

Production-Engineering-Distribution • Radio-Television-Sound Projection

RADIO Industries

With which is incorporated Radio Manufacturers' Monthly

NOVEMBER • 1930

Ghost Images

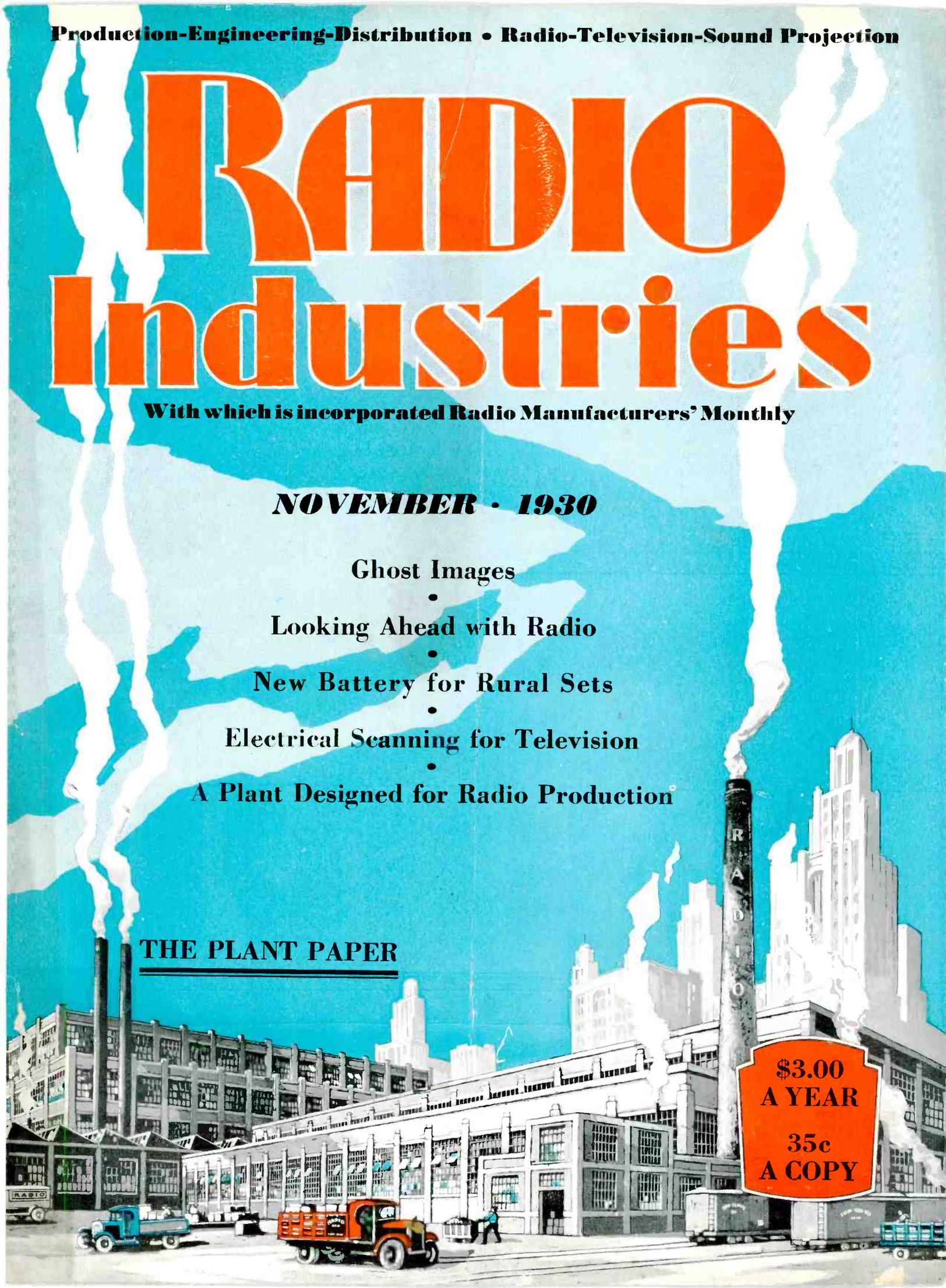
•
Looking Ahead with Radio

•
New Battery for Rural Sets

•
Electrical Scanning for Television

•
A Plant Designed for Radio Production

THE PLANT PAPER



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A YEAR
35c
A COPY**

The Rejection Pile



Quality Insulating Materials Will Reduce Coil Casualties

Many coils are lost when the impregnating compound or wax used, has failed to fulfil its purpose. In some cases, the coils have not been properly treated. Often the viscosity of the compound is too high and results in poor impregnation; or, the compound lacks plasticity and the coils are ruptured in handling.

In the production of a "Dolph" compound, great pains are taken in order that it may possess the exact combination of characteristics required for a particular work.

Now, should you desire a compound for fine wire coils having a dropping point of 167°F and a viscosity at 275°F of 6 seconds for 100 revolutions (Stormer Viscosimeter), yet great plasticity and toughness, Dolph's No. 915 Audio Compound would be just the thing.

Power transformers often require a high melting point, and Dolph's No. 1016 is used most extensively for them. It has the fol-

lowing desirable features:— Dropping Point 195°, Viscosity at 275°F—17½ seconds for 100 revolutions (Stormer Viscosimeter).

Dolph's Insulating Compounds Mean "Quality"

Dolph's No. 1085 is a late development. It is a neutral wax and can be used with safety on coils wound with very fine wire. Its viscosity at 275°F is 19 seconds for 100 revolutions; Dropping Point 186°F. This material has great elasticity and shows considerable adhesive power.

The John C. Dolph Company has put a dent in many a rejection pile and can do the same for you. Even though an extensive line of stock compounds is maintained, special materials will be prepared promptly to meet any special demands.

Send your specifications and a few coils to the Dolph Laboratory in Newark for vacuum impregnation; or, if you wish samples, substantial quantities will be submitted accompanied by complete directions on application.



John C. Dolph Company
Insulation Specialists
COMPOUNDS VARNISHES WAXES
NEWARK NEW JERSEY



THE STRONGEST ADVERTISEMENT EVER WRITTEN FOR POLYMET PRODUCTS

*The Testimony of Satisfied Customers
as Expressed by Their Engineers*

CROSLEY

"Powel Crosley, Jr. sets for us the task of making Crosley Radio Receivers as nearly perfect as radio engineering knows how. Polymet specialized Parts go far to help us to accomplish this."

GULBRANSEN

"The really vital things of radio are the hidden parts the average listener never thinks of. In the Gulbransen he doesn't have to. Thanks to Polymet, we can depend on these parts to operate without attention or care."

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"We use Polymet Products because a specialized part is needed to complete the high quality of Fada Sets."



"We use Polymet Products because they are definitely superior specialized parts."

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"Exhaustive tests in Edison Laboratories showed Polymet Condensers worthy of incorporation in fine Edison Light-O-Matic Radios."

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"We specify Polymet Parts in Stewart-Warner Sets because we know that Quality radios can be made only with quality parts!"



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**SERVING OVER 80% OF THE INDUSTRY WITH
CONDENSERS - RESISTANCES - COILS - TRANSFORMERS**

YOU CAN HIRE A MASTER EXECUTIVE FOR \$1920 YEARLY!

You have a job in selling your product. Beyond that your product must be kept sold.

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As a further adjunct to your selling job, direct representatives or sales engineers are sent out to make personal contacts with your prospective customers. These men, if they know the facts and figures concerning your product and its application to the industry, can accomplish considerable in making sales for you. A staff of sales representatives scattered throughout the country then is also a necessary part of your selling effort.

Another necessary part of your selling job is Business Paper advertising. Such advertising, continuously month after month, keeps your name before your prospective customers and those whom you count as customers today and would like to retain. This sort of advertising paves the way for the reception of your sales letters. Making your name and product well-known, your advertising gets your salesman a satisfactory reception.

Think of *Radio Industries* as an additional executive on your staff. Reaching out into every radio and allied plant in the U. S. and Canada each month and read, as it is by every executive with an ounce of buying power, it should be given foremost consideration in your selling plans. The influence of its editorial columns assures equal influence for your advertising message. *Radio Industries* will allot you a page space for your message every month for the year for \$160 each issue—\$1920 is the total cost. Why not put *Radio Industries* on your pay-roll to help you with your 1931 selling job. Well, why not?

[Advertisements in Radio Industries are placed next to reading matter. They are never buried. Thus the careful perusal of your message is assured.]

You can do a good job
with smaller space, too.

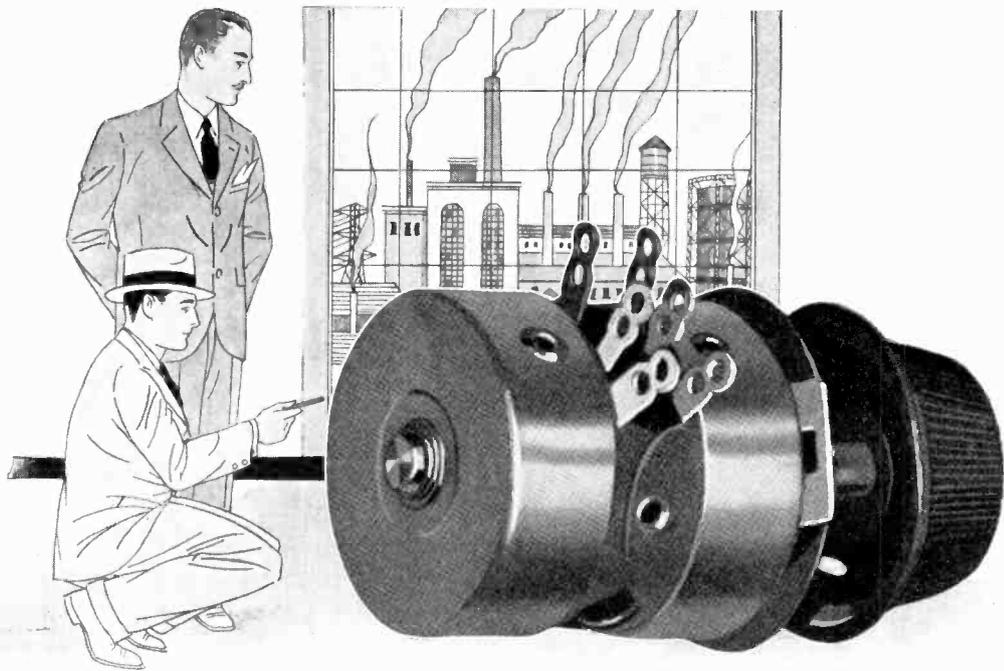
RADIO Industries

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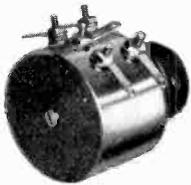
520 North Michigan Avenue

CHICAGO

Rate Card showing rates
for color, etc., will be
sent on request.



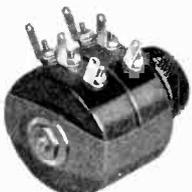
If volume controls were as large as steam turbines



No. 890



No. 280—280



No. 188J—1880

HOW carefully each and every detail would be studied by the receiver manufacturer and his engineer if volume controls were as large as steam turbines! Think what careful scrutiny these important factors to receiver efficiency then would undergo before they were chosen! . . . But because they are relatively small in size, volume controls must necessarily be extraordinarily well made if they are to deliver perfect service, just as a fine watch of small dimensions must be perfect in every detail in order to possess correct timekeeping qualities.

Frost-Radio Volume Controls, whether of the wire-wound or carbon element type, are built with a precision and with a correctness of design that insures absolute satisfaction in receiver service over the entire life of the radio set. They are noiseless, unusually sturdy, correct as to curve within exceedingly close limits, and built from "stem to stern" in the country's largest manufacturing plant devoted to the production of volume controls and fixed and variable resistors of highest quality.

An inquiry on your letterhead will bring you a copy of our valuable treatise on Volume Controls Why not write for your copy today?

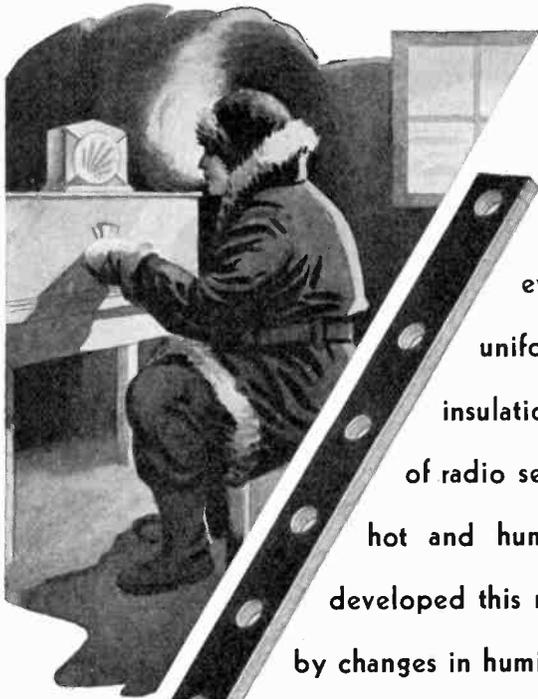
HERBERT H. FROST, Inc.

Main Offices and Factory: ELKHART, IND.

FROST-RADIO

TEXTOLITE LAMINATED

Preserves the original tuning regardless of the weather



RIGHT on the premises of Uncle Sam, the whims of weather vary between seasons (and between local-

ities) from arctic frigidity to tropical humidity. ¶ In

every season and atmosphere, radio listeners expect

uniform performance from their radio sets. Where the

insulation used is Textolite, the original precise tuning

of radio sets is preserved through dry and cold, and

hot and humid weather. General Electric research

developed this material, which is so slightly affected

by changes in humidity that it possesses a practically

constant power-factor. ¶ Besides the radio-frequency

grade, there are available many other grades of Textolite

for the needs of radio manufacturers. ¶ The eastern

and western fabricators of Textolite are equipped to

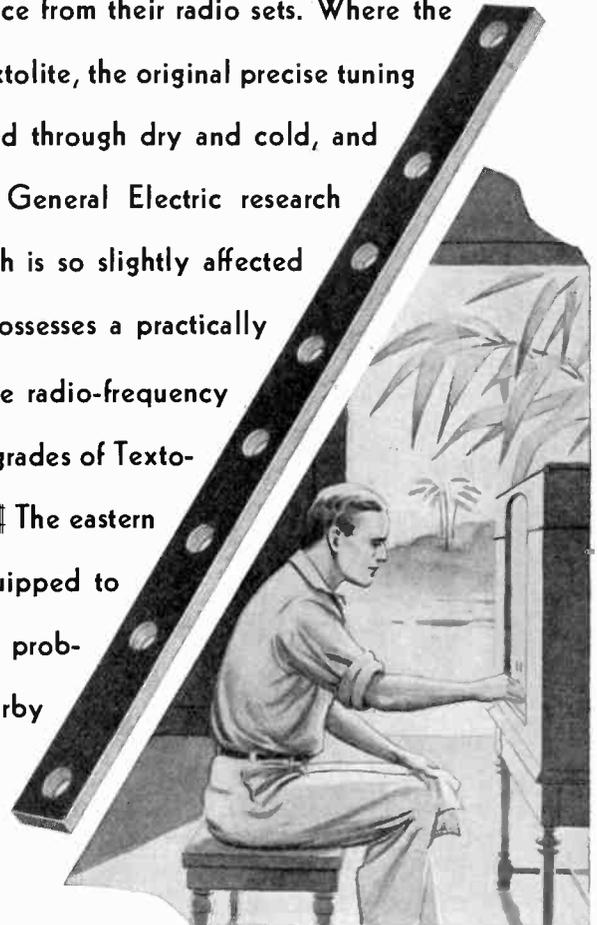
furnish advice or specifications regarding your prob-

lems. There is also a Textolite specialist in your nearby

G-E sales office.

General Fabricating Co.
165 Greenwich St.
New York City

Electrical Insulation Corp.
308 W. Washington St.
Chicago, Ill.



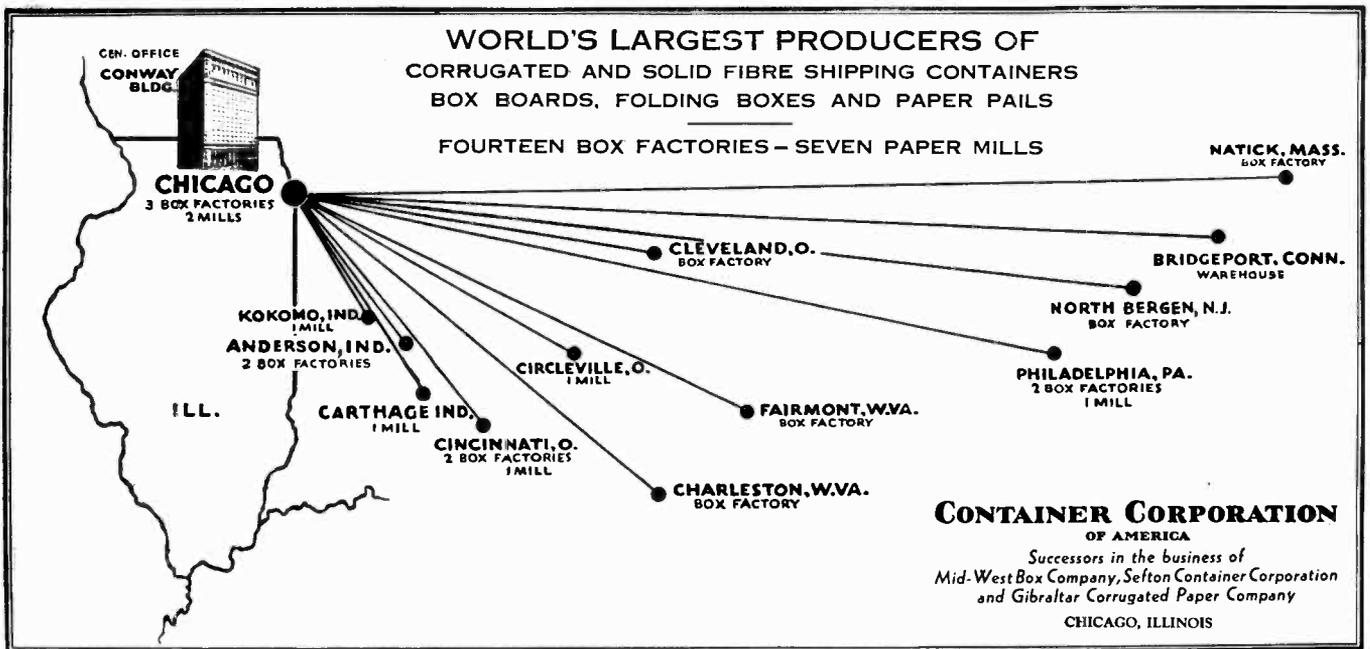
Join us in the General Electric program, broadcast every Saturday evening on a nation-wide N.B.C. network

885-47

GENERAL ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

Say You Saw It in Radio Industries

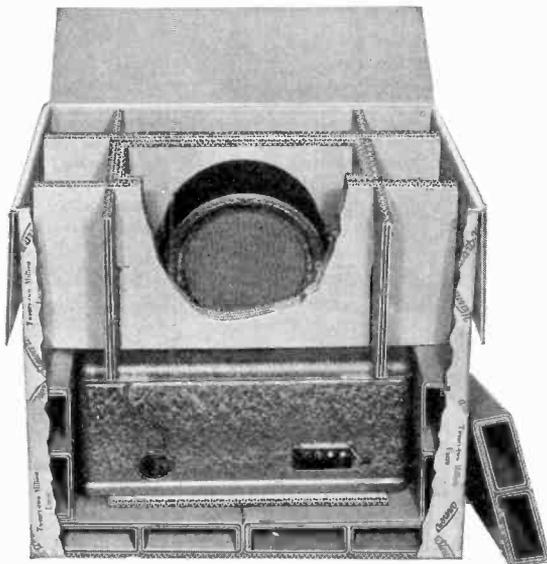


Our Progress Is the Gain of Our Customers

The growth of the Container Corporation of America is a notable one in these times of stress. Its progress is a tribute to sound management and dependable, high quality products which have secured the confidence and support of many of the Nation's biggest buyers and shippers as well as a host of manufacturers with smaller, but nevertheless important, requirements.

With the acquisition of the Sefton Container Corporation in the early part of the year, our line of quality Corrugated and Solid Fibre shipping containers and Box Boards was supplemented by a fine line of

Folding Boxes and Paper Pails, well known and popular with the trade. Recently another plant, the Gibraltar Corrugated Paper Company, was secured resulting in an unequalled manufacturing setup of mills and box factories in strategic locations which insures superior service to customers.



