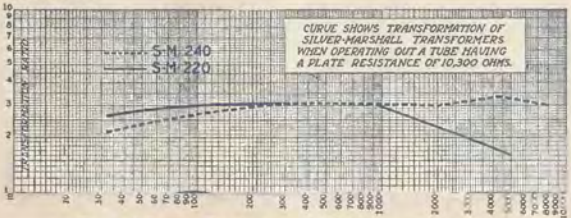
Silver-Marshall now offers two smaller size audio transformers for replacement work in old sets, wherever price and size is a consideration. Type 240 audio transformer is equal or superior to the majority of high-grade audio transformers, but does not reproduce frequencies below 80 cycles to the extent that the famous 220 does. Its single stage amplifier curve is shown above—in two stages, the 240's afford practically the same 5000 cycle cut-off as do 220's, although this is not evident in the single stage curve above. 241 output transformer offers the same low frequency compensation as type 221 and 222. Due to their small size, these transformers will fit in almost any of the older receivers, and once installed, will work wonders in tone quality improvement, for their performance nearly equals that of 220's and 221's. Size 3 7-16" high, 2 1-4" wide, 2 5-8" deep, weight 2 lbs. 4 oz. each. Price, 240 audio, $6.00, 241 output $5.00.

Laurence Cockaday, for the preferred audio amplifier for the LC-28 receiver, uses two 240's and a 241 with an S-M power supply!

440 JEWELERS TIME SIGNAL AMPLIFIER

The S-M 440 Amplifier is a three-stage tuned R. F. amplifier and detector completely wired and sealed in a copper and brass catacomb and tuned exactly to 112 K. C., the 2677 meter wavelength of the U. S. Naval Observatory Station at Arlington, (NAA).

Each of the four circuits of the amplifier is sectionally shielded. The selectivity is so great that interference from other wavelengths is impossible, while with large low resistance tuned air core transformers, hermetically sealed, the amplification is tremendous—higher than that of any 3-stage long wave amplifier that can be constructed from standard parts today. The 440 simplifies receiver construction and eliminates all guess-work in transformer matching. Price $35.00.



The New Shielded Six Is Ready!

The Improved Shielded Six is ready, the very latest model of this excellent receiver which has over a year of successful and satisfying performance to its credit. The Improved model has vastly increased selectivity, greater distance getting ability, and the same fine tone that has made almost every builder say of the original "That's the finest set I've ever heard!"

This year the Six offers the additional possibilities of push-pull amplification with 210 tubes for the man who wants the utmost. All in all, the Six deserves the reputation as the finest tuned R. F. kit you can buy, equalled only by $200 to $400 factory built sets. Yet it's priced at but $95.00 for the complete kit, or $142.00 assembled, in cabinet, and guaranteed to satisfy you. S-M will be glad to tell owners how last year's model can be converted to the Improved Six, or push-pull 210 amplification installed with simple changes.

We can't tell you the whole story of new S-M developments, so if you'll just fill in the coupon, and mail it with 10 cents to cover postage, we'll send you free more up-to-the-minute advance radio information than you could buy in a text book.

SILVER-MARSHALL
INC.
850 West Jackson Boulevard
CHICAGO, U.S.A

Silver-Marshall, Inc.,
850 West Jackson Blvd.,
Chicago, Ill.

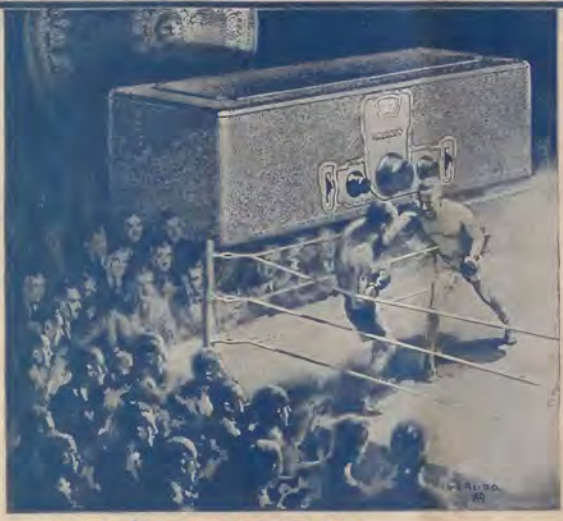
Please send me information on new S-M developments, for which I enclose 10 cents.