How a fragile radio can be packed and shipped in a corrugated fibreboard box. Note double wall reinforcements for protection

Again, our new contribution to the corrugated field—MYRACOL—which enables buyers to secure corrugated boxes in all the colors of the rainbow, at a very slight increase in cost, further indicates progress in research that is outstanding in the field. We are happy to be able to fill the long felt want of shippers for a package in colors that not only gives their goods big publicity but also brings home the name and trademark of a maker to the consumer. Here's your big chance to come before the public with a real advertising package.

Write us for complete information on your requirements for any one of our many products. On request our box engineers will call to help solve some intricate packing problem. No obligation. In regard to MYRACOL colored boxes—write in direct care of General Sales, Chicago.

CONTAINER CORPORATION OF AMERICA

Mid-West Box Company Sefton Container Corporation

Seven Mills ♦ Fifteen Factories
Capacity ♦ 1300 Tons Per Day



General Offices ♦ Conway Bldg.
111 W. Washington St., CHICAGO

Say You Saw It in Radio Industries

"The Plant Paper"

Published by
RADIO INDUSTRIES CORPORATION
 Chester A. Darling
 President
 Thomas Liddell
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 Secretary-Treasurer

RADIO Industries

**PRODUCTION
 ENGINEERING
 DISTRIBUTION**
 •
**RADIO
 TELEVISION
 SOUND PROJECTION**

With which is incorporated Radio Manufacturers' Monthly

VOLUME V

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MONTHLY CHATS

Sewing machines, vacuum cleaners and many other household appliances are now being offered to the radio wholesaler and retailer. A glance through the Chicago and New York radio shows revealed many new faces and new lines of merchandise other than the usual radio sets and accessories. Since these various appliances are all operated electrically, sold from house to house and require a certain amount of servicing, they blend in very well indeed with radio.

The question of which lines are best adapted for the radio wholesaler and retailer is one with which the Radio Wholesalers Association is at the moment concerning itself. A special committee has been appointed by the association for the purpose of studying the problem. It will be the duty of the committee to investigate each manufacturer and make a careful analysis of his product. If the committee feels that the line offered is worthy, it will receive their endorsement and recommendation.

The officers of the Radio Wholesalers Association should be commended for the fine work they are doing toward elevating the standards of merchandising in the industry.

While we are on the subject of wholesalers, let us quote part of a rather interesting editorial which appeared recently in *Printers' Ink*, "The unskilled wholesaler is an economic waste. He is a bad credit risk and does a large part of his business with other bad credit risks. He cannot give a manufacturer efficient co-operation. His salesmen are order takers. There is no reason under the sun why he should receive the same concessions as those wholesalers who have studied their businesses in the light of modern methods and who give the manufacturer economical and helpful co-operation." We agree with *Printers' Ink* and so does the Radio Wholesalers Association.

With the industry continuing to stabilize, the manufacturer can be much more independent in selecting his distributors than was true several years ago. Nowadays he is more concerned with a fair production for which he is reasonably sure of receiving his money than the reputation of being "the world's largest manufacturer" simply for the glory of it all.

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C. A. DARLING	Publisher
GEORGE GRUSKIN	Managing Editor
K. A. HATHAWAY	Associate Editor
H. G. BOYLE	Associate Editor
FRANK ROMER	Associate Editor
THOMAS LIDDELL	Business Manager
RALPH L. POWER, PH.D.	Pacific Coast Editor
LOUIS BRUCHISS	European Editor
LEE DE FOREST, PH.D.	Chairman, Editorial Advisory Board

Wm. G. Many—Eastern Editor and Manager
 Salmon Tower, 11 West 42nd Street
 NEW YORK CITY—Lackawanna 8738

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CHANGE OF ADDRESS. Instructions for change of address should be sent to the publisher at least two weeks before the date of effect.

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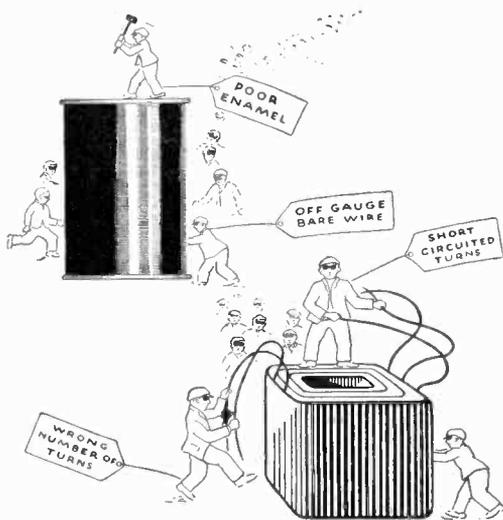
INCA
PRODUCTS
afford
PROTECTION



— *from the* **ROBBERS OF ELECTRICAL EFFICIENCY**

COILS and magnet wire may appear perfect to the naked eye. But this is an unsafe way to judge them. Defects, hidden beneath the thousands of turns preceding the outer layers may show up quickly or may not come to light for months.

Robbers of electrical efficiency! Short circuited turns, wrong number of turns, poor enamel, off gauge bare wire, high or low resistance — there are many of these "sneak thieves" invisible to the naked eye but which are likely to appear in any but the most carefully engineered products.



Inca magnet wire and coils are made to stand the supreme test, namely, *continuous operation in the field*. The necessary burglary insurance giving protection from the attacks of these robbers is provided through new and modern methods of manufacture; specially designed equipment; wire of high quality; skilled operators long experienced in wire drawing, enameling and winding, and a system of rigid tests for all products. As a result, Inca wire, inch by inch, is the best, and Inca coils, turn by turn, the most efficient it is possible to manufacture.

It is always a pleasure for Inca engineers to give you the benefit of their knowledge, facilities and experience.

NATIONAL ELECTRIC PRODUCTS CORPORATION

Inca Manufacturing Division

Copper Wire Products — Fort Wayne, Indiana

EASTERN OFFICE: Newark, New Jersey

Industrial Office Building

WESTERN PLANT AND OFFICE: 1547 Venice Blvd.

Los Angeles, California

Say You Saw It in Radio Industries

EDITORIALS

Many dealers these days are selling radio sets on a straight three-months' guarantee. In other words, the sets are guaranteed against any defect for three months following the sale. Even tubes are replaced if they burn out within that period.

GUARANTEED SETS

After all, this is virtually the same practice as that in selling automobiles. Most cars are guaranteed for a 90-day period, following which the public must assume any troubles that may arise.

But in the case of radio sets, the dealers have frequent cause for complaint regarding radio tubes. It appears that the poorer grades of tubes used as initial equipment in some sets, frequently do not stand up for the 90-day period. Consequently, the dealer must replace defective tubes in the hopes that the tube manufacturer will make good. And when the tube manufacturer fails to stand back of his product, it's just too bad for the dealer.

To those set manufacturers who ship their sets with tubes, it may be well to give real thought to this matter of the 90-day guarantee as it applies to tubes as well as to sets. Defective tubes should be immediately replaced. It's no use telling the dealer the tube was abused, for it isn't supposed to be abused in a set for which it is intended. Replace those tubes without argument. Don't antagonize the dealer. Don't waste time all around. And see to it that your tube manufacturer stands back of his product, even if he has to charge part of his replacement costs to advertising. There is no better advertising in the world today.

We were attending a gathering of radio manufacturers, not so long ago. The question of increasing the general radio market came up for discussion, in due course. After all, competitors can be good friends, and, what is more, may actually work together to the end of increasing the total market possibilities, thereby helping one another to a greater volume of business with everyone the gainer. The one startling point brought out was the lack of entertainment promotion and merchandising on the part of the radio industry as a whole.

After all, we in the radio industry are really selling home entertainment and enlightenment. If we could provide the same entertainment and enlightenment by merely showing the public how to throw open a window and gather in the sounds, we'd collect just the same as now. But it so happens that elaborate electrical mechanism is essential to bring in those precious sounds, and so we are manufacturing and selling electrical or radio equipment. Meanwhile, the broadcasters and sponsors attend to the main item in our sales promotion work.

Are we failing to sell the right thing—the program? Perhaps we are. What are we doing to introduce big

punches in programs? Practically nothing. Here and there a radio manufacturer is presenting an excellent program, but it is just one of many. What we need is novelty, curiosity, fresh appeal. If we put on a novel program feature, well advertised in advance, it sells a pile of sets and tubes. Every major ring battle has cleared the dealers' shelves. Perhaps we should cooperate, as a manufacturing group, with the broadcasters and see what can be done by way of some startling features during the next few months.

Many plants supplying parts and materials to radio set manufacturers are now working two and three shifts.

WATCH OUT!

Some report the greatest volume of business in their career. Never before has the radio industry seen such production activities in any one month. But—

Let's be careful! Month after month, we have been calling attention to delayed production schedules, and to the fact that set manufacturers would start with a bang and demand immediate deliveries on the bulk of their parts and materials. That is precisely what is happening. After delaying actual production for many months, set manufacturers are now trying to jam through a good part of their production schedules in time for the Christmas trade. The chances are that the entire season's production will be turned out within three months, which is a great deal less time than even the shortest production seasons of the past hectic days of the radio industry. We used to weep over the six months' production season, followed by the six months of idleness. Perhaps we shall soon be weeping over a three months' production season, and a nine months' period of idleness.

The sudden prosperity or rush of business in some radio quarters is simply a highly condensed production season. Don't be fooled! Spread out your figures over a six months' period, and you'll know more what the present business means. And whatever you do, do not expand on the basis of present rush orders. Work more shifts, crowd in more help, make machines work twice or three times as hard and fast. But don't expand on the basis of present rush orders!

When are we going to stop giving away our profits to jobbers and dealers? That's the big question at this

KING DEALER

time, when certain products, particularly radio tubes, are virtually being sold to the trade at practically no profit and very big expense.

The old law of supply and demand has served to crown the dealer the king of the radio industry. Said dealer sits back and listens to pyramiding promises and tapering prices. Radio manufacturers, desperately striving to unload their over-produced products, are offering the dealer the greatest bargains of a lifetime, together with

(Please turn to page 400)

TYM-FLEX

Tympanum Flexum

A New
And Exclusive Feature of
Jensen Speakers

The Year's Most Important Contribution To the Radio Industry

TYM-FLEX is the name of a new diaphragm . . . or cone . . . destined to become synonymous with Jensen as a mark of distinct superiority on loud speakers.

Over three years ago, Peter L. Jensen foresaw that the next great forward step in dynamic speakers would be in the cone design and material.

The new TYM-FLEX Cone is the result of three years of intensive research and development on the part of Jensen engineers under his direction.

This new cone has many mechanical and acoustical advantages. It is moulded in one piece . . . no glued or matched joints. It is impervious to water or moisture. It is unaffected by the widest and most rapid changes in humidity. It is free from all rattle or mechanical vibration.

These distinct mechanical advantages are greatly overshadowed by this new cone's acoustical advantages. TYM-FLEX Cones, for the

first time permit wide latitude for the incorporation of desired acoustical qualities in loud speaker diaphragms. Thus, in the skilled hands of Jensen engineers, TYM-FLEX Cones even improve the performance of Jensen Speakers . . . recognized standard of the radio industry. With the TYM-FLEX diaphragm a new performance heretofore considered unattainable is scientifically accomplished.

The industry's approval is attested by the endorsement of radio set manufacturers, more of whom use TYM-FLEX equipped Jensen Speakers than any other make.

Naturally TYM-FLEX Cones are an exclusive Jensen feature and available only in Jensen Electro-Dynamic Speakers.

Write for the new Jensen booklet, "The Story of the TYM-FLEX Cone" which tells of the dramatic development

of this outstanding improvement in loud speaker design.



Licensed under Lektophone Patents



ANOTHER NEW JENSEN SPEAKER

The trade and retail buyers are now demanding an electro-dynamic speaker with Automobile Radio Receivers. To satisfactorily meet this demand Jensen offers the new



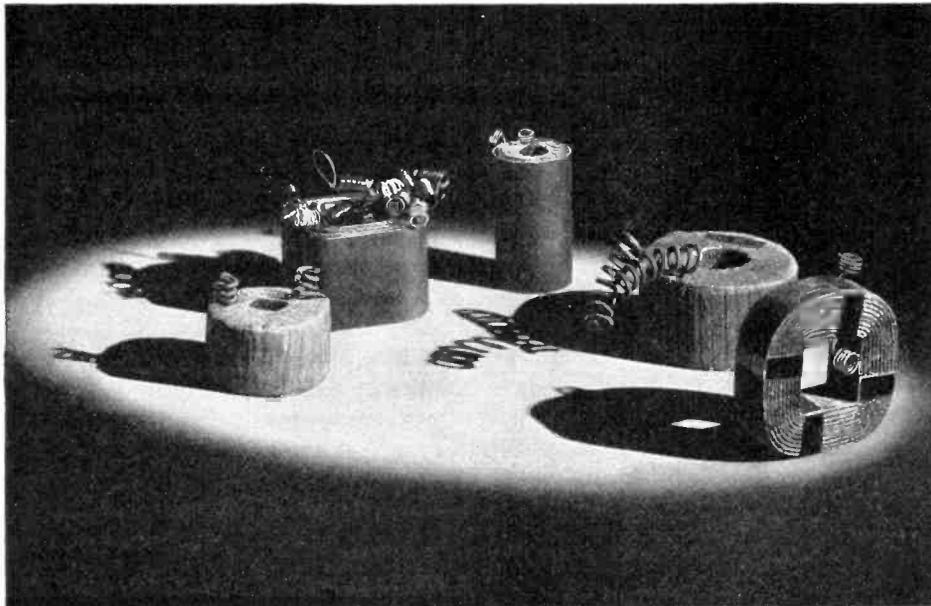
A compact electro-dynamic speaker using a minimum of current from the storage battery. Designed to withstand road shock. Built into a rigid metal housing, with sturdy adjustable brackets for convenient and quick installation. . . List price, \$16.50.

JENSEN RADIO MANUFACTURING COMPANY, 6601 South Laramie Ave., CHICAGO, ILL.

Say You Saw It in Radio Industries

RESEARCH

challenges existing coil design



Franklin's research — the researches of Farraday, Edison, Steinmetz, Hertz and many others — gave us, step by step, the great science on which all electrical industry is founded.

Many fundamentals are known and classified. Many great basic researches are done. Their contributions have been applied.

Still, electrical research goes on! General Cable has accepted the never-ending challenge for improvement. In its specialized research on coils — and in other fields — it has already brought forth much new knowledge.

This new knowledge has had its practical tests. And General Cable is ready to apply it to assist you in redesigning the coils you use.

General Cable's experience and knowledge, its research and engineering staffs, its wide manufacturing facilities are all at your command.

GENERAL CABLE CORPORATION

EXECUTIVE OFFICES: 420 LEXINGTON AVENUE, NEW YORK • OFFICES IN PRINCIPAL CITIES

Say You Saw It in Radio Industries



"The Plant Paper"

PRODUCTION
ENGINEERING
DISTRIBUTION

RADIO Industries

RADIO
TELEVISION
SOUND PROJECTION

With which is incorporated Radio Manufacturers' Monthly

Looking AHEAD with Radio

The Radio Industry, Pausing for Breath After a Decade of Unequalled Progress, Prepares for Greater Achievements in the Near Future

By CHESTER A. DARLING

Publisher

THE radio industry has been pausing for a few moments to catch its breath. An industry, like an individual, does not rush ahead at record pace without occasionally stopping to get its wind. During the past decade the radio industry has covered more ground than any other industry in the history of the world. Little wonder, therefore, that it has slowed up during the past twelve months, if for no other reason than to take an inventory of its achievements, to consider its future moves, and to prepare for such moves, quite aside from its due share of the general business recession.

It is estimated by the Department of Commerce that there were 13,478,600 radio sets in use as of July 1, 1930. New York, California and Illinois, which have the greatest number of automobiles, are credited with the greatest number of receiving sets, while Nevada, which has the smallest number of automobiles, likewise has the fewest radio sets. Nearly 25 per cent of the total number of sets is credited to the three states of New York, California and Illinois, which are estimated to have 1,752,000, 1,570,000, and 1,060,000 sets, respectively. These states are followed by Pennsylvania, with 977,000, and Ohio with 845,000. At the other end of the scale are Delaware, with 29,000; New Mexico, with 28,000; and Nevada, with 23,000. All in all, radio sets have been pretty generally distributed during the past decade, which accounts for the increasing sales resistance and the corresponding intensified merchandising efforts.

YET the radio set totals are not as disheartening as they might seem at first blush. The Department of Commerce tends to bulk all radio sets, irrespective of type, vintage and condition, in making its report. We know from the Department of Agriculture surveys that many rural homes are still equipped with crystal receiving sets, while battery sets are common in city homes quite as well as rural. There are many early AC sets still in use. Of the total of 13,478,600 radio sets in use as of July 1, 1930, it is safe to assume that not more than 5,000,000 sets are of recent origin, the remaining

8,000,000 odd sets being due for early replacement. There is as much difference between the present-day electric set and the earlier electric set as between night and day, so that we actually have an enormous potential market for our latest electric sets. Also, we have an enormous market waiting for a good battery-operated set—a market running into the millions of sets.

The automobile radio idea has been momentarily sidetracked, so far as public acceptance is concerned. This is easy to understand: during business depression, the public thinks solely in terms of reasonably essential things. An automobile radio set, being entirely new and unknown, is by no means an essential, hence it receives little consideration for the moment. But automobile radio sets are certain to come into extensive use just as soon as business in general revives, providing radio manufacturers with a large market for their wares.

OF vacuum tubes, it is estimated that the 1930 market will total about 50,000,000 to 60,000,000, although the guesses at the beginning of the year were between 85,000,000 and 90,000,000. The reason for the marked discrepancy between estimated and probable total sales, is that the replacement market has failed to live up to its reputation. In times of business depression, radio set owners have used their tubes longer than ever before, and that used to be plenty long enough. Instead of figuring on a thousand hours of useful life, many set owners are running tubes up to 3,000 hours, which speaks well for the sturdiness of our present-day radio tubes, but does not sound so well from a sales standpoint. Fortunately, however, there are many new radio tube applications in sight, which may come along soon to swell the total tube sales.

What are some of these new hopes in the radio industry, aside from a normal increase in radio set sales and radio tube sales? That is the question which many of us are trying to answer. So here is a collection of facts gathered here and there during extensive wanderings

among radio men during the past month or two, together with some interpretation so as to make them understandable.

First of all, our radio set standardization, including the tuned radio-frequency and the super-heterodyne circuits, may not be for long. In many quarters there are new circuits under way, some of them of remarkable promise. These circuits aim at remarkable selectivity, so that in time it may be possible to divide the broadcast air into two or three times as many channels, without interference. One circuit under development includes a variable band pass filter, so that the set may be tuned for any width of signal, therefore taking in every last bit of modulation or side bands, while sharpening the tuning sufficiently to discard any overlap of adjacent signals. Such a circuit is essential in developing a universal short-wave receiver to handle sound or sight programs, since the latter are generally ten times wider than the former, and must be tuned in accordingly. Of course, if more selective circuits are to be introduced, followed by more broadcast channels, the existing receivers must ultimately be discarded, which will create a huge replacement business on the one hand, while making far more programs available to the average home.

IN the matter of radio tube sales, there are many promises of a vastly increased market in the near future. Numerous radio tube devices, including the photo-electric or the grid-glow tube, have made their appearance of late, with many more to follow. For the present, these devices are designed around the standard radio tubes, so that the market is correspondingly increased for standard types. Some of these new applications are highly ingenious. For instance, there is the automatic elevator leveling device, which is coming into extensive use. It makes use of a standard photo-electric cell and a radio tube amplifier, actuating the necessary relay mechanism. Recently, the elevator door check has been introduced, which prevents the elevator door from closing while a person is passing in or out of the elevator. Insurance companies have been prompt to recognize the value of such a device, and liability insurance rates have been dropped in the case of such installations, paying them off in short order.

Industrially, the photo-electric cell and its accompanying tubes has been steadily gaining ground. Many plants are now using the electric eye for counting, sorting, matching and other forms of inspection. It is reported that this form of inspection is far more accurate than human inspection, while the cost is far less.

A leading electric manufacturer, engaged in every conceivable activity from manufacturing delicate meters to the building of huge turbines, assigns a radio tube engineer to every department, with instructions to look for ways and means of applying tubes. Many unexpected applications are thus being unearthed, and the research and engineering development groups are hard at work on the commercializing of those applications. However, and this is the usual note of warning, the development of this new art is, as in the past, being left to three large organizations. Those organizations are busy filing patents. In due course the industry at large will wake up to what has been done by way of developing new markets, but will find itself blocked by patents. There

will be the usual wailing and gnashing of teeth, and the cry of illegal monopoly and restraint of trade. Meanwhile, no one prevents any organization, large or small, from engaging in the necessary original work. The field is so vast that there is room for everyone.

BUT to return nearer home: there are several interesting developments under way. Home talkies, for instance, are ready for the market. One organization was ready to spring home talkies this fall, but, due to business conditions in general, withheld this innovation, fearing that the public might not be sufficiently receptive. That organization has good sound-on-film talkies, reproduced through the usual radio set amplifier and loudspeaker. A motion picture organization has a home talkie system making use of films and discs. The organization plans to build up a vast library of subjects, which will be made available to equipment owners by means of a rental system. Within a year, we shall see the introduction of home talkies, especially in the absence of practical radio-vision. The home talkie industry, which will in large part be handled by our radio industry, will be made or broken on just one point: the library of subjects. Heretofore, the home movie projects have gone broke on the question. Antiquated films have been placed in libraries. The public has refused to pay rental for such films, when the latest films could be seen in the nearby theatre. Today, the same situation obtains. Either the home talkies will have to be up to the minute, well reproduced, and obtainable at a rental somewhat below the price of admission at the nearby theatre, or the idea will be a flop.

THE radio organ is undoubtedly under way, as a further development of the self-expression idea in home radio. The theremin, or oscillator controlled by the waving of the hands of the player, introduced over a year ago, did not meet with the expected success. The reason may perhaps be traced to the price of the apparatus, which is out of proportion with the standard receiving set with which it is usually employed. At a lower price, together with some real merchandising activity, the theremin idea would go over big. However, the radio organ is a far more attractive proposition. Here we have a keyboard and a collection of oscillating radio tubes, so that chords, rather than a single note, may be played at one time. It is possible to introduce all kinds of musical effects and, indeed, simulate the organ successfully. Several workers are engaged on the radio organ problem, and just as soon as business in general perks up to the necessary degree, this device will make its appearance.

One thing which the public at large is waiting for is a simple, inexpensive photo-electric cell unit, complete with amplifier, for application to any number of functions. Little has been done so far in this direction. There are so many things that can be accomplished by the photo-electric cell, that a suitable control unit would meet with extensive favor. In fact, this method of attacking the broad photo-electric cell field is far more sensible than trying to develop the individual applications themselves, except in instances where definite re-

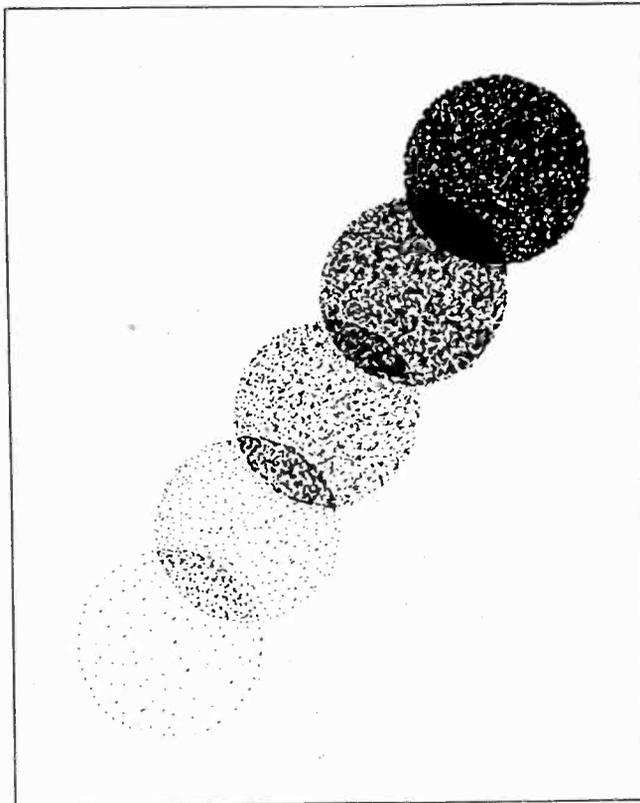
(Please turn to page 403)

GHOST IMAGES

Observations of the Effect of the Heaviside Layer on Television Reception

By U. A. SANABRIA

Chief Engineer, Western Television Corporation



Ghosts at 2,800 K.C.

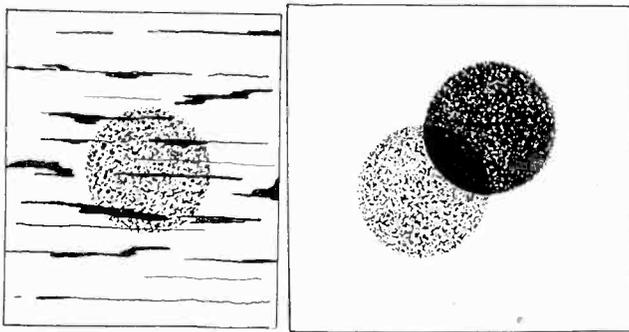
THE reception of Television images beyond the ground wave of the transmitter is made possible by the refracted wave from the sky or ionized layer of air around the earth. The conventional theory is that these ionized layers of gas exist at several levels, each having a different and varying index of refraction and a varying height above the earth. The electromagnetic radiation below 214 meters is refracted critically back to earth close to the transmitter. Above 214 meters the radiation is said to penetrate the Heaviside layer and emerge upward, perhaps striking several other strata at various heights. Depending upon heterogeneous probabilities, it may be refracted again to earth at any point, the exact location of which is not definite. The electromagnetic radiation from a radio transmitter will behave substantially like light and therefore the same well-known theories and observations can be applied; though, of course, the shorter the wave length the more nearly this seems to be the case.

There is an area which varies with the season of the year through which the ground wave and the refracted wave from the transmitter exhibit the same signal strength, but because the speed of radio transmission is finite and the earth so very large, 300,000,000 meters per second is too slow and the refracted wave lags behind the ground wave from a thousandth to a three hundredth of a second depending upon the climate, the zone, the time of the year and the time of the day or night. Television or voice reception in this area is a total loss; the sound reception effect resembles someone talking within a barrel, and in television a double image or more correctly a multiple image or ghost is observed. It is accepted by all known workers at this time that this double image is caused by the combination of the ground wave and the refracted wave. The radio sound engineer

has eliminated this problem for practical purposes by using wave lengths above 214 meters, and therefore his observations and technique have not been of much assistance in the radio transmission of television. It has been necessary for television workers to take on the burden and master the art of intermediate wave transmission heretofore known as the grave-yard wave lengths so carefully avoided by the experts of early days and to which the American amateur radio man was sentenced with the belief that he would become discouraged and pass out of existence. Fortunately, the television instrument is the most ideal device known to observe refraction defects for the elements of time and image fidelity are combined in a dynamic condition that for practical purposes is as good as a film oscillograph, but not having any of that instrument's disadvantages.

We have been enabled to improve our radio transmission technique very rapidly because of the advantages of the television receiver as a means of directly making observation. Mr. A. F. Conto and the writer have conducted numerous observations at various intervals during the past year. The height of the Heaviside layer in 1929 was apparently much higher than in 1930 and we were bothered by ghost images only at great distances from the transmitter. In the early part of May we observed a flashing ghost five miles north of the transmitter, commencing at 9 P. M. and growing more violent until 11 P. M. at which time the ghost continued to be received with less power until one hour before sunrise.

We noticed that the antenna stretched in the open received much less ghost than the one that was shielded by a metal building. I concluded that the ground wave was considerably weakened by the absorption due to the metal in the observatory and the refracted wave was relatively stronger. The antenna on the open side of the



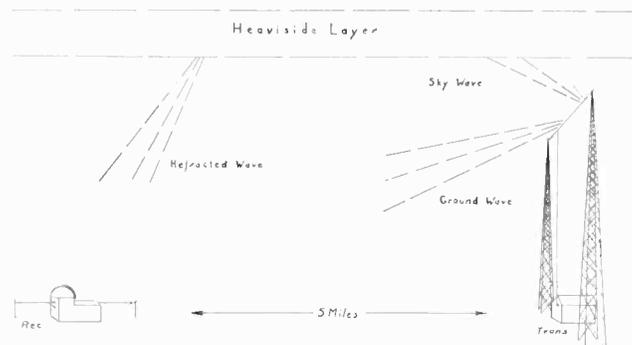
Left, Effect of Self Heterodyne. Right, Ghost at 2,000 K.C.

house collected less disturbance. I attempted to observe the co-relation of visible clouds in the sky with the weak ghosts that occurred at brief intervals in the afternoon, but sometimes the two occurred simultaneously and at other times only faint traces of clouds were apparent. The ghosts at this time were simply black brief flashes. The net result of this observation is nothing definite. The months of May and June passed with strong refracted images observed five miles from the transmitter during the night. July and August saw this disturbance move out to 12 miles. The summer nights made it possible to stay outside and observe the hour to hour effect and conduct many antenna experiments. The use of a large copper screen over the antenna was tried with the object of screening the sky wave but not the ground wave. This experiment did not eliminate the sky wave. A vertical antenna sent up to a great height with balloons practically eliminated the disturbance. It seems that the height of this antenna enabled it to collect a large quantity of direct radiation. A small vertical antenna was better than a horizontal antenna. A vertical loop reduced the sky wave interference. It has been apparent that refracted waves are received at all points from the transmitter, but nearby the direct radiation is sufficiently strong seemingly to "blanket" the refracted wave so that it can not be observed except behind large metal objects.

One very objectionable effect is the self heterodyne phenomenon. A modulated carrier leaves the transmitter, but arrives at the receiver as two different frequencies because of the difference in time between the refracted and the direct wave. Consider a rising audio frequency, rising from 2,000 to 3,000 cycles continuously repeated every three hundredth of a second. The direct wave travelling 30 miles will arrive as a frequency of 2,000,000 cycles with a modulated frequency of 2,000 cycles in approximately one sixth thousandth of a second, but the refracted wave may arrive one three hundredth of a second later, having the same carrier frequency but with 3,000 cycles impressed. This gives rise to a self made beat phenomenon that occurs violently when the carrier wobbles with modulation and shows flashing dirt in the picture. All of these observations were made with Station W9XAO of the Western Television Corporation at 147 meters. W9XAP—The Chicago Daily News Station operating on 107 meters was installed by Mr. W. N. Parker of our Company and from this we observe audio frequency ghosts as close as two miles from the transmitter. The ground wave radiation at this frequency with a Hertz antenna has been very weak, but the sky wave radiation has been very strong and it has been received in New Mexico and New Jersey

with great strength. Considerable study of radiators at this frequency will be required before it will be as commercially satisfactory as the 147 meter wave length. It is apparent that this wave length is critically refracted by the Heaviside layer and by various strata of it causing the various refracted waves to be rapidly shifted in and out of the picture.

It is difficult to account for such strong refraction so close to the transmitter if we consider the Heaviside layer to be flat, but since it is quite possible that its surface is very irregular and that the layers have various refractive indexes, the occurrence seems more rational. At a later time I shall be able to describe various theoretical and practical methods and means for eliminating the ghost image on television as considerable work is being done in this direction at the present time. The ghost image oc-



Showing How One Antenna Will Receive More Ghost than Another

curs principally during the night though very slightly during the day at great distances. About one hour after sundown the multiple image phenomenon begins to show, increasing in violence for about two hours and then gradually decreasing. A full moon greatly decreases the violence of this effect. The Heaviside layer seems to rise in height and the ghost area moves farther away from the transmitter as the hour grows later. About one hour before sunrise the refracted wave is very quiet and has very little power except at great distances. During the course of 45 minutes beyond this time all the effects observed during the night over a period of hours are again observed giving evidence that the Heaviside layer descends at great speed as the sun's rays strike it. About 15 minutes before sunrise all disturbance ceases and does not reoccur until after sunset.

RADIO INDUSTRIES is read by every manufacturing executive, chief engineer, factory representative, and leading jobber in the United States and Canada. Established in 1926, it has developed real leadership and its proper position as the only publication edited and published exclusively for the radio and allied manufacturing industries. **RADIO INDUSTRIES** has one advertising rate, one subscription price and one major policy—to render superlative service to its readers by reporting the live news and urging sound business principles.



THIS RADIO INDUSTRY

V. The Midget Manufacturers Hold Their First Annual Convention.

A PLANT Especially DESIGNED

By W. J. FRISBIE, SR.

Factory Manager, Silver-Marshall, Inc.

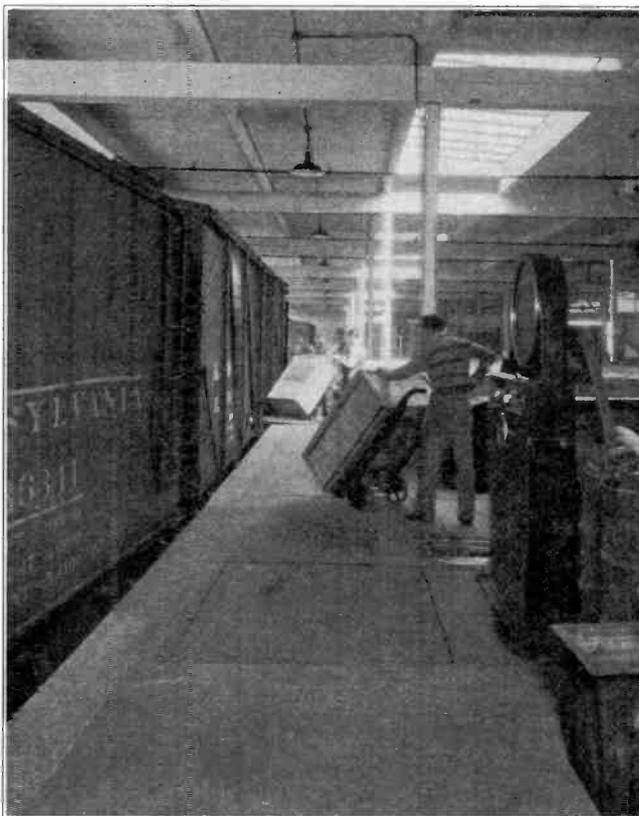
A FACTORY especially designed for the manufacture of radios is something of a novelty in this young industry. The Silver-Marshall plant at Chicago is an unusually good example of the modern type.

As practically all parts are fabricated from the raw material, the stock-room is the key to the plant's arrangement. It covers 12,000 square feet in the exact center of the building and consists of rows of open shelving and bins with aisle-ways between the rows.

Standard-gage tracks running into the building deliver carloads of raw material to the loading platforms from where it enters the stock-room. Preliminary inspection of incoming material is carried on there so as to eliminate the additional paper work and extra handling that would be necessary under any of the older, less efficient systems.

Huge sheets of transformer steel are drawn from the stock-room by the machine shop and run through slitting machines directly to the press platforms where the punched laminations are automatically stacked and delivered to the transformer laminating department where they are used in manufacturing the 47 types of S-M transformers. In the finished form they are returned to the stock-room to be re-issued to the Assembly Department.

The tremendously large coil department operates in the same manner. All iron-cored types of coils, after going through exhaustive tests, are delivered to the Transformer Department and the air-cored types are tested and sent to the Assembly Department that uses them, either through the stock-room where a pool of them is built up, or direct to the Mechanical Assembly Department where production is geared in exact step to



The standard-gage railway terminal in the Silver-Marshall factory where raw material is unloaded. Freight cars are re-loaded with out-going merchandise before they leave the plant



Coil winding department where the enormous number of coils are made that are required daily in the construction of Silver-Marshall Superheterodyne receivers



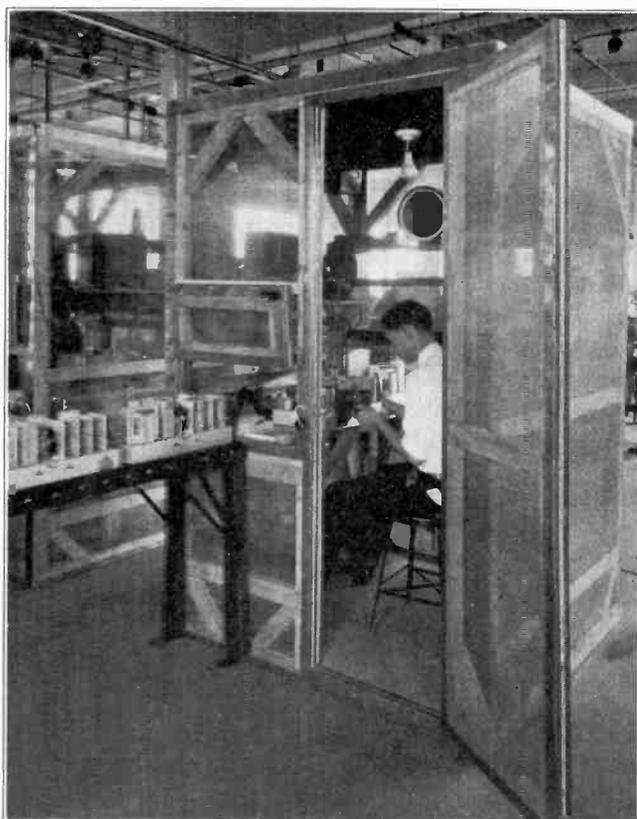
Part of the research laboratory at the Silver-Marshall factory, where all S-M circuits are developed. From here they go downstairs to the factory laboratory where working models are designed

For MODERN Radio PRODUCTION

Describing an Ideal and Thoroughly Systematized Factory Layout



The 12,000 foot, centrally located stock-room into which all material flows and from which it is drawn as needed by the various departments. All preliminary inspections of raw materials are also made here which greatly speeds up operations in manufacturing departments



Detailed view of one of the six testing booths at the Silver-Marshall factory. The Cabinet Assembly department is the next destination of the receivers

the production of the section of the Coil Winding Department that makes these particular items.

Various finished parts made in other departments flow step by step through progressive assembly, pass out the other end as complete sub-assemblies that go to the main production lines to go through yet other progressive assembly operations, emerging in a surprisingly short space of time as completed radio products.

From the production lines the completed receivers go over a conveyor system through the test booths, where the tuning condensers are aligned and the receivers are tested for sensitivity.

From the test booths the receivers go to the Cabinet Assembly Department where the same high degree of efficiency is maintained. Handling is cut to a minimum here by the use of a U-shaped conveyor track along one leg of which the cabinets are unpacked and placed on the tract where they are inspected and moved along for the installation of the finished chassis and speaker unit. It is here that the radio sets receive their final test on actual broadcast programs—the last of more than 700 inspections.

After their final approval they are conveyed to the end of the line where they are packed and shipped from the same railway spur that brought raw material into the plant.

* *

Howard W. Sams, General Sales Manager of Silver-Marshall, Inc., recently invited a party of acquaintances at the Chicago Radio Show to witness the night shift at the factory regularly testing the new Silver-Marshall Superheterodynes on California stations.

Every receiver manufactured during the night is regularly tested on KFI, Los Angeles, before it receives final approval.



From the production lines the completed receivers go over a conveyor system through the test booths where the tuning condensers are aligned and the receivers are tested for sensitivity



Radio DISTRIBUTORS Planning EXPANSION

Radio Wholesalers' Association
Making Survey of Potential
Supplementary Lines

By H. G. ERSTROM

Executive Vice-President, Radio Wholesalers Association

I NTEREST in the handling of supplementary lines to Radio has grown to a very marked degree this year and manufacturers of allied lines welcome this new channel of distribution. Such manufacturers inevitably call upon the radio wholesaler as one of their best and most aggressive means of distributing their product. The appeal of radio merchandise brings the consumer to the radio stores, and it is becoming a recognized fact that this direct contact makes the wholesaler and retailer an ideal outlet for all products used in the home.

During the past year, many products have been offered for consideration of the radio wholesaler with the result that a large number of them have added allied lines to their radio business. It is a well known fact that many other radio wholesalers are looking for supplementary lines and when they are submitted to them desire to have them investigated as completely as possible, in order to ascertain whether or not the product is adaptable to radio distribution channels.

I N order to be of the greatest service possible to the radio wholesalers, the Radio Wholesalers Association is now making a survey of all allied lines offered for consideration of their membership. When an individual member is approached by a manufacturer of an allied line and he desires complete information on that company he has but to write to the Executive Offices and they will immediately undertake a survey to secure definite, bonafide information on the company for his information. Mr. Robert Himmel, President of Hudson-Ross, Inc., Chicago, has been appointed Chairman of the Special Supplementary Line Committee. The three members, Mr. H. E. Richardson, Young, Lorish & Richardson, Inc., Chicago, Mr. Peter Sampson, Sampson Electric Co., Chicago and Mr. Harold J. Wrape, Benwood-Linze Co., St. Louis, Mo., will make up the complete mem-

bership of the committee. The committee is already functioning and have investigated several supplementary lines for the benefit of the membership. It behooves manufacturers of allied lines to request the Executive Offices of the Association for a copy of the Supplementary Line Survey Form so that they might fill it out completely and can then refer to their form being in the hands of the Special Committee so that any wholesaler member might have direct access to this information by writing headquarters.