Name.....

Address.....

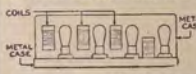
—when the crown stands or falls....

"—You're *there* with a Crosley..."



The Crosley Radio Corporation:
Folks who buy radio are vitally interested in what they get for their money. Why don't you radio manufacturers stop talking like a lot of doctors and tell us what it's all about in one syllable words? What's this "shielding" business anyway?
Yours truly,
Fobes Supply Co., Seattle, Wash.

Shielding is necessary in a modern radio receiver. The more sensitive the set is, the more you need it. Some sets are merely housed



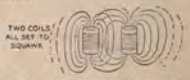
in a metal case. This helps to keep strong local signals from breaking through, but it is even more important to keep them where they belong after you get them the proper way from the antenna.

A set has tubes, condensers and coils. Here is a coil. The lines around it are the magnetic field. You know the earth's magnetic

field will work a compass down in a mine, or up in a plane (it certainly worked for Lindbergh) and the fields around unshielded coils get all mixed up and the set howls and squeals and has to be choked off by turning down the filaments in the tubes.

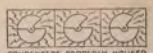
Now if the coils are housed in copper shields the fields can't mess each other up, and the tubes can do a real job of amplifying. The coils in Crosley sets have these copper shields, and there isn't anything better.

Then there are the condensers, and if it wasn't for the shield around them, the fields would act like those in the coils, and the results would be just as bad, or worse.



It isn't enough to shield the coils and the condensers, because even the wiring of the set has fields around it. This too is shielded,

as it is in all really high grade sets. Of course, it's all in knowing how to do it, but that's why Crosley sets can be as good as the best without costing half as much.



The BANDBOX
A 6 Tube Receiver *of* unmatchable quality at $55

Many features of this set have been found heretofore only in the most expensive radio. Since Crosley is licensed to manufacture under nearly all important radio patents, this combination with Crosley leadership and experience naturally produced an amazing radio, the remarkable value of which can be judged by the following features incorporated and by seeing it and hearing it at your dealers.

1. Completely shielded coils, condensers and wiring. 2. Acuminators for sharper tuning. 3. Completely balanced genuine neutrodyne. 4. Volume control. 5. Single tuning knob. 6. Illuminated dial. 7. Single cable outside connections. 8. Designed for easy installation in consoles. 9. Beautiful frosted brown crystalline finished cabinet. AC model using new R.C.A. AC tubes and working directly from electric light socket through Crosley Power Converter is $65. Power Converter $60 extra. Hear this wonderful new contribution to the enjoyment of radio. If you cannot find one of the 16,000 Crosley dealers near you, write Dept. 63 for his name and literature.

Crosley is licensed to manufacture under patents of the Radio Corporation of America and associate companies, also The Hazeltine Corporation and Latour Corporation.

APPROVED CONSOLES

Selected by Powel Crosley, Jr., as ideal, acoustically and mechanically for the installation of the Crosley "Bandbox" Genuine Musicone built in. Crosley dealers secure them from their jobbers through

H. T. ROBERTS CO. 914 S. Michigan Ave., Chicago, Ill.

Sales Agents for Approved Console Factories

Showers Brothers Company

The Wolf M'fg. Industries

$35

$65

$85

IMPROVED MUSICONES

Musicones improve the reception of any radio set. They are perfect affinities in beauty and reproductive effectiveness for Crosley Radios. A tilt-table model, with brown mahogany finish stands 86 inches high, $67.50 —16-inch Super-Musicone as pictured above with "Bandbox", $12.75 —12-inch Ultra-Musicone, $9.75.

CROSLEY RADIO

The Crosley Radio Corporation, Powel Crosley, Jr., Pres. Cincinnati, Ohio

Crosley Radio is licensed only for Radio Amateur, Experimental and Broadcast Reception

Prices slightly higher west of the Rocky Mountains

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for Audio Visual Conservation
www.loc.gov/avconservation

Motion Picture and Television Reading Room
www.loc.gov/rr/mopic

Recorded Sound Reference Center
www.loc.gov/rr/record