I T is felt that this service will be invaluable in assisting the members to determine whether or not it is advisable to add the line to their present radio merchandise. It will be of great value in predetermining whether or not the company is sincere in their methods of establishing distribution and whether or not they have the financial requisites to carry on and continue in business.

Any member desiring to refer their inquiry to the Executive Offices can have the company manufacturing their allied product investigated immediately. The committee will investigate all inquiries from an absolutely unbiased viewpoint and to the best of their knowledge and ability; they will neither recommend, endorse, nor condemn any product, but will make the investigation in a very conscientious manner and report the true facts immediately.

It is planned to bring this subject to the attention of the home talking picture industry, home entertainment features, musical devices, sporting goods houses, electrical side lines, and all other allied trade bodies for their information. The future developments in radio will make this service an invaluable one in protecting members of the association on their future expansion.

(A copy of the survey form to be filled out by manufacturers of supplementary lines will be found on page 404)

A New BATTERY for RURAL SETS

**Air Cell "A" Battery Is Especially
Designed for 2-Volt Tube
Receivers**

By **E. E. HORINE**

Engineer, National Carbon Company

THE new constant voltage "breathing battery," about which many rumors have been circulated for several months, has finally been announced officially by National Carbon Company, whose research laboratories designed the new product. The battery, named the Eveready Air Cell, was on display for the first time at the Radio World Fair in New York the week of September 22.

The most interesting aspect of this new development is that, when considered in conjunction with the new 2-volt tubes, it promises to open up a vast and practically unexploited market for the sale of radio receivers in rural sections for use in unwired homes. Already several large manufacturers have started production of Air Cell receivers designed around this battery-tube combination.

There is, and always has been, a large, untouched market for battery operated receivers, conservatively estimated at 2,000,000 families, mostly rural, so located that radio can come to them only by way of battery sets, but, who, so far, have refrained from buying because the industry has been unable to make the kind of receiver these people must have.

THE only kind of battery operated receivers the industry has been able to offer these people have been the so-called "storage battery" set and the "dry battery" set. The storage battery set uses a type of tube which demands such heavy filament current that only a storage battery can meet the demand. The storage battery set has proved itself to be better and more practical than the dry battery set, but it can not be used by these 2,000,000 or more people because they either will not, or they can not go to the trouble and the expense involved in keeping a storage battery charged.

The dry battery set, so named because it uses a type of tube so sparing in its consumption of filament current that its demand falls within the current-producing ability of the dry cell, at one time promised to be the solution of the rural radio problem. The eagerness with which the first dry battery sets were snapped up by the trade and the public is evidence of the existence of a large and hungry market for a battery set which does not require a storage battery. In spite of its initial



enthusiastic acceptance, however, the dry battery set failed to achieve commercial success. Its popularity waned, and, in spite of serious efforts to perpetuate it, finally passed out of the picture. It is no longer being manufactured. The failure of the dry battery set left a large part of the rural radio market high and dry.

THE research Laboratory of National Carbon Company went to work over two years ago on a radio research program having for its ultimate object the development of the means which would enable the radio industry to produce the right kind of receiver for this large, and hitherto neglected market. Out of this work have come the new Eveready Air Cell "A" Battery AND the new 2-volt tube. Of particular interest is the fact that the means of making the right kind of set is provided not by the battery alone, or by the tube alone, but by both in combination.

When we think of dry battery sets, we usually think of the 199 tube, because this was the first so-called "dry battery" tube, and because it was more widely used in commercial receivers than its running mate, the WD-11. However, the remarks about to be made apply equally to both types of tubes, and in fact, to all tubes classed as dry battery tubes. Reference is made to the 199 specifically because it is more familiar than other similar tubes.

The majority of people familiar with the history of the dry battery set blame its failure on the tube. The 199 (and others) have the reputation of being fragile, delicate, short-lived, and generally unsuited for the purpose they were intended for. It is true that these tubes exhibited an alarmingly high rate of infant mortality; premature death was the order of the day, and the grief attendant upon the epidemic of tube failures caused many a tube and set engineer to sweat blood and turn gray before their time. But the trouble was not in the tube. It was the result of attempting to consummate a union between that mismatched pair, the vacuum tube and the dry cell.

THE vacuum tube and the dry cell are not compatible. Either alone is perfectly satisfactory, but nature never intended them to get along together. This was not well

understood in the early days of radio, and is not generally understood now, but it really is the cause of all the trouble the industry experienced in its efforts to exploit the dry battery set idea.

THE vacuum tube demands, and must have, its filament current delivered to it at practically constant voltage; the dry cell, by nature, is incapable of meeting this demand, being inherently a variable voltage device. If the voltage applied to a tube filament is only slightly above the rated value, the tube loses emission, or may actually burn out. On the other hand, if the applied voltage falls slightly below the tube's rated value, the tube ceases to function for as long as the voltage is below normal. The upper safe voltage limit, above which burnout occurs, and the lower satisfactory voltage limit, below which the tube ceases to operate, are rather close together, the permissible leeway between them amounting to not more than 5% of the rated voltage of the tube, in most cases.

In contrast with this exacting demand for constant voltage, the initial voltage of a good dry cell is at least 50% higher than the final voltage at the end of life.

The tube, then, ANY tube, as a matter of fact, including the new 2-volt tube, is essentially a constant-voltage device; any dry cell is inherently a variable-voltage device. These directly opposing traits are responsible for the failure of the dry battery set, not the reputed fragility and general unsuitability of the tube.

To get right down to the fundamentals of the thing, the dry battery set failed because of an unsuitable battery-tube combination.

Many devices intended to bring these opposing traits into line have been tried, but without permanent success. A few of the more familiar of such devices are: the filament rheostat, the indicating filament voltmeter, the ballast resistor, and the automatic voltage regulator.

When it is considered that none of these devices were successful, it is evident that any effort to invent still another device intended to reconcile the difference in the dry cell and the tube would be wasted. Then, too, there is still another weakness of the dry battery set which should be overcome, if possible, and that is the frequency with which even the recommended, most economical combination of dry cells must be renewed. Depending on the number of 199 tubes in the set, the best dry cell "A" battery consists of six, nine or twelve dry cells, hooked up in a complicated series-multiple connection, a form of connection extremely difficult for the average set owner to make, and one which has resulted in the ruination of numerous cells and tubes, through wrongly made connections. Even assuming that the set owner gets his dry cells hooked up correctly, he has to go through the whole procedure again in two, three or four months. To be completely acceptable, the new sets should be free of this nuisance, inconvenience and expense.

THIS leads to the inescapable conclusion that the dry cell is not a satisfactory source of filament power for radio receivers. It never has been; its variable voltage characteristic kills it for that. It is perfectly satisfactory for a host of other uses, and is daily demonstrating its

fitness to serve devices not requiring constant voltage, including the "B" circuit of the vacuum tube, but it is now evident that nature never intended it to serve as an "A" battery for a radio set. We must seek elsewhere for a suitable source of filament power.

Since an unsuitable battery-tube combination was at the root of the dry battery set failure, it is logical to conclude that the way to go about making a successful set would be to develop a suitable battery-tube combination; a battery and a tube in which the essential electrical characteristics would harmonize, rather than oppose each other. And, in addition, the tubes should be as sparing as possible in the consumption of "B" battery current, to prolong the life of that important adjunct, and the "A" battery should have large capacity, to the end that it will last much longer than the best combination of dry cells hitherto available, and thus make it possible for the user to obtain satisfactory reception for unusually long periods from one installation of batteries.

THE Research Laboratories of National Carbon Company, in other words, set out to develop a battery receiver which would look like, act like, and be operated like the now universally familiar AC set; a battery receiver which would afford its owner the simplicity of operation, the dependability, the quality of reception, the economy of upkeep of an AC set, but which would not require a storage battery and which would not require manually adjustable controls, which, through accidental mis-adjustment, could cause damage to the tubes, the batteries, or both.

The most important characteristic of the new battery, and the one which makes it an inseparable companion of the 2-volt tube is its constant voltage feature. Unlike most primary batteries of the past, the voltage of this battery remains practically at full initial strength throughout its entire life, without recharging. This important feature is the result of a development by National Carbon Company Research Laboratories in the form of a special carbon electrode, by means of which the essential, life-giving oxygen is drawn into the battery as required, directly from the air. Hence the name "Air Cell" Battery.

IN all other forms of batteries, the oxygen is supplied in the form of some chemical or mineral built into the battery. The oxygen carrier in the dry cell, for example, is manganese dioxide, a natural mineral occurring at widely separated points in the earth's crust. In the dry cell, as the oxygen, which is the depolarizer, becomes used up, the working voltage falls as a consequence. In the Air Cell battery, with an unlimited supply of oxygen always available, the voltage-reducing hydrogen can not accumulate within the battery, but is converted into harmless water as fast as it is generated by the flow of current through the cell. Thus the voltage remains well up until all the active, electricity-producing ingredients in the battery have been consumed.

The idea of using the air itself as the depolarizer is almost as old as the primary battery. Probably every

(Please turn to page 405)

PACKING Radio Products

New Fibreboard Packages Developed for the Radio Industry

By O. W. WINTE

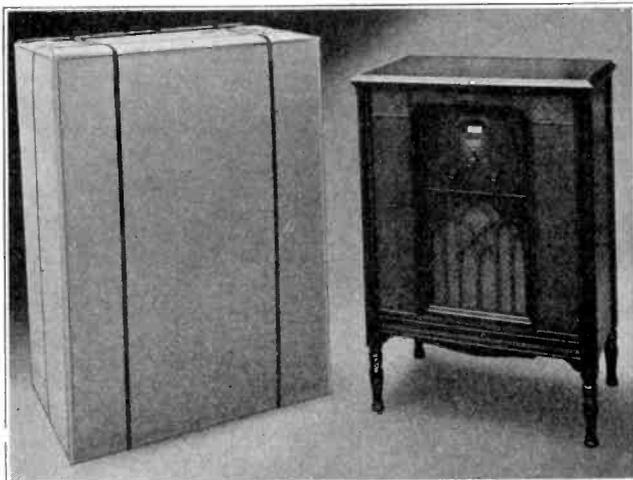
Special Representative, Container Corporation of America

IN looking back ten or fifteen years, the manufacturers of corrugated and solid fibre shipping containers are grateful for the large volume of business received from the radio industry and it might be of interest to readers of *Radio Industries* to briefly summarize the part that fibreboard boxes have performed in the packing and distribution of radio products.

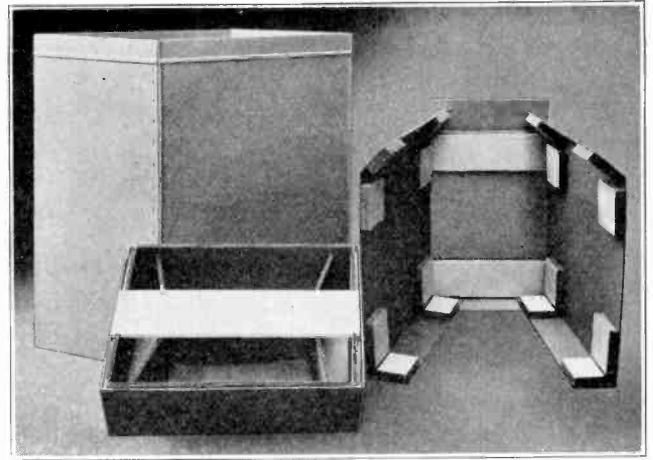
The term Fibreboard covers both the corrugated and solid fibre construction of material. Corrugated boxes are made with one or two sheets of cellular constructed board, faced on each side with tough fibre sheets of various calipers. Solid fibre boxes are built of several piles of chipboard faced on each side with tough fibre sheets. Solid fibre boxes for shipping are manufactured in thickness caliperings .060, .080, .100, and .120.

Each construction has its advantages and the one best adapted is determined by the products to be packed. Also the weight, size, and shape of the article packed are determining factors.

The first package problem in the radio industry was the advent of the small Crystal Set which presented few difficulties on account of its light weight and size. Shortly after this the Table Set Radio and Loudspeaker were introduced. Here the package manufacturer faced the problem of greater weight, irregularity in shape, and



Howard console packed ready for shipping



Outer tube, bottom tray construction and corrugated assembly piece to fold over the cabinet

sensitivity of mechanism. Today the fibre box manufacturer can look back and state with assurance that hundreds of thousands of Radio Sets and Loudspeakers have been shipped in fibreboard boxes with complete success. These boxes were properly designed by using the correct strength and thickness of board, together with interior packing used to rigidly brace and cushion the contents so as to withstand outside shocks and the ordinary handling received in transit.

The Container Corporation of America maintains a Research Department where package engineers are constantly engaged in the study of special packing problems, and in the last decade many changes have been made to give greater strength to materials and interior packing construction. Articles of larger sizes and heavier weights can now be shipped satisfactorily in fibreboard boxes and research work has developed safe packages for the heavier weights and larger sizes.

The latest development is a fibreboard packer for large Radio Console sets. This construction may seem to many as a radical departure from the present method of packing in wooden cases, but it is a safe package and effects many economies.

There are fundamental requirements for a successful packer for Radio Console sets regardless of whether a wooden or fibreboard packer is used. The cabinet must be rigidly held in place and suspended from the sides of the outer box, and the legs supported in the box to withstand any drop on the bottom corners and prevent them from coming in contact with the outer box. The material and construction of the outer box must be of sufficient strength and rigidity to withstand the usual shipping and handling hazards.

This new fibreboard packer will meet these requirements and has other advantages. Briefly, it is constructed as follows.

First. The cabinet and legs are suspended one and one-half inches from the bottom by means of a solid fibre tray in which there is a double wall corrugated liner, two pads, and heavy chipboard end pieces which serve the purpose of sustaining the weight and bracing the

(Please turn to page 400)

An ELECTRICAL SCANNING SYSTEM

One of the World's Outstanding Workers in the Realm of Television
Development Here Describes the Fundamental Theoretical
and Technical Principles Underlying the Partic-
ular Radiovision System That Is the
Product of His Own Research

TELEVISION has intrigued the imagination of inventors and laymen alike for many years. To the inventor the problem is one of absorbing interest, because of its extreme difficulty, and of its very evident tremendous value to humankind.

Lately, the goal has been glimpsed. It will be reached—some think tomorrow, others more conservative, and in some instances the writer believes not well informed, predict at least a decade before Television in the popular sense will be a reality.

The Television worker is confronted by a most formidable list of problems. An image, possessing as it does three dimensions, requires that a very great amount of information be transmitted for its reproduction. When each point is transmitted successively, about 100,000 to 200,000 current changes are required to transmit each picture, or from 1,500,000 to 3,000,000 changes per second for continuous vision. A simple effective system to scan an image at this enormous rate is of paramount importance to the

television inventor. Attempts made to solve this problem have brought forth the Nipkow scanning disc, the Jenkins scanning drum, special mechanical oscillographs, and many other very ingenious devices. The problem of attaining at the transmitter light intensity enough to give an input signal of sufficient magnitude is very difficult. An amplifier to handle the extremely wide band of frequencies required constitutes another exacting requirement. Synchronization of the transmitting and receiving scanning system is a problem particularly difficult where mechanical scanning is used. The design of a receiver simple enough to be used in the home, giving an image large and intense enough to be accepted by the lay public, has taxed the ingenuity of all inventors to the limit. Finally, in the radio transmission medium, in order to handle the requisite wide band of frequencies, it is necessary to use relatively short waves with consequent trouble from fading and double images. All in all, it appears that the skeptics have very good reason to doubt that Television will be available soon.

The writer has felt from the beginning that if Television were to be accomplished by the use of the principle of scanning, the system employed must be electrical and should preferably employ no mechanically moving parts. The Television system to be described in this article has solved a great many of the problems enumerated above. It permits an image to be scanned at practically any rate. It allows synchronization to be obtained in a simple and entirely effective manner. It allows light intensity to be obtained at the receiver that is ample for most purposes. Most important of all it transmits vision over a distance with sufficient distinctness to be of immediate practical value. The sensitivity of the transmitting tube is such that with a cell designed for moderate detail, direct scanning of objects may be had with illuminations that are not too bright to be used with animate subjects; in fact, are quite comparable to those used in motion picture photography. An amplifier has been completed which will amplify all frequencies between 20 cycles and well over 1,000 kilocycles. This amplifier is more than adequate for television purposes.

Difficulties as yet facing the television worker are those due to the extreme difficulty of transmitting the wide frequency band required from transmitter to receiver. If this problem were solved there would be no reason why television comparable to the present motion pictures could not be immediately available.

Electrical Scanning

Dissector Tube.

When this work was first undertaken, the most urgent need was

¹Bell System Technical Journal, Oct. 1927, "For an Elementary Treatment of the Wave Band Requirements, etc., for Television."
²See for example, U. S. Patent No. 1,470,696, A. McLean, Nicolson, Oct. 16, 1923.

³A. R. Olpin "Method of Enhancing Sensitivities of Alkali Photo-Electric Cells." Phys. Rev. Vol. 36, July 15, 1930, page 251.

⁴L. R. Koller, J. O. S. A., R. S. I. 19-135, 1929. See also Koller, Phys. Rev. 33, 1082 (A), 1929.

⁵Zworykin and Wilson "Photo-Cells and their Application," page 55.

⁶Nicolson, U. S. Patent, Loc. Cit.

⁷B. Rosing, U. S. Patent No. 1,161,734, Nov. 23, 1915.

⁸Zworykin, Paper presented before IRE in Nov., 1929.

⁹See for example an article by R. V. L. Hartley, "Transmission of Information." Bell System Technical Journal, Vol. 7, 1928, page 535.

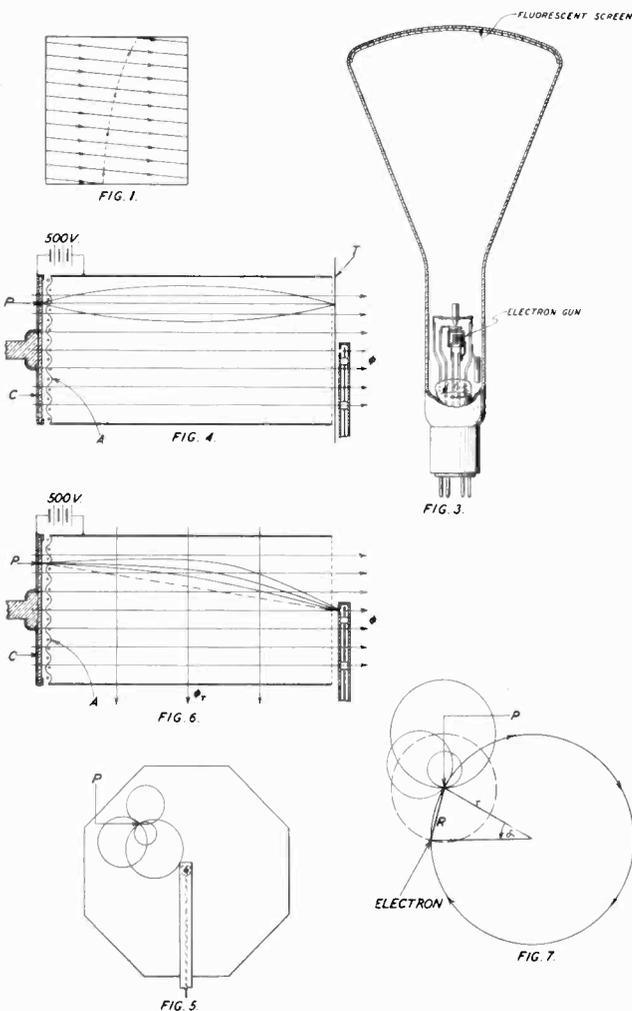


Fig. 1. Mode of scanning

Fig. 3. Oscillite or receiver tube

For TELEVISION

By **PHILO T. FARNSWORTH**

Director of Research, Television Laboratories, Inc.

for an electrical scanning system. The basis for this system as it has finally evolved is an image dissector tube a practical form of which is shown diagrammatically in Fig. 2, and Fig. 8. As will be seen, it comprises a cathode (C) coated with photo sensitive material, parallel and closely situated to an anode screen (A). The anode screen is electrically connected to the electrostatic shield (S). At the end opposite the cathode is placed a target electrode having all but a single small area shielded from the discharge.

This tube considered broadly is a photo-electric cell wherein provision is made for forming an "electron image" of an optical image focused on its cathode surface. By "electron image" it is meant that were a fluorescent screen placed in the plane of the electron image, the original optical image would be reproduced. The condition necessary for the formation of this electron image is that all electrons emitted from any single point on the cathode surface shall meet again in a corresponding point in the plane of the electron image.

An image of the object to be transmitted is focused on to the cathode. The photo-electrons emitted therefrom are accelerated through a potential of the order of 500 volts between the cathode and anode screen. Most of them are projected into the equipotential region between the screen and target. By means to be described later, these electrons re-combine to give an electron image in the plane of the target. This electron image made up as it is, of a prism of moving electrons can be shifted by a magnetic field transverse to the tube. By this means, the image is moved over the scanning aperture in the target shield.

In practice, two sets of coils are positioned about the dissector tube as shown in Fig. 2. These two coil systems are placed at right angles to one another. A saw tooth wave alternating current of about 3,000 cycles per second flows through one set of coils producing—let us say, a horizontal deflection of the image. A current of similar wave form of a period of 1/15th of a second flows through the other set of coils, and produces a vertical deflection of the image. The resultant path of the image, relative to the aperture is similar to that given in Fig. 1. There will be 200 horizontal lines drawn for each traversal of the image, and

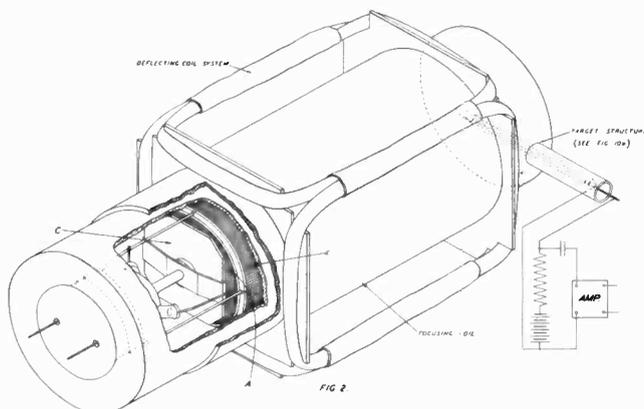
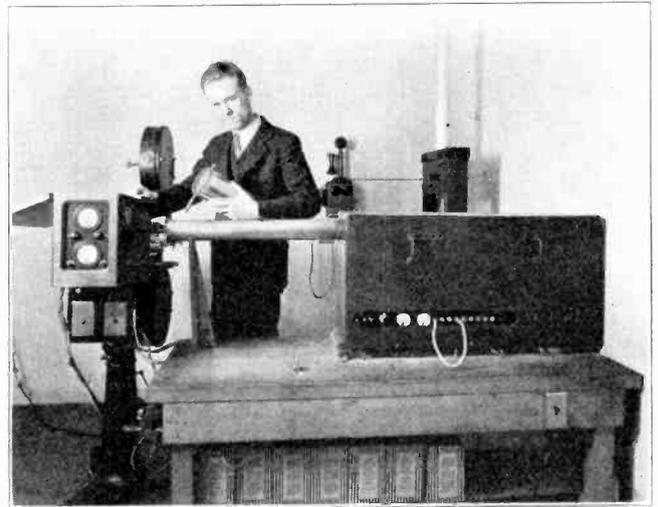


Fig. 2. General arrangement of dissector tube and coil system



The author, Philo T. Farnsworth, standing beside the electrical scanning mechanism he has developed. When asked for a short autobiography, Mr. Farnsworth sent the Editors the following communication: "Regarding my life's activities, the years of 1922 to 1924 inclusive were spent at the Brigham Young University, Provo, Utah. These years were largely spent in securing part of a college education, but they were also years in which I was quite actively at work on my television system. I spent 1925 doing whatever I could find to do. Most of my time, however, was spent working out the details of my television system. In 1926 I came to San Francisco where Crocker Research Laboratories were organized for the sole purpose of carrying on television research. Two years later this laboratory was changed to Television Laboratories, Inc. which has, up to this time, been engaged solely in the development of an electrical television system; my ideas and those of my associates

the time will be one three thousandth of a second. We shall therefore require an amplifier handling a band width of approximately 300 kilocycles to amplify the target current.

Amplifier for Picture Currents.

This problem presented by the amplifier has been one of the most difficult encountered in any of this work. Furthermore, at the higher frequencies, the impedance in series with the dissector target becomes very low due to the capacitance shunting it, resulting in a corresponding decrease in the amount of voltage delivered to the input of the amplifier. However, the whole problem has been greatly simplified by a system of admittance neutralization, which is particularly useful in the neutralization of capacity, and which permits input impedances (as well as inter-stage tube impedance) of as high as several megohms to be obtained up to a million cycles, or more. At the present time an amplifier is being used which has a frequency characteristic approximately flat to 600 kilocycles. The admittance neutralization principle, as well as the design in general of these wide frequency band amplifiers, will be the subject of a later article.

Oscillite or Receiver Tube.

The picture frequencies from the dissector amplifier are rebuilt into an optical image at the receiver by means of an electron beam tube², or oscillite, as shown Fig. 3. This is simply a modified Braun Oscillograph which makes use of the electron image principle used in the dissector tube, to allow good light intensity to be obtained.

Synchronization.

It is required to generate at the receiver, two alternating currents of saw tooth wave form, identical to those used at the transmitter. These currents of course have to be synchronized with those at the transmitter. To accomplish this, use is made of the fact that these currents induce a strong voltage pulse into neighboring circuits during the steep part of their slope. This

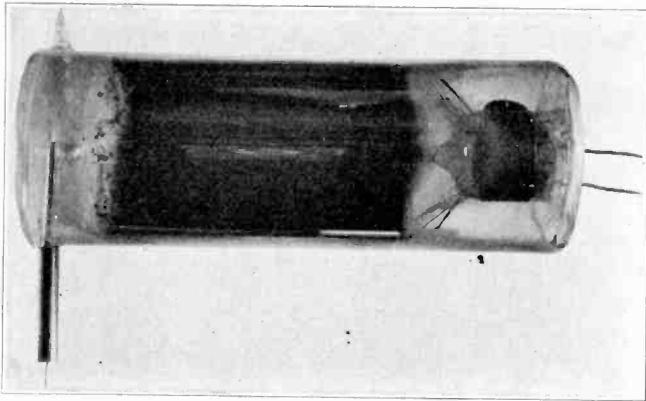


Plate I. This tube has a Sodium Sulphur vapor cathode, and with a sensitivity of about 5×10^{-6} amps/lumen

voltage is accordingly allowed to induce into the picture frequencies' circuit, and serves at the receiver to hold the scanning generators in step. It serves the further purpose of turning off the oscillite spot during the return part of its path, that is, during the very steep part of the saw tooth wave cycle.

This system of synchronization is very simple and very effective. It does not require any extra transmission medium for the synchronizing impulses nor even any extra equipment such as filters, etc., to separate the synchronizing impulses from the picture frequencies.

Much work has been done in the development of these saw tooth wave generators, and on this system of synchronization, but space requirements will not allow their being reported here.

Electron Image

General.

The problems present in securing an electron image can be best understood by considering those electrons which leave a single point on the cathode surface to the dissector tube. Referring to the diagram of Fig. 4, imagine an image focused on the cathode (C) of a point of light so that its image falls at the point (P).

If all of the electrons leaving (P) could be constrained to travel parallel to one another, then any transverse section of the beam would represent a perfect image. For all electrons' paths to be parallel, however, there must be no component of transverse velocity. The photo electrons are emitted with a random velocity of from zero to about three volts. There is another component of transverse velocity added by the ending of the electro-static lines of force near the wires of the anode screen (A); still another component is added by the microscopic irregularity of the cathode surface. The sum of these effects has been found to give a divergent pencil or cone of electrons from each point. The angle of this cone is about 5 deg. in our present dissector. Therefore, only a very poor electron image will result if an attempt is made to produce parallel electron paths. Nevertheless, since the electrons' paths are not distributed uniformly over this cone, we can secure something of an electron image in the plane (T) by the use of low frequency light, careful construction of the anode screen, and the use of high potential between cathode and anode. In fact, the dissector tube was first used in this manner, however, it has been found possible to focus these electrons magnetically to give an electron image which is fully comparable in sharpness to the optical image.

Magnetic Focusing.

To accomplish this a uniform magnetic field of exactly the proper intensity, ϕ , is adjusted so that the lines of force are parallel to the axis of the tube. The effect of this magnetic field is to bend the electrons into helical paths tangent to the line of magnetic force through the emitting point.

Neglecting for the moment the longitudinal velocity, (see Fig. 5) and considering the helices as circles in the plane of the point (P), we see that we have a family of circles all tangent to the

point (P). The radius of these circles is given by the relation

$$r = mv / \phi e \quad (1)$$

The angular velocity ω , with which an electron travels around the circle is given by

$$\omega = v/r \quad (2)$$

Solving this equation for r , and substituting in equation (1), we have

$$\omega = \phi e/m \quad (3)$$

thus it will be seen that the angular velocity is independent of the transverse velocity of the electrons. Therefore, since all of the electrons start at the same point, they will arrive back at the same point, when $\omega t = 2\pi$, that is when they have transversed the circle once, or for any value of magnetic field intensity which gives an integral number or revolutions. In practice the first focus is used.

Deflection of the Image.

It will be seen that the axis of the helices need not be within the electron pencil; if the longitudinal velocity is the same for all, every electron, no matter how divergent, will eventually return to tangency with a line of magnetic force passing through its point of origin. It follows therefore, that if the direction of the field be changed, the point at which the rays are focused will follow the field. If we superimpose a transverse magnetic field on the longitudinal field, the electrons will be deflected to follow the resultant field, as shown in Fig. 6.

It will be seen, therefore, that a pair of coils placed, one on each side of the dissector tube, and carrying an alternating current will give a deflection along the axis of the coils, that is, in the direction of the magnetic lines produced by these coils, rather than at right angles to this direction, as would be the case if there were no longitudinal or focusing field.

Definition Obtainable in the Electron Image.

The amount of blurring in the electron image can be computed from the diameter of the electron helices and the amount of variation in the longitudinal velocity, V_L . Equation (1) gives the radius of an electron's helix to be dependent only upon the transverse velocity, V_t and the magnetic field, ϕ . In a dissector tube where the distance between the target plane and the cathode is eight inches

$$r = .066 \text{ inches} / \sqrt{\text{volts}} \quad (4)$$

This is for an anode accelerating potential at 500 volts. Since ω is constant for a given value of magnetic field intensity ϕ , the angle \angle , between the electron and the point (P) (see Fig. 7) will be given by

$$\angle = \pm 360^\circ \times \frac{\text{relative variation of } V_L}{\text{mean } V_L} \quad (5)$$

assuming that the best focus is obtained for the mean value of longitudinal velocity. Electrons from a single emitting point on the cathode surface will form a circle of radius R in the focal plane, where

$$R = r \tan \angle \quad (\text{approximately}) \quad (6)$$

It has been found in the anode screen type dissector that the amount of dispersion produced by initial velocities is totally

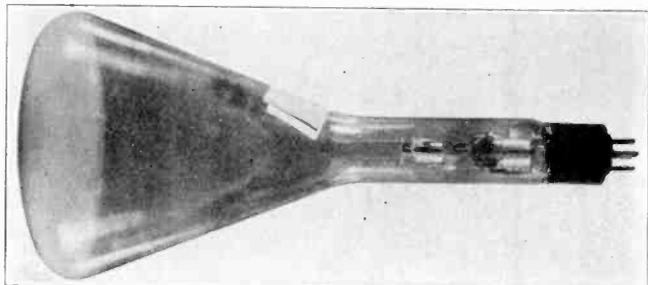


Plate II. Oscillite or Receiving Tube. This tube has a special screen which gives an image that is nearly white

negligible in comparison with that produced by irregularity in the electrostatic field between cathode and anode, and is affected mainly by the construction of the anode screen.

The present dissector tube with its carefully made anode screen secures a stationary electron image which is not inferior to a very good optical image. When the image is deflected for scanning, however, the resulting moving image in the plane of the collecting aperture is slightly blurred at the edges for the following reasons:

1. The distance between the aperture and cathode is greater for the edges than for the center.
2. The electron velocity in the direction of the aperture is less for the edges than for the center.
3. The resultant magnetic field in the direction of the electrons' path increases as the angle from the center increases.

All of these factors are reduced by increasing the deflection distance. In practice, 15 degrees deflection on either side of zero is the value used, when the scanning aperture is not smaller than 0.015 inches.

Application to Oscillites.

The principle of magnetic focusing becomes very useful in the construction of oscillite tubes. It enables us to focus back to a point, all electrons from a single emitting point, and thereby to obtain very good light intensity in one of these tubes. In fact, the light intensity so obtainable is limited only by the properties of the fluorescent material. Spot intensities can be obtained which turn fluorescent material black and inactive after only a few seconds exposure. The element used in this work will be described later on.

Anode Screen Type Dissectors

Construction.

The high vacuum type dissector tube (see Fig. 8) in use at present comprises a cylindrical glass envelope, having at one end a flat window which is polished before sealing in. At the other end is a stem upon which the elements of a tube are supported and through which the leads pass. The inner end of the stem carries a short glass pillar terminating in a square button; the button supports a silvered mirror on which is deposited a photo-sensitive film. A band clamp is supported from the stem, having wires welded to it which carry the anode structure.

The anode structure itself, (see Fig. 11) is made by winding very fine tungsten wire around a tungsten nickel frame as shown. This is supported from the collar so that it is closely parallel to the cathode. Supported separately from the collar is a cylindrical screen, usually of fine nickel mesh which conforms closely to the inner surface of the glass envelope. In the latest types of tubes, this screen has been replaced by a platinum coating on the walls of the tube. The target is supported from a side tubulation at the end of the tube opposite the cathode.

Two general types of targets are in use; that shown in Fig. 10-a, is designed to make use of secondary emission, while that shown in Fig. 10-b is intended only for primary emission.

Potassium Hydride Type.

After the elements of the tube have been sealed in, it is sealed on to the pump in much the same manner as an ordinary photo-electric cell, provision being made to distill into the tube a small amount of potassium. After the tube has been baked for three or four hours on the pump, and the vacuum is as good as can be obtained, a small amount of potassium is distilled into the tube and allowed to condense where it will; then, by heating the lower portion of the tube, the potassium is driven on to the cathode, the tube having been designed so that the cathode remains cool, unless the stem is heated.

It is necessary to be very careful in this process to drive the potassium very slowly, otherwise a glazed cathode surface is obtained which has been found to be inferior in uniformity to an unglazed surface. Care must also be taken to keep the target of the tube warm during the potassium distillation, to insure that no metal condenses inside of the target shield.

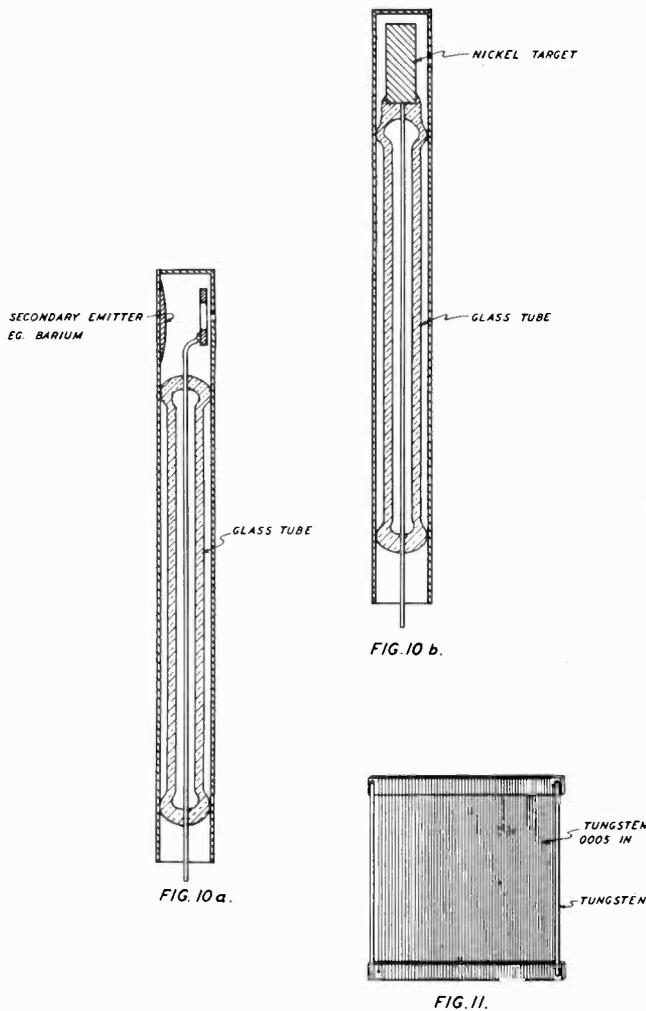


Fig. 10a. Target construction to utilize secondary emission
 Fig. 10b. Target construction for primary emission
 Fig. 11. Anode screen

After the tube has cooled thoroughly, hydrogen is admitted and the surface colored by the Elster Geitel Process. Care must be taken at this stage to insure the exact pressure of hydrogen which will permit the entire surface to form at one time, otherwise a non-uniform emitting surface will result. The cell is then carefully pumped to rid it of all traces of hydrogen, after which it is sealed off the pump.

Sodium-Dielectric Film Cathode Type.

The work of A. R. Olpin³ and L. R. Koller⁴ has indicated two general methods for greatly increasing the sensitivity of photo-electric cathodes. The Olpin process particularly has been applied with great success to the construction of dissector tubes. The general technique as it has been evolved for the preparation of these Sodium Sulphur dissector cathodes is closely similar to that employed by Olpin. One rather interesting side light is that if in the preparation of the sodium sulphur cathode it is spoiled for some reason or other, a moderately sensitive dissector is secured simply by admitting hydrogen and passing a glow discharge as in the Elster Geitel process. This usually gives a cell having a sensitivity of 1 micro amp/lumen. The sensitivity seems to be more permanent than that of the KH cell.

Sensitivity.

The sensitivity of a potassium hydride dissector is of course the same as that of the usual potassium hydride photo-electric cell. It has an optimum value of about 0.5×10^{-6} amps/lumen. This is approximately 1/20th that of the gas filled photo-cells of the same cathode material. This sensitivity can be nearly doubled by making use of secondary electrons splashed out of

(Please turn to page 401)

CURRENT ABSTRACTS

The Development of Modern X-ray Generating Apparatus, (Part One), by Dr. W. D. Coolidge, (Associate Director, Research Laboratory, General Electric Company). Among the subjects discussed: The Development of Ductile Tungsten, The Tungsten Target, Historical Development of the Hot-Cathode Tube, Heat Removal from Focal Spot, Focal Spot Shape and Size, and Tubes for Very High-Voltage X-ray therapy. The second part will appear in the December issue.—*General Electric Review*, November, 1930.

* *

Electrically-Driven Tuning Forks, by Horatio W. Lamson, (Engineer, General Radio Company). The choice of a particular type of tuning fork depends largely upon the requirements of the problem at hand and upon the degree of frequency stability desired. Simplest and least precise are the contact-driven forks which, however, are capable of supplying considerable power of approximately square-top waveform. When a sinusoidal output of good precision is desired, as, for instance, in the case of a tone source for bridge measurements, the single microphone drive serves admirably well. Still greater precision, more power, and purer waveform are to be had from the somewhat more complicated double-button fork, such as is exemplified by the vacuum-tube-driven type. The ultimate in precision so far attained is to be found in the freely vibrating fork with suitable provision for eliminating its temperature error.—*The General Radio Experimenter*, September, 1930.

* *

Accurate Method of Measuring Transmitted Wave Frequencies at 5,000 and 20,000 Kilocycles Per Second, by E. L. Hall, (Associate Engineer, Radio Section, Bureau of Standards, Washington, D. C.). The measurement of the frequency of a radio transmitting station offers a convenient means of intercomparison of frequency standards situated in different laboratories. While there have been several articles published dealing with station frequency measurements, these have, for the most part, considered frequencies in the broadcast band or lower. This paper describes a method of measuring station frequencies applicable to any frequency but dealing primarily with frequencies of approximately 5,000 kc and 20,000 kc. A high order of precision is obtained by the use of harmonics and audio-frequency beat notes. Most of the units of the equipment employed have been previously described in connection with other applications.—*Proceedings of the I.R.E.*, November, 1930.

The Diurnal and Seasonal Performance of High Frequency Radio Transmission Over Various Long Distance Circuits, by M. L. Prescott, (Radio Engineering Department, General Electric Company, Schenectady, N. Y.). This paper presents a quantity of radio wave propagation data that has been obtained during the past six years by the General Electric Company through the use of its developmental transmission facilities at South Schenectady, New York.

Nineteen radio circuits which radiate in various directions from Schenectady are treated. These circuits range in length from 2,300 to 11,400 miles. Data are given which will aid in determining the proper frequency to use in any high frequency radio circuit from 1,000 to 10,000 miles in length.

It is shown that the day-darkness distribution over the path of propagation largely determines the diurnal and seasonal performance of high frequency transmissions.—*Proceedings of the I.R.E.*, November, 1930.

* *

On the Frequency Division, by Janusz Groszkowski, E. E., D.Sc.). It is demonstrated that the division of frequencies, that is, the inverse process from frequency multiplications, is possible by using a triode arrangement. The requirements of such of circuit are analyzed theoretically and the conditions resulting from this study are tested experimentally. Curves are included showing the results of these experiments when the initial frequency bears a ratio to the final frequency equal to a small integer number.—*Proceedings of the I.R.E.*, November, 1930.

* *

An International Comparison of Frequency by Means of a Luminous Quartz Resonator, by S. Jimbo, (Electrotechnical Laboratory, Tokyo, Japan). The international comparison of frequency standards made with the luminous quartz resonator shows the different laboratories.—Physikalisch-technische Reichsanstalt, National Physical Laboratory, Bureau of Standards and Electrotechnical Laboratory,—to be in agreement to one part in 10^5 when used to calibrate the resonator at its flexural fundamental of about 10kc, due allowance being made for the temperature coefficient of the resonator in this mode namely about 1 part in 10^5 and negative. The apparent agreement seems limited by the luminous glow resonator used rather than by any difference between the laboratory standards compared.—*Proceedings of the I.R.E.*, November, 1930.

Characteristics of Piezo-Electric Quartz Oscillators, by Isaac Koga, (Assistant Professor, Tokyo University College of Technology, Tokyo, Japan). It goes without saying that piezo-electric quartz oscillators are very satisfactory in their stability of frequency, but their frequencies are obviously somewhat influenced by several factors associated with the circuits. Starting from the Barkhausen equation, their behaviour is almost completely explained together with their amplitudes of oscillations.—*Proceedings of the I.R.E.*, November, 1930.

* *

Note on the Accuracy of Rolf's Graphs of Sommerfeld's Attenuation Formula, by H. Howard Wise. Dr. Bruno Rolf has recently published two papers giving graphs and tables for Sommerfeld's attenuation formula. In the original paper but four sources of error are mentioned and it might be inferred that aside from them the graphs are rigorously applicable to vertical dipoles at the surface of a homogeneous earth. It is the object of this paper to point out that a number of approximations are not mentioned by Rolf and to discuss one of them. Numerical examples given show that in the region of short waves and low conductivity Rolf's graphs may be considerably in error.—*Proceedings of the I.R.E.*, November, 1930.

* *

The Van Der Pol Four Electrode Tube Relaxation Oscillation Circuit, by R. M. Page and W. F. Curtis, (Naval Research Laboratory, "Bellevue," Anacostia, D. C.). Relaxation oscillations of an electrical nature are defined, and the operation of a tetrode relaxation circuit is described in detail. The mechanism of frequency division is explained, and oscillograms of the oscillations in this circuit are shown, both of the free oscillation and of the oscillation as controlled in frequency division.

The characteristics of the oscillator are discussed with reference to frequency drift and stability of frequency division. The period of the oscillator is shown to be approximately $RC \log V_1/V_2$, where V_1 and V_2 are initial and final voltages on the condenser, respectively, during the discharge. V_1/V_2 is shown to change very steeply with average internal grid resistance.

Modifications are shown for increasing the frequency stability and over-all efficiency of the system, and for controlling the ratio of charging time to discharging time of the condenser. A further modification is suggested for making the internal grid resistance independent of filament voltage when the grid is positive.—*Proceedings of the I.R.E.*, November, 1930.

NEWS OF THE INDUSTRY

HANDLE BOTH G-M PRODUCTS

Sales of electric refrigerators will bolster up the Spring and Summer sag in the radio business. Likewise, sales of radio receivers will keep business stable for the electric refrigerator dealer during the Fall and Winter months when he is experiencing his seasonal depression.

Confident that application of these theories will work a general improvement in



business not only for radio dealers but also dealers in electric refrigerator two General Motors subsidiaries, General Motors Radio Corporation and Frigidaire Corporation, have formed a sales alliance which will enable many of their respective dealers to handle both lines.

Radio receivers and electric refrigerators are complementary lines, in the opinion of R. J. Emmert, President of General Motors Radio, and E. G. Biechler, President of Frigidaire Corporation, who jointly made the announcement. Peak sales of the two lines are recorded at different seasons.

The joint statement of Mr. Emmert and Mr. Biechler follows:

"Frigidaire Corporation and General Motors Radio Corporation have formed an alliance which makes it possible in many instances for the General Motors radio and electric refrigerator to be sold by the same dealer.

"This does not mean that all General Motors radio dealers will at this time have an opportunity to sell Frigidaire, nor does it mean that all Frigidaire dealers will be permitted to sell General Motors radio, except where such an arrangement can be made, consistent with the policies of both organizations."

BROWNE KEEPS ADS UP

Burton Browne, Advertising Manager of Silver-Marshall, Inc., recently reported the usual fact that advertising appropriations for promoting sales of Silver-Marshall Superheterodyne are exactly the same as they were during the 1929 season.

DE FOREST FACILITIES GROW

Announcement has been made of the acquisition by the DeForest Radio Company of 15,000 square feet of additional floor space adjoining its factory at Passaic, New Jersey, according to William J. Barkley of that organization.

The DeForest Radio Company manufactures not only receiving and transmitting tubes, but also transmitters and short wave receivers as well. In line with its policy of pioneering in vacuum tube design, the organization already has a tube laboratory and an experimental transmitting station. The new floor space is to be used to enlarge the experimental laboratories, in which research will be carried on as to the behavior of tubes in transmitters, receivers and televisions. The audion, or DeForest tube, will be adapted to the latest transmitters and receivers now being designed by the leading set manufacturers. Moreover, new uses for tubes are continually being found, particularly in the television field and in conjunction with the photo-electric cell.

The new experimental facilities should result in increased usefulness for the already busy vacuum tube and its adaptation for utmost service in the radio receivers of the future.

MANAGES DUBILIER SALES

The appointment of M. Caldwell as General Sales Manager of the Dubilier Condenser Corporation, New York City, is now announced by N. S. Tobey, Executive Vice-President of that organization. Until his recent election to the office of Executive Vice-President, Mr. Tobey was General Sales Manager of the Dubilier Organization.

Mr. Caldwell brings to the Dubilier Condenser Corporation a wide and varied experience in sales and merchandising both here and abroad. For years he was the sales manager of the Marion Steam Shovel Company. For nine years he was the export manager of the Certainteed Products Corporation. During the World War, he served as Captain of Engineers. The radio industry at large, quite as well as the Dubilier Organization, gains by the valuable knowledge and experience which Mr. Caldwell brings to radio merchandising circles.

VOGEL TAKES NEW POST

The appointment of Mr. Ernest H. Vogel as Sales and Advertising Manager of the Radiola Division, has just been announced by Mr. J. L. Ray, Vice-President of the R.C.A. Victor Company. Mr. Vogel was formerly Advertising and Sales Promotion Manager of the Radiola Division.

Mr. Vogel brings to his new position, 20 years of merchandising and selling ex-



perience, 12 of which were spent in the musical merchandise field. Prior to joining the Radiola Division early in 1930, he was in charge of advertising and merchandising for a chain of 12 retail stores operated by the American Piano Company, throughout the country. Previously, he had been Sales Manager of the Welte-Mignon Company, and Advertising and Sales Manager, successively, of the Kohler and Campbell Industries, one of the largest manufacturers of pianos in the United States.

His promotion to Sales and Advertising Manager of the Radiola Division follows outstanding work in the introduction of the new line of Radiola instruments. In the eight months in which Mr. Vogel has directed Radiola advertising and sales promotion he has built up a remarkable record of achievement. His energetic direction and industry have won him the full confidence and respect of the R.C.A. Dealers and Distributors. Among other things, Mr. Vogel was author of the current Radiola Sales Promotion campaign which dealers and distributors have acclaimed as the finest and most comprehensive work of its kind in the history of R.C.A. Radiolas.

Mr. Vogel is 39 years old, is married and has two children. He recently moved his home from Larchmont, N. Y. to Merion, Pa. to be near the Camden plants.

NEWS OF THE INDUSTRY

BRIGGS IN S-M SALES POST

Howard W. Sams, General Sales Manager of Silver-Marshall, Inc., recently announced the appointment of Howard C. Briggs as Assistant General Sales Manager.

Mr. Briggs is a well known man in the radio industry in the Middle West, having been five years with E. T. Cunningham, Inc., a year as District Manager of Michigan for Grigsby-Grunow and a year with



the radio division of the Kellogg Switchboard Company before joining the sales organization of Silver-Marshall.

STUDY LIFE TEST FOR TUBES

In coordinating and standardizing the development and manufacture of vacuum tubes, much important work is being done and progress made by the R.M.A. sub-committee on life testing of tubes, headed by George L. Rishell of the Sylvania Products Company. Meeting in New York on October 9, representatives of the principal tube manufacturers exchanged information toward the standardization of life tests of thermionic tubes, and will hold another meeting soon.

Lieut. Commander Starkey of the U. S. Navy Department was among those present at the sub-committee meeting on October 9, together with J. I. Cornell of the Radio Victor Corporation and Frank Hinners of F. A. D. Andrea, Inc., the latter representing the R.M.A. Receiving Set Committee. Others at the meeting were Walter Krahl of the Arcturus Radio Tube Co.; Richard F. Briggs of Champion Radio Works, Inc.; Wallace T. James of R.C.A.-Victor Corporation; C. F. Stromeyer of Cable Radio Tube Corporation; M. Fagin of the deForest Radio Company; D. F. Schmit of E. T. Cunningham, Inc.; C. W. Haller of Hygrade Lamp Company; Dr. P. T. Weeks

HAS NEW RESPONSIBILITIES

Mr. H. J. Dillon has been elected as Director and Vice President and Assistant General Manager of the Magnavox Company and Magnavox Company, Ltd.

Mr. Dillon will assume direct charge of all production, purchases and engineering and will make his headquarters at the new Magnavox factory at 2131 Bueter road, Fort Wayne, Indiana.

Mr. Dillon is well known in the Radio industry and his many friends will be glad to know of his new responsibilities.

GET DISTANT TELEVISION

That the Chicago power network is somehow interconnected with Albuquerque was evidenced by the following communication recently received by Clem Wade, President of the Western Television Corp. at Chicago:

"Maybe you would be interested in knowing that I get your Television pictures from Station W9XAP at Albuquerque almost every night. About four nights a week your pictures are perfectly clear, and bright as can be. The other nights static interferes somewhat.

"I receive these pictures on a Western Television receiving set, and there is a great interest in the television here.

"I can't get the station in the day time, but of course, we can not get the voice stations either in the day time on account of our location here in between the mountains.

"The first night your station was on, we saw the boxing match for a few minutes and then something happened to the set and I missed the last part of it. We would all like to have more boxing."—(Signed) M. Canham, Canham Radio Company, Albuquerque, New Mexico.

It is considered remarkable that the pictures, broadcast from Chicago, are being received with such clarity in New Mexico, inasmuch as power networks are not usually interconnected over so great a distance. It is also a tribute to W. N. Parker, Engineer in Charge of Transmitter Design of Western Television Corp., inasmuch as the transmission facilities of W9XAP may be credited to him.

W9XAP employs the Sanabria three-spiral disc system.

of Raytheon Mfg. Co.; Dr. F. E. Kilpatrick of the Electrical Testing Laboratories; Paul Schwerin of Perryman Electric Co. and Francis E. Engel of R.C.A.-Victor Corp.

The sub-committee on life testing of tubes is a division of the R.M.A. Vacuum Tube Committee of which Mr. George Lewis of Arcturus Radio Tube Company is chairman, in the Standards Section of the Engineering Division.

HEADS SALES AND SERVICE

W. N. Potter, Director of Sales of United Motors Service, announces the appointment of George Kohlenberger, formerly of the Oakland, California Branch, and well known in radio circles on the Pacific Coast, as Manager of Radio Sales and Service.

Service and sales of the new Delco Automotive Radio, other than original equip-



ment, comes directly under United Motors through its 27 Branches and more than 3,600 authorized service stations throughout the United States and Canada.

Mr. Kohlenberger has had wide experience in radio, both as a dealer, as a service director, and in the experimental field. He was one of the first men to direct the flight of an airplane from the ground by radio. This was at Fullerton, California, where he sent a plane up to an altitude of 2,500 feet, dropped it to about 500 feet and then sent it circling over the city for more than an hour. A pilot was in the plane as a safety measure, but at no time was it necessary for him to take control.

PACENT EXECUTIVE ABROAD

B. H. Noden, Secretary of the Pacent Electric Company, New York City, sailed October 14 on the S.S. Bremen for Europe, where he will conduct important business for Pacent in the radio and talking picture fields. It was announced coincident with Mr. Noden's departure that both the Pacent Electric Company and the Pacent Reproducer Corporation have plans under way for the manufacture abroad of their radio, radio-phonograph and sound-reproducing products for the European market. It is considered probable that final negotiations will be completed soon, as the result of Mr. Noden's trip.

NEWS OF THE INDUSTRY

WILL MAKE SPECIAL TUBES

Announcement is made of the organization of the Taylor Vacuum Products Co., 1522 N. Ogden Ave., Chicago, who are now in production on 250, 281, 866, 210 and 845b (50 watt) type tubes. The company is also centering its activities on the development of tubes for special projects.

Warren G. Taylor, Vice-President and Chief Engineer, started with Westinghouse nine years ago, after a year's experience with which concern he went into the tube manufacturing business for himself in Cornwall, N. Y. There, he operated until June, 1927, when he joined forces with the Sentinel Mfg. Co., and organized the Travis Tube Co. He occupied the position of Chief Engineer both with Travis and Sentinel. In July, 1930, the Taylor Vacuum Products Company was incorporated, and began operations on the first of September.

W. M. Craig, Secretary and Treasurer in Charge of Sales, is well-known to the industry. As head of the sales agency operating under his own name, he has represented Cinch Mfg. Co. and Norton Laboratories for several years.

W. W. Dwyer, Production Manager, has been associated with the tube business for 15 years. He began his career with Western Electric, working on miniature lamps and radio tubes. Later, QRS and Travis claimed his services.

Since going into production in September, the Taylor Vacuum Products Company has enjoyed a nice business, especially on such standard tubes as 250s and 281s. They have been shipping from Seattle to New York. The fact that they are specializing in the creation of special tubes has aroused much interest among engineers.

They occupy a modernly equipped plant, and are prepared for a conservative production of from 2,500 to 5,000 tubes a day.

REPRESENTS I.R. ABROAD

Harry Kaiker, Sales Manager of the International Resistance Company of Philadelphia, Pa., manufacturers of metallized resistors, filaments, and precision wire-wound resistors, announces the appointment of Martin Openshaw as foreign representative. Mr. Openshaw, well known to our radio trade, will shortly leave for an eight months' tour of the world. He is maintaining a head office at Paris. Mr. Openshaw plans to report the results of his world tour next April, when he will be back in Philadelphia.

MANAGES SALES PROMOTION

Arthur A. Trostler, announced on October 3, the appointment of Sydney Schwartz as Manager of the Brunswick Radio Corporation Sales Promotion Division. Mr. Schwartz graduates from Southern District Managership to this position with the good wishes of the entire Brunswick organization with which he has been associated for more than ten years.

Mr. Trostler has long felt that a Sales Promotion Division should be headed by a



man with extensive sales experience, supplemented by an advertising promotional background, since the scope of the Sales Promotion Department, as he sees it, is to build up a closer affiliation between manufacturer, distributor and dealer, and to assist the retail salesmen in selling. Mr. Schwartz fills these requirements perfectly.

In his first general letter to the trade, Mr. Schwartz outlined his immediate intentions as including a complete sales education and dealer development program. His proposal includes the Brunswick organization's supplying of material for sales meetings and the concentration upon the promotion of all retail salesmen to "Merchandising Assistants."

R.M.A. BOARD TO MEET

President Metcalf of the Radio Manufacturers Association has issued a call for a meeting of its Board of Directors at Cleveland, Ohio, on Tuesday, November 18th, at the Hotel Cleveland. Among many important industry problems to be considered at the Cleveland meeting is that regarding the 1931 trade show. A meeting of the directors had been planned at Chicago last week during the Chicago radio show but so many directors found it impossible

MAGNAVOX MOVES TO CHICAGO

The general offices of the Magnavox Company, manufacturers of Magnavox dynamic speakers, and Magnavox Company, Ltd. are now located at 155 East Ohio street, Chicago. The headquarters were formerly maintained on South Michigan avenue, for the past several years, and the removal to the new offices was made late in September. Richard A. O'Connor, President of the Magnavox Company and Magnavox Company, Ltd. makes his headquarters at the new Chicago office, and the offices and factory formerly maintained at Oakland, California, have been discontinued.

The factory, and engineering and purchasing departments, are now located in a modern factory at 2131 Bueter road, Fort Wayne, Indiana.

ENGEL JOINS BRUNSWICK

Henry C. Engel, a well known figure in the radio manufacturing field, since his association with the Chas. Freshman Corporation in 1924, has joined the staff of the Brunswick Radio Corporation located at Muskegon, Michigan. It is generally understood in the industry that Mr. Engel will occupy the position of Comptroller of Purchases, at this plant of the Brunswick group.

Mr. Engel has had an interesting history. Prior to his association with the radio industry, and after his graduation as an engineer, he was associated with tunnel construction, having been responsible for a great portion of the executive work back of the Catskill aqueduct tunnel which holed through 165 miles. He was also associated with the building of the old Fourth avenue subway and was working with the organization that had the contract for driving the three tunnels under the East River when the United States entered the World's War. He served for the duration of the war, but upon his return to America, his physicians informed him that his health was so impaired that he could not follow the profession of compressed air tunnel expert. At that time, he concentrated his engineering executive experience on accounting and joined the staff of the New York Central Railroad. He passed his C.P.A. examinations later and as a public accountant, handled the problems of many large manufacturing concerns and municipalities, especially in the State of New Jersey.

to be present at Chicago that the R.M.A. Board meeting was postponed until November 18th. The postponement has afforded opportunity for further exchange of views between manufacturers regarding the 1931 show.

NEW DEVELOPMENTS

DE FOREST PHOTO CELLS

Two photo-electric cells are announced at this time by the de Forest Radio Company of Passaic, N. J.

The de Forest photo-electric cell No. 602 is of the potassium hydride type. The active surface is deposited upon the inside wall of the bulb as a cathode, while a wiring ring in the center serves as the anode. The essential characteristics are: *Bulb*, spherical, 2" dia. *Base*, large UX. *Window*, circular, 1 sq. inch area. *Anode* connected to grid terminal of UX socket. *Cathode* connected to right-hand filament terminal of UX socket. *Anode Voltage*, 130 volts maximum. *Ionization Voltage Dark*, 200 volts. *Photo-electric Sensitivity* at 90 volts, 3.5 to 7.5 microamperes per lumen.

The de Forest photo-electric cell No. 668 is of the calcium argon type. The active surface is deposited upon a half cylindrical silver-plated cathode, while a straight wire at the axis of the cathode serves as an anode. The essential characteristics are: *Bulb*, tubular, 1" in diameter, 2½" long. *Base*, small UX. *Cathode*, intercepts area of light ⅝" by 1¾". *Anode* connected to plate terminal of UX socket. *Cathode* connected to left-hand filament terminal of UX socket. *Anode Voltage*, 90 volts maximum. *Photo-electric Sensitivity* at 90 volts, 35 to 77 milliamperes per lumen.—*Radio Industries*, November, 1930.

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A-K BRING OUT SUPER-HET

Announcement has been made by the Atwater Kent Manufacturing Company, Philadelphia, of the addition of a Super-Heterodyne set to their new 1930-31 line of Golden Voice receivers.

According to the factory announcement, the new Model 72 Atwater Kent Super-Heterodyne is a truly super-selective set.

In addition to this super-selectivity, great range and power, the Model 72 has the new quick-vision Dial; a new enlarged speaker... new enriched tone—the Golden Voice... and a tone control that allows the operator to secure four definite tone shadings.

Known as the "Low Highboy"... a new note in radio furniture design... it combines grace and dignity of line with unobtrusive size. It is finished in American walnut with matched butt walnut front panels and apron, and rubbed top.

The new Super-Heterodyne circuit uses nine tubes, including three screen-grid and one rectifying tube. 60 cycles, 110 volts AC (less tubes) \$133.—*Radio Industries*, November, 1930.

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PILOT ENTERS MIDGET FIELD

The Pilot Radio & Tube Corporation, of Lawrence, Mass., which hitherto has made only radio parts, kits and tubes, has entered the set field with a new receiver of the midget type. This is a six-tube outfit of advanced design, housed in an attractive two-toned walnut cabinet 17 inches wide, 8½ inches deep and 17½ inches high. The front panel holds a tuning dial, a power switch, a volume control and a dynamic speaker, the opening for the latter being covered by a decorative grille.

The chassis is neatly made of aluminum, and is so arranged that it can be slipped out of the cabinet for examination or repair without being put out of actual operation. An efficient electrical circuit is used, comprising two stages of a screen-grid radio frequency amplification, a screen-grid power detector, a 227 first audio stage and a 245 output stage, with a 280 rectifier tube. The six-inch dynamic speaker is of special construction, its field winding forming part of the filter system of the power-pack.

The performance of the new Pilot "Midget" compares quite favorably with that of large console models. The set is extremely sensitive and selective, and its tone quality is of a high order.

The retail price of the receiver is \$59.50, without tubes. The set is being merchandised through regular retail dealer outlets.—*Radio Industries*, November, 1930.

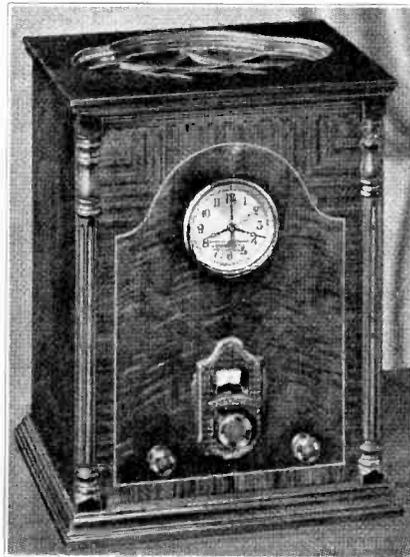
STEP-DOWN TRANSFORMERS

Acme Electric and Manufacturing Co., 1452 Hamilton Ave., Cleveland, O., announce a line of step-down transformers which find their principal application in the export field where the voltage supply ranges from 200 to 240 volts, either 50 or 60 cycles. In some locations, 150 or 165 volt installations are encountered. Acme transformers are liberally designed and the coils are especially impregnated to meet conditions in the export field. Care is taken to give each transformer a high voltage insulation breakdown test at ten times the working voltage, as well as an induced voltage test, at twice the normal working voltage, doubling the frequency. High grade non-ageing silicon steel insures a low core loss. Each transformer is furnished with eight feet of cord and plug. Bulletin 121, which describes Acme types of transformers, characteristics and list prices can be secured by writing the Service Department of *Radio Industries*.—*Radio Industries*, November, 1930.

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CLOCK BUILT IN CABINET

The Austin A. Howard Corporation, 1725 Diversey Parkway, Chicago, is now in pro-



duction on "The Austin," a small type radio receiver embodying all the latest refinements in radio and containing nothing but the highest quality parts. Two 224s, two 227s, two 171As and one 280 are used. The cabinet is unique in design and presents a beautiful appearance. An electric clock, as shown, is built in the front of the set, thus following a fast-developing and increasingly popular trend in the industry. The price is \$89.50, without tubes.—*Radio Industries*, November, 1930.

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ELLIS DEMOUNTABLE "MIKES"

Ellis Electrical Laboratory announces Ellis Demountable Microphones, obtainable in the standard models of the now famous Ellis Models No. 29 N. and 30 N. The Ellis Demountable Microphone was designed for convenience and safety—safety from shock and from exposure to the elements. These purposes are attained by making the microphone unit easily and quickly removable and "demountable" from the supporting fixtures and easily replaceable.

The value of this improvement in the microphone field will be appreciated by those whose patience has been taxed by the clumsy and burdensome task of removing a microphone, locating a screw driver to disconnect and reconnect the wires, unlacing and relacing a tight set of springs, and being careful to avoid mistakes in reconnecting the cable. All the connections and fixtures remain intact when the demountable unit is removed or replaced. List price, including rim fittings, \$85.00.—*Radio Industries*, November, 1930.

SUPREME TUBE CHECKER

Model 19 Supreme Tube checker, developed by Supreme Instruments Corp., provides an accurate test of all types of tubes at the correct filament voltages, and without the aid of adapters. It is extremely simple in operation and exceptionally speedy in its testing work, thus being ideal equipment for the dealer or service man. Full size transformers are used, and the meter is a 3½" General Electric copper-oxide type with two scales of 80 and 8 milliamperes, affording easily discernible readings. Separate sockets are employed for each type of tube and average characteristics and rejection points are indicated on the panel alongside of each socket.

The Model 19 Tube Checker provides a very accurate and dependable test of screen-grid tubes, and in addition, tests pentode and the new 2-volt, '30 series tubes. It is furnished with an on and off toggle switch, and is encased in a handsome polished hardwood case, making it exceptionally durable. The portable model is equipped with hinged cover, snap catch, leather handle, detachable flexible cord, and is suitable for either counter or portable work. The counter model is priced at \$26.95 and the portable model at \$29.95.—*Radio Industries*, November, 1930.

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MEISSNER COIL-WINDER

A space winding mechanism designed primarily for winding radio frequency transformers wound on bakelite tubing has recently been developed by the Meissner Manufacturing Company, 522 S. Clinton Street, Chicago. In the Model 30 machine the turns of wire are accurately spaced by the spacing arm, producing a uniform distribution capacity, practically eliminating difficulty in matching.

Various sizes of wire ranging from No. 20 to No. 38 inclusive can be wound and accurately spaced by this machine. The traverse mechanism operating in one direction only can be set to any desired length up to approximately six inches. As standard equipment the Model 30 winding machine has two sets of gears, an Allen-Bradley foot control, a 1/30 H. P. motor, ball bearing bench spool carrier and two endless linen belts. The mounting board is finished in birch mahogany. The revolution counter governing the number of turns of wire to be wound is essentially a part of the winding head which permits accurate operation at very high speeds with no shock to the counting mechanism. The counter can be instantly reset, counts accurately from 1 to 10,000 turns and is very visible being six inches in diameter. To assure a high rate of production speed the shaft operates on ball bearings.

The space winding arm together with the gear rack may be taken off or eliminated from the machine and by using a more powerful motor and a suitable chuck, practically any type of hand winding can be duplicated on the Model 30 winding machine.

Radio frequency transformer coils having 130 turns of No. 29 wire on bakelite tubing can be produced at an average of 850 coils per eight-hour day. Skilled operators have wound as high as 1,100 of these coils daily on the Meissner Model 30 coil winding machine.—*Radio Industries*, November 1930.

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TONE CONTROL FOR EACH SET

That outstanding feature of 1930 radio sets, the tone control, is now made available to owners of any and all radio sets irrespective of type or vintage. In the Clarostat Tone Control, introduced by the Clarostat Mfg. Co., Inc., Brooklyn, N. Y., there is provided a universal device applicable to a radio set by the simple expedient of slipping the disc connectors around the prongs of both power tubes in the push-pull type, or around the prongs of the power tube and connecting the other lead with the ground binding post.

The device is in the form of a neat case with felt bottom, for use on any table or on top of the set cabinet, together with two long flexible leads terminating in the connectors, so that no tools or special knowledge are necessary for installation. A knob turns from the "Treble" to the "Bass" positions, providing any degree of sharpness or mellowness desired.—*Radio Industries*, November, 1930.

NEW DEVELOPMENTS

SMALL LOW-PRICED VICTOR

The new line of Victor radios has been expanded to include a smaller lower-priced model. It is a four circuit screen-grid set with three tuned radio frequency stages and a power detector.

The tuning condensers of the R-15 have a considerable degree of flexibility in operation and as a result are capable of a corresponding degree of balance and accuracy of alignment. Unlike the larger models the four condensers are mounted vertically, thus making it possible to operate them on a single shaft, which also makes greater compactness possible.

The tubes employed are: Four Screen-Grid Radiotrons UY-224 three as R.F. Amplifiers and the fourth as power detector. Two UX-245's are used in the power amplifier stage and a UX-280 as a rectifier. The tuning dial is circular, instead of straight-line as in the larger Victor models. It is calibrated in kilocycles thus making possible the characteristic precision tuning which is such an outstanding feature of the Victor radios.

Other salient features of this instrument are: its super-dynamic corrugated cone loud-speaker, the beauty and compactness of its cabinet (It measures 34 3/4 inches high, 20 1/2 inches wide, and 13 inches deep)—a cabinet designed in the early English manner with a beautiful and elaborately decorated front panel, with a colorful tapestried cloth behind a gracefully scrolled grille, and last, and most important, a price of \$112.50 less Radiotrons.—*Radio Industries*, November, 1930.

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THE KENNEDY CORONET

In the Kennedy Coronet, the cabinet is 17 inches high, the base width 16 1/2 inches and the depth 10 inches. The weight of the entire job, less shipping case, is 31 pounds.

Its tube complement consists of four No. 224 type screen-grids, which are used as two tuned radio frequency amplifiers, a tuned power detector and resistance coupled first audio stage. A type No. 245 power output tube, also resistance coupled, provides ample amplification and volume without distortion. A type No. 280 rectifier tube completes the tube line-up.

The audio system is entirely resistance coupled—no audio transformers being used. This aids in getting tone quality as well as permitting a maximum of audio amplification from the screen-grid tube used as the first audio amplifier.

Three tuned stages consisting of a compact three-gang shielded condenser and three doubly shielded coils are employed in a radio frequency-detector circuit identical with the circuits of the larger Kennedy receivers except for the omission of one tuned stage. The coils are so wound as to attain a higher gain per stage to compensate for the lack of the additional stage.

A sensitivity almost equal to the standard large Kennedy receivers is attained. This permits the use of this receiver in any locality where the larger receivers will operate, and does not, as with some makes, limit its use to larger cities or broadening centers.

While but three tuned circuits are employed, the selectivity for even the larger cities with a number of powerful broadcasters has been maintained by utilizing an antenna circuit volume control and complete shielding. The individually shielded radio frequency coils are in turn completely enclosed in the all metal non-magnetic chassis, as are the sockets, by-pass condensers and associated parts. The radio frequency and detector tubes are shielded.

Power is supplied by a full sized transformer with an ample factor of safety—provision being made for the substitution of a transformer for 25 to 30 cycle power. A full-sized electrolytic filter condenser of high capacity aids in holding the AC hum to the same level as the larger receivers.

A full electro-dynamic speaker is used. Provision has been made to enable the use of Utah, Jensen or Magnavox speakers of the 8 1/2 inch size. The field resistance is 2,250 ohms and the standard large size speaker used with the other Kennedy models may be operated from the Coronet with but a few changes in connections. The set is also equipped with a SELECT-TONE control to tone reception to suit the individual ear.—*Radio Industries*, November, 1930.

MOTORS FOR CLOCKS IN SETS

Electric Clock Corp. of America, 500 S. Throop St., Chicago, announces a line of dependable synchronous motors, designed to operate on 60 cycle, 105-120 volt AC current. They are precision built and are designed to operate quietly and accurately. Dials, hands and lenses may also be had. Among the features of the mechanism are: hardened bearings, felt oil retainers, polished and burnished shafts.

Radio set manufacturers should take a genuine interest in these motors, inasmuch as the inclusion of a clock in the receiver-cabinet has proven to be an item of popular current merchandising importance.—*Radio Industries*, November, 1930.

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T. C. A. CLARION JUNIOR

Transformer Corporation of America adheres to its policy of bringing radio prices down to the level of the average purse when announcing the new Clarion Junior (Model 60), manufactured to sell at the low price of \$63.30 complete with tubes.

It is of battleship construction and rivals the bigger Clarions in tone quality, sensitivity and selectivity. There is perfect shielding of variable condenser, radio frequency coils and tubes. This eliminates the



possibility of dirt collection and also insures against mechanical harm in the variable condenser. The mechanical construction of the eight inch dynamic speaker eliminates 'fuzzy' or hazy reproduction.

Heavy cabinet construction lends ability to reproduce the entire musical scale while tone control permits the operator to express individual taste in tone shading. Oversize units are used throughout to insure long life. Because of high sensitivity, a small antenna measuring 25 feet overall is usually sufficient.

Clarion Junior is equipped with phonograph jack and switch, giving excellent record reproduction with any good electric pickup having proper impedance.

Dimensions of the set are 20 x 16 inches, and, like the larger receivers, it has an illuminated velvet veneer dial.

Clarion's four plants are now operating to capacity and 2,000 Juniors are leaving daily for widespread distribution over the entire country.—*Radio Industries*, November, 1930.

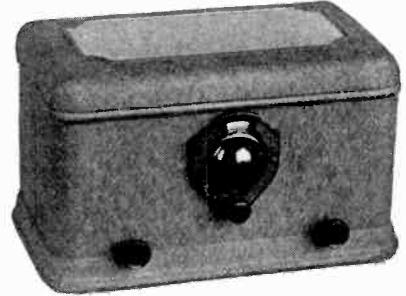
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TRANSMITTING CONDENSERS

The new Floethheim transmitting condensers are available in the following working voltage ranges, in 1, 2, and 4 mfd. capacities: 1,000 volts DC (750 rms. RAC); 1,500 volts DC (1,000 rms. RAC); 2,000 volts DC (1,600 rms. RAC); 3,000 volts DC (2,200 rms. RAC); and 5,000 volts DC (3,300 rms. RAC). Additional engineering data and other information regarding these condensers can be obtained gratis by writing to the Allied Engineering Institute, Suite 1105, 545 Fifth Avenue, New York, N.Y.—*Radio Industries*, November, 1930.

WALKER SUPER-CONVERTER

The Workerite Radio Corp., 1812 E. 30th St., Cleveland, O., announces the George W. Walker Super-Converter, a four tube converter, including a stage of screen-grid



radio frequency ahead of the detector, requiring one '24, two '27s, and one '80 type tube. The '80 type rectifier is selected due to its long life, low cost and the advantage of furnishing a truly reliable and adequate power supply. There are no camouflaged tuning controls. Both tuning and oscillator condensers are ganged and controlled by a vernier dial, insuring simplicity and ease of operation.

The converter is especially designed to cover a wave band of 15 to above 200 meters. One of the coils furnished with the converter covers the popular wave band of 15 to 50 meters. All of the popular short wave programs, including foreign stations, are confined to a wave band of about 15 to 50 meters. This makes the changing of coils unnecessary.

The converter can be used with either battery or AC receivers. It is attractive in appearance with its neat and compact two-toned moire finished metal cabinet. Completely wired and assembled, less tubes, it sells for \$65.00.—*Radio Industries*, November, 1930.

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SPLIT WINDING FOR RESISTOR

Extreme precision in wire-wound resistors may now be obtained by means of a unique split winding technique developed by the International Resistance Co., Philadelphia, Pa. Instead of a single winding of a given size of wire, whereby a single turn may, in the case of high-resistance wire, throw out the resistance value more than 1/4 or 1%, the ceramic form is wound with a high-resistance wire in one section, and a low-resistance wire in the remaining section, the latter serving to balance the winding to the exact resistance value with extreme precision. The only problem remaining is one of establishing definite and permanent contact between the two different wire windings. The International Resistance Company's engineers have developed a special moulded section between both windings, thereby providing perfect contact between the two windings, just as there is established perfect contact between the ends of the combined winding and the pig-tail leads.—*Radio Industry*, November, 1930.

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COLONIAL ANNOUNCES MIDGET

At the Seventh Annual Radio World's Fair, the Colonial midget set made its first appearance.

The size of the chassis is 12 3/4 inches wide, 6 1/2 inches deep and 7 inches high. It features inductive volume control and employs six tubes as follows: 2—R. F. Screen-Grids, 1—Screen-Grid Detector, 2—345 Push-Pull Output, 1—380 Rectifier.

In selectivity and sensitivity it is as good as the regular Colonial "32" models. The speaker used in the Colonial midget set is an 8-inch Dynamic, assuring reception in regard to tone quality and volume that will compare favorably with the regular sized conventional receiving sets.

The cabinet is finished in walnut, in a distinctive Gothic design. Its dimensions are 15 inches wide, 7 1/2 inches deep, and 16 1/2 inches high.—*Radio Industries*, November, 1930.

LETTERS FROM OUR READERS

FROM ACROSS THE PACIFIC

Whilst the writer was visiting your country some months ago, your publication, "Radio Industries," was favorably commended to him, and a subscription was promptly placed for same.

It is unnecessary to state that we read your various issues with great interest, and must congratulate you on the high standard of your journal.

We notice in the August issue, just to hand, a paragraph mentioning that you have in your possession copies of two new technical bulletins issued by the Acheson Oildag Co., Pt. Huron, Michigan, featuring oildag as a radio parts lubricant, and aquadag as resistance material.

The writer would be deeply grateful if you would forward both of these booklets to him at your earliest convenience, along with any other interesting technical booklets that may be in your possession at the time of receipt of this letter.

Thanking you in anticipation, and with best wishes for the success of your publication, we are,

Yours faithfully,

New System Telephones Pty. Ltd.,
Sydney, Australia

(signed) R. G. W. Kennell

9-15-30

Chief Engineer,

EXPORT MAN AVAILABLE

I am writing you to request that my name be placed on file for any opening that might come up in the export field.

I have had twelve years experience in export business, having been engaged for the past two years in exporting radios for my own account. I have but recently returned from a trip through Mexico, where I found that great interest existed in the mantle sets, and if possible I should like to make a connection with a reliable manufacturer of that particular type of radio.

I am thoroughly familiar with every phase of the radio business in foreign countries, and feel confident that a connection with some manufacturer interested in developing his foreign business will prove mutually advantageous.

Thanking you in advance for anything you may do for me and assuring you that I shall be very glad to reciprocate the favor, I beg to remain,

Yours very truly,

10-29-30

(Signed) J. A. Rivera

THOMPSON JOINS PHILCO

Roger R. Thompson, for the past five years General Sales Manager of the refrigeration division of the Welsbach Company, has joined the Philco national organization in an executive sales capacity. He has been identified with the manufacture and sale of appliances for 16 years, specializing in outside retail selling.

WILL GIVE AWAY CABINETS

We have discontinued the manufacture of radio cabinets, and have on hand possibly 500 of various sizes. These are almost obsolete, and we will give them away to anyone who will pay the cost of crating and shipping, which we estimate to be 50c. It occurred to us that some of your advertisers who manufacture parts might be willing to advertise these at their expense for the sake of furnishing the parts, and even if they do not for the sake of the industry, we believe you might mention this on your editorial page. It is absolutely nothing to us except that we do not like to burn material which amateurs would no doubt be glad to have.

Yours very truly,

THE SOUTHERN TOY CO.

(Signed) G. F. Ivy,

10-25-30

Sec. & Treas.

NAME NEW R.W.A. MEMBERS

E. A. Nicholas, formerly connected with the Radio Corporation of America, in an important executive post and now distributing their product through his own organization in Chicago, has just affiliated with the R.W.A. according to an announcement from the Executive Offices today. The association has gained a very strong member in adding Mr. Nicholas to their membership roster and it is felt that he will be of great value to the association on their plans for improving conditions within the radio industry.

E. J. Edmonds Co., one of the largest and oldest distributors of Atwater Kent radios, and one of the leading metropolitan distributors of New York City is also announced as being a new member of the R.W.A. by the Executive Offices. Mr. Edmonds has long been prominent in association activities in the electrical field.

The Executive Offices wishes to announce the acceptance of the application of the Commercial Investment Trust Company of New York City, financing radio paper throughout the United States, as an associate member of that body.

WESTINGHOUSE CONDENSED STATEMENT OF OPERATIONS

	Nine Months Ended September 30		
	1930	1929	1928
Orders Received	\$132,715,293	\$185,625,135	\$143,637,037
Sales Billed	137,446,908	159,545,778	138,572,390
Net Income after Depreciation, Reserves and Taxes	11,355,619	19,796,819	15,425,424
Interest Charges	3,375	252,608	1,135,389
Balance Available	* 11,352,244	19,544,211	14,290,035

* Equal to \$4.25 per share on the Outstanding Preferred and Common Stocks.

Orders received and sales billed this year do not include radio receiving sets and tubes, the manufacture of which was transferred as of January 1, 1930 to the Radio Corporation of America. The income from sales of receiving sets and tubes now being distributed under the Westinghouse name

ALWAYS AT OUR SERVICE

Am in receipt of the four copies of *Radio Industries Magazine*, for which I thank you most sincerely.

My subscription will be forwarded in the near future. Your magazine is one that is doing fine work, and it helps to know that we have one organ that is perused exclusively by people that understand what our articles are all about. I feel that you are to be thanked and helped to the utmost in your work in advancing the various branches of the Radio Art.

Always at your service in Television debates, and thanking you again for past favors, I am,

Respectfully,

(Signed) Amory H. Waite, Jr.,

Asst. to Chief Eng.

SHORT WAVE & TELEVISION LAB.,
10-29-30 INC.

ACCEPT SUPERHET LICENSES

The Radio Corporation of America announced on October 27, that the offer recently made to its Tuned Radio Frequency Receiver Licensees of Supplemental Licenses for superheterodyne radio broadcast receivers and certain other apparatus, has been accepted by the following companies:—Atwater Kent Mfg. Company, Audiola Radio Co., Balkeit Radio Co., Gilfillan Bros., Inc., Grigsby-Grunow Company, Howard Radio Company, Silver-Marshall, Inc., Stromberg-Carlson Tel. Mfg. Co. and United Air Cleaner Corp.

CECO OPENS OHIO BRANCH

E. T. Maharin, Vice-President in Charge of Sales of the CeCo Manufacturing Company, announces the opening of another wholly-owned distributing branch to be located at 800 Sycamore street in Cincinnati.

Eric Matchette, formerly President of the Carnegie Distributing Company in Pittsburgh, a CeCo subsidiary, has gone to Cincinnati to take charge of the new corporation known as the CeCo Radio Tube Company of Ohio, Inc.

will be included in net income.

For products other than radio, orders received during the nine months' period of 1930, compared with the corresponding periods of 1929 and 1928 show a decrease of 17 per cent from 1929 and an increase of 8 per cent over 1928.

EHLE AND KALKER PHILADELPHIA RESISTOR CHIEFS LOOK THE FIELD OVER

Wherever radio is intimately known, resistors and resistance problems are likewise known. And when one comes to deal with resistors and resistance problems, one soon makes the acquaintance of Francis R. Ehle and Harry Kalker, President and Sales Manager, respectively, of International Resistance Co., Philadelphia, Pa. Both gentlemen have much to do with the steadily growing popularity of metallized resistors, which play an important role in radio sets, not to mention the wire-wound resistors lately announced. Although their company produced and sold over 2,500,000 feet, or about 470 miles of metallized filament last year, they are still figuring out ways and means of obtaining a still greater market for the coated glass resistance threads spun by their battery of electrical spiders. Here they are, in the President's office, discussing the ways and wherefores of the present radio market.

A testimonial to the quality of Durham Resistors may be seen in a framed certificate over Mr. Ehle's head presented to the International Resistance Company by Rear Admiral Byrd head of the Byrd Antarctic Expedition expressing their appreciation of the cooperation extended to the expedition by the International Resistance Company.



MAJESTIC IN PRODUCTION

The formal entry of the Grigsby-Grunow interest into the electrical refrigeration field becomes a fact with the announcement from Majestic Household Utilities Corporation in Chicago that its factories are now in production at the rate of 1,000 daily, with a rapid step-up to 4,000 machines daily assured. The prices, which have long been a matter of wide-spread conjecture, are \$175.00 for Model 150, having a nominal capacity of five cubic feet of food storage space, and \$195.00 for Model 170 with a seven cubic foot capacity. These prices are f.o.b. factory.

Asked for interesting facts on the history and development of his latest product, W. C. Grunow, President of the corporation, outlined the highlights as follows: "The refrigerating unit is the result of the mature experience of one man's, C.E. Lipman's, lifetime, supplemented by a corps of experts gathered together under H. E. Kranz, vice-president in charge of engineering, for one purpose, namely, the construction of a commercially perfect refrigerating mechanism.

Examination of either model shows that the cabinet is made entirely of steel, finished in white enamel, the food compartment being also of steel, coated with vitreous enamel. No hooks are used to support the shelves, these having been supplanted by rounded knobs that make for ease in cleaning. Insulation is ample to the point of extravagance, being a full three inches in thickness. A combination of fibreboard and "Dry Zero" has been developed to give the temperatures in the food compartment excellent protection from temperatures outside. On this point Majestic engineers point out that excess insulation secures economy of operation, just as it costs less to wear a heavy overcoat in very cold weather rather than to use a light one and then try to eat enough "heating foods" to keep up one's temperature. Their theory

SEND TELEVISION NIGHTLY

Test radiovision programs are being transmitted nightly except Saturdays and Sundays, from 8 to 10 P. M., Eastern Standard Time, by Station W2XCD of the De-Forest Radio Company at Passaic, N. J. The signals, transmitted on 2,065 kilocycles, are of the standard 48-line, 15 pictures per second category. The present transmitting power is sufficient to cover the New York metropolitan district. With contemplated increases in transmitting power, the signals will soon be available over a considerable part of the country. The programs consist of half-tone and silhouette movies for the present. The pictures contain exceptional detail if intercepted with a suitable receiver and reproduced with an accurate radiovisor, due to refinements and improvements in the pick-up apparatus and the transmitter. Reports from "lookers-in," stating how the signals are being received, will be greatly appreciated.

is that where one is spending money to secure cold, one spends less on current if the outside heat can be effectively shut out.

Noise has been all but eliminated. The cold unit, or heat absorption coils, enclose two freezing compartments of the same size. The upper one holds two trays each with a capacity of 21 ice cubes. With separators in place, the tray in the lower compartment provides 42 more cubes, or, with separators removed, it gives generous space for frozen desserts or the new packages of sharp frozen chops now being marketed and which may here be kept indefinitely!

Since vibration tends to set up noises, the decision was reached by Majestic's engineering staff, to eliminate any possibility of vibration by using a rotary type pump, this to be driven directly from the motor. Motor and compressor are hermetically sealed into a pressed steel "bell-housing."

MANAGES BRUNSWICK LAB

On September 22, R. W. Jackson, Vice-President and General Manager of the Brunswick Radio Corporation, announced the appointment of Mr. Jack Kapp as Manager of all laboratory operations. Mr. Kapp has been credited, for a number of years, with the achievements of the Chicago laboratory of the Brunswick group, and, according to Mr. Jackson, his "outstanding achievement in the securing of talent and making of commercial records of various types, fit him for the position which he has now attained."

Previous to his association with Brunswick, Mr. Kapp worked with the Columbia recording organization, starting as office boy. In fact, while still attending school, his vacation days were spent in the recording industry. He first became associated with Brunswick as sales representative, graduating from this position to Manager in charge of Race Records. His next step was that of Sales Manager for the Vocalion division of Brunswick, finally attaining position of Manager of the Chicago laboratories.

Mr. Kapp combines with a keen sense of the commercial, a knowing musical ear, and it is expected that the Brunswick operations in New York, where he is now located, and throughout the Brunswick laboratories all over the world, will profit from his intensive experience.

The resulting unit is so compact that it is only nine and one-half inches in height and is therefore readily placed in the space above the food compartment yet below the lid.

In depth overall, both models of Majestic Refrigerator are the same, 27 $\frac{1}{8}$ inches; in the larger machine the height is 59 inches and the width 33 $\frac{1}{8}$ inches, while the smaller model is 54 $\frac{1}{8}$ inches in height and 28 $\frac{1}{2}$ inches in width.

WEST OF THE ROCKIES



What the Industry and Its Leaders on the Coast Are Doing,

as Reported by—

RALPH POWER, Ph. D.

Pacific Coast Editor

RADIO INDUSTRIES

Frank A. Emmet, factory representative, has worked up a large sized business with Frost volume controls . . . is rushing around with the new DeJur-Amsco variable condensers . . . appoints Elmore-Lambing Company as representative for Speed tubes . . . and adds two beautiful stenographers to his office staff . . . making a total of two, 324 North San Pedro street, Los Angeles.

* *

Howard D. Thomas, Perryman tube representative for the coast, gets new Los Angeles office at 1054 West Sixth street in the professional building . . . sorta high class. Putting his boy in the military school at San Diego, he intends to bring Mrs. Thomas down south for the winter, taking up a more or less permanent abode in Los Angeles after some twenty-five or thirty years up Seattle way. His office managers . . . Joe Grison, Los Angeles; Howard S. Pyle, Seattle, and W. I. Bristol, San Francisco.

* *

Ralph Hetzel, engineer for a half dozen mantle set makers the past year, goes with the new Austin Radio Manufacturing Company, Inc., 1015 West Vernon avenue, Los Angeles . . . H. C. Block, E. B. Dunn, Jack Bloom, A. C. Spencer, Benton Ellis and N. Hiriart in the firm . . . new four screen-grid model.

* *

Seen at the Los Angeles show . . . E. J. Dykstra, general sales manager for Transformer Corporation of America (Clarion); D. F. Griff, district sales manager; and James Hermans, of the San Francisco office.

* *

Long Beach, California, is rapidly becoming a proving ground for sets out this way. One manufacturer last year dumped a score of carloads of sets here without the necessary selectivity. One of the nationally known firms is now experiencing difficulty. If a set will work in Long Beach it will work anywhere. Residents there cannot get all the Los Angeles stations on ordinary sets . . . probable reason, miles of iron pipes, tons of steel oil derricks, and other paraphernalia in the oil fields. Most mantles now find that a four gang condenser, with a few minor changes in the set design, is necessary to make the mantle sets workable and selective.

* *

The little musical jugs created quite a commotion at the Chicago world's fair back in '93, even though they only played one tune. But now along comes the modern coffee table radio set that can play 'most anything. Davison-Haynes Manufacturing Company, makers of the Angelus midgets, a console and a combination job, now bring out a nifty coffee table . . . tile top, dial on the side, speaker grills on the end. Hot tunes and hot coffee would almost make this a hot box.

* *

The Los Angeles radio show has gone down in history. It was a fair success with most of the groups represented. Atwater Kent seems to have been the only prominent organization not represented. While primarily for the public, in the Ambassador auditorium, many manufacturers, jobbers and agents had rooms in the hotel for headquarters. The majority of these, however,

did not stay all the week but pulled out after the Labor Day holiday.

* *

The last meeting of the newly formed California Radio Interference Association was held in Fresno October 28 and 29 . . . composed of representatives of city, utilities utility and association men.

* *

"Certified service" men in San Francisco are now getting cards from their trades association to present to customers. The plan, inaugurated in Los Angeles more than a year ago, gives promise of working out well in general way.

* *

Southern California golf addicts and their clubs . . . Claude Foote (Philco), Flintridge . . . Harry Ungar (Majestic), Hillcrest . . . Fred Prentice (Zenith), Potrero.

* *

Glimpsed at the Los Angeles show . . . Les Taufenbach, Brunswick distributor, known as Handsome Sparks on account of being an ex-navy operator . . . H. E. Howard, maker of Waltham midgets, debonair and well dressed . . . Bill Fremensdorf, Colonial representative, big and bulky . . . Mart Borden, manager of Plymouth, wearing a loud and shrill necktie . . . Ray Stoehle, president of Flint, swapping telephone numbers with Charles Weinberg, factory representative, wearing new gold tooth and carrying his infamous pipe. . . .

* *

. . . C. E. Flynn, representative for Magnavox and Mershon, picks buttonhole bouquet from the hotel garden . . . C. Merwin Dobyms, manager of station KGER, gets in on a free ticket . . . Herb Bell, of Jackson-Bell, cries out for bigger and better radio shows . . . Bert Knight, representative of various lines, goes swimming in the hotel pool . . . Bill Hitt seems to be getting old, becomes winded playing checkers . . . Frank Emmet asks Al Farquharson if he likes to go out with chorus girls and the answer is the coarser the better . . . Waldo Tupper, show manager, says cows make the same noise as saxophones and give milk, too . . . R. B. Yale forgets room number and takes nap on the lobby lounge . . . Boy Haynes (Angelus) mistaken for ticket taker on account of being so tall . . . Jim Fouch, Universal microphones, forgets his pass and tries to climb in window.

* *

Percy Feeney, coast representative for Colin B. Kennedy, has been going the rounds from San Diego to Seattle.

* *

Freeman Lang, loud speakers, has been busy installing public address systems in miniature golf courses . . . assisted by Eddie Barnes, erstwhile radio announcer.

* *

Samuel I. Cole, general manager and treasurer for Aerovox Company, has been visiting out on the coast for a short time . . . genial smile, stockily built, with the proverbial black cigar stuck in his chops . . . sorta looking like the "man from the South."

RESISTORS



... A Reputation always based on accuracy

Our resistor sales this year are running considerably ahead of last year yet the accuracy of our product is never sacrificed. From 1 ohm to 200 megohms our resistors are accurate and rugged. Write today for prices on the types in which you are interested, or for any data which our engineering departments will be glad to supply, as we are constantly working with leading radio manufacturers.

DURHAM

MADE BY THE MAKERS OF

Metallized
RESISTORS
INTERNATIONAL
RESISTANCE COMPANY

2006 Chestnut St.

Phila., Pa.

Write today for samples for your tests, or any resistor data.

Thomas A. White, of the Jensen organization, drops into Los Angeles long enough to appoint the Brothers Marshank (Bill and Dave) Marshank Sales Company, as representatives for Jensen speakers.

* *

George H. Curtiss, Jr., not so large as his paternal ancestor, severs his connection with the De Forest Radio Company in coastwise service, to become a partner with Robert A. Baxter, Ltd., automotive parts wholesalers, 739 Polk street, San Francisco. His father is secretary of the radio trades group in San Francisco . . . burly, good natured, energetic . . . already laying plans for the 1931 trade show around the bay district.

* *

F. D. Rowe, at one time with the Kellogg Switchboard and Supply Company, joins the interference staff of the trades association in San Francisco. George R. Walters, in similar capacity down in Los Angeles, is reported as recuperating from an appendicitis operation.

* *

American Laboratories, Ltd., 122 East Seventh street, Los Angeles, brings out its "Novo Mike" at the radio show . . . a miniature microphone for home use with the receiver.

* *

Speak-O-Phone Corporation of California, Ltd., 1751 North Highland avenue, Hollywood, . . . personal phonograph records . . . begins to issue franchises for its business in Oregon, Utah, Nevada and Washington.

* *

The Radio College of California, 921 West Sixth street, Los Angeles, has changed its name to the Radio Institute of California, specializing in radio and sound instruction . . . H. A. McGonagil, president.

Latest mantle set group . . . Pacific coast Radio Sales, 2415 West Washington, Los Angeles . . . mantle sets, small sized model and a third line with electric clock in speaker grill.

* *

A resident salesman and warehouse in Butte, Montana, is planned by Zion's Cooperative Mercantile Institution of Salt Lake City . . . new Brunswick distributors for Montana . . . also for Utah, Idaho, Eastern Nevada and Western Wyoming . . . R. F. Perry, manager.

* *

Gresser Pacific Company, Ltd., 371 Nineteenth street, Oakland, manufacturers of automobile accessories, is now making slip covers for shipping radio sets.

* *

Kenneth G. Ormiston has worked out the circuit of the new Plymouth model for holiday distribution.

* *

Jackson-Bell is making the Velvet Tone mantles for Westinghouse distribution in the northwest.

* *

Herbert H. Horn is making the Lark midget for Electric Corporation distribution.

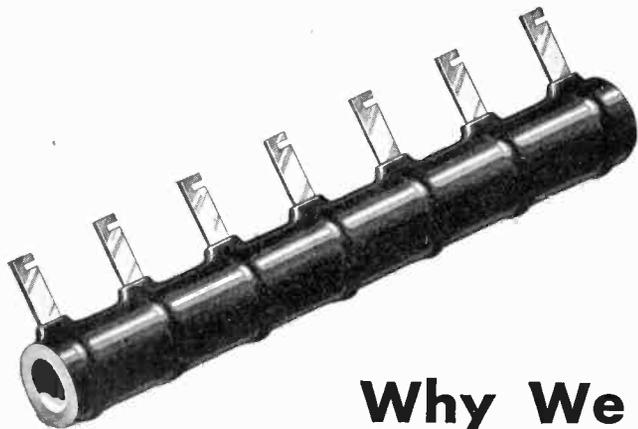
* *

Master voltage control and master filtered aerial, for midget sets, (Master Engineering Company, Chicago) has appointed a Pacific coast representative in the form of robust Willard H. Cooke, 216 Laughlin building, Long Beach . . . distributors. Radio Supply Company, 912 South Broadway, and Herbert H. Horn, 1629 South Hill street, both of Los Angeles.

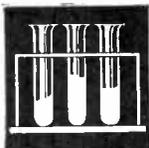
* *

Kemper Radio Corporation, 1238 Santee street, Los Angeles, . . . direct selling organization . . . at last enters the midget field with the Kemper Kompact, a six tube set.

VITROHM RESISTORS



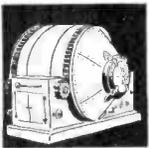
Why We ENAMEL Resistors



Ward Leonard has always developed and made its own vitreous enamel



Practically every application demands a different enamel



Enamels are mixed in ball mills for many hours



This, together with large batches, makes uniformity certain

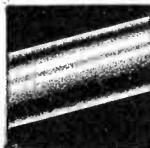
WE do not enamel our resistors to imitate another's product and thus provide sales talk.

Vitreous enamels are used by us for the protection of wire and terminal connections against chemical action, mechanical injury and for the rapid conduction of heat from the wire.

One enamel won't cover all requirements. We use 150 formulae, developed and made by us exclusively to provide for all needs. Specify **VITROHM  RESISTORS**—It's been safety insurance for 39 years.



The enamel bonds with wire, terminals and refractory



The final, tough, hard, tenacious coating is perfect protection.

WARD LEONARD ELECTRIC CO.
Mount Vernon, New York
resistor specialists for more than 39 years

EDITORIALS

(Continued from page 372)

the most stupendous advertising support ever imagined. Indeed, the whole matter has been so overworked that most dealers are frankly suffering from an indigestion of advertising support and from a headache of discounts.

We must produce more intelligently. We must avoid over-production, even if it comes to the drastic step of dumping part of our over-production in the ocean. We must increase the radio market as a whole. We must strike a happier balance between supply and demand. Kings are not in good taste today: we cannot afford to have King Dealer dictate our marketing policies.

They have not gone so well, these various radio shows supposedly addressed to the public at large. Both trade and public express themselves as fed up on radio shows. Unless some mighty big things are introduced in time for the next round of radio shows, there will be little promise of successful radio shows in the future.

As many leaders of the radio industry have expressed it, the public at large can see more of a radio show in the large radio dealers' showroom, than at a typical radio show. There is little sense in having the public pay 75 cents or a dollar admission to a show that has little more than a wide assortment of radio set brands which, truth to tell, can hardly be told apart in their essentials.

Either let us trot out our home talkies, refined radio-vision, home recording, facsimile reception of news bulletins, radio organ, new short-wave receivers and other novelties now in the making, in time for the next round of radio shows, or let's forget radio shows altogether.

PACKING RADIO PRODUCTS

(Continued from page 385)

wood rider piece attached to the bottom of the cabinet.

Second. One large piece of corrugated board, creased and slotted, is made to fold over the top and four sides of the cabinet and this piece has a number of corrugated pads approximately 1 1/2" in thickness glued thereon at various spots, so when this large piece is folded over the cabinet a cushion contact is effected over the top part and around the sides and ends of the cabinet and it also holds the cabinet away from the outer case. These corrugated cushion pads will absorb shocks, thus affording protection to the delicate mechanism of the set.

Third. A solid fibre outer tube is placed over this set and packing, and the complete packer is banded with one-half inch wide metal strapping. The photograph reproduced with this article shows this construction, and several shipping tests have already been made which have proved it to be a satisfactory packer. This fibre-board packer is lower in initial cost, requires less time for packing, and is much more easily unpacked by the dealer or jobber. The smooth surface and color of the outer box makes it possible to show distinctive advertising copy in one or two color printing. It will completely

eliminate the possibility of the finish becoming marred or scratched as might occur in other types of packers.

In the radio tube industry manufacturers are now called upon to supply the set manufacturers with a combination set of tubes for their receivers, packed in individual corrugated containers and this is known as the Kit package. These corrugated Kit packages are constructed with corrugated partition cells to enclose each tube, and corrugated inner parts are used to effect an air cushion around the four sides and top and bottom of the box. This type of packing is adapted to hold any Kit combination of tubes desired, and the information necessary to build a Kit package is to know the size of each tube and the number of tubes packed to the Kit. In the shipping of individual Kit packages to the set manufacturer, it is suggested that a quantity of six, eight or ten be packed in an outer corrugated container, and this will insure each package arriving at destination in good condition and have the appearance of a new box.

It will also interest readers to know that corrugated shipping cases can now be furnished with the outer surface in a distinctive color background. This can be had in any one of a variety of standard colors, and your copy can be printed thereon in one or two colors, giving a three-color effect. These colors are known as MYRACOL colors and are now offered by the Container Corporation of America after two years of research.

Boxes in MYRACOL colors will give an advertising medium that is novel and distinctive and will attract the eye more quickly than the advertising shown on the ordinary color of boxes. Corrugated boxes in color can be manufactured in minimum quantities of a carload of assorted sizes to one color, and the increase in cost is very nominal.

Research work in the Radio Industry will be a distinct factor in maintaining steady growth and prosperity and it is believed that new ideas and changes will occur in radio products that will require new packing methods. The Fibre Industry with its intensive research work stands ready to play its part in giving the most modern packing methods for shipping and distribution of radio products.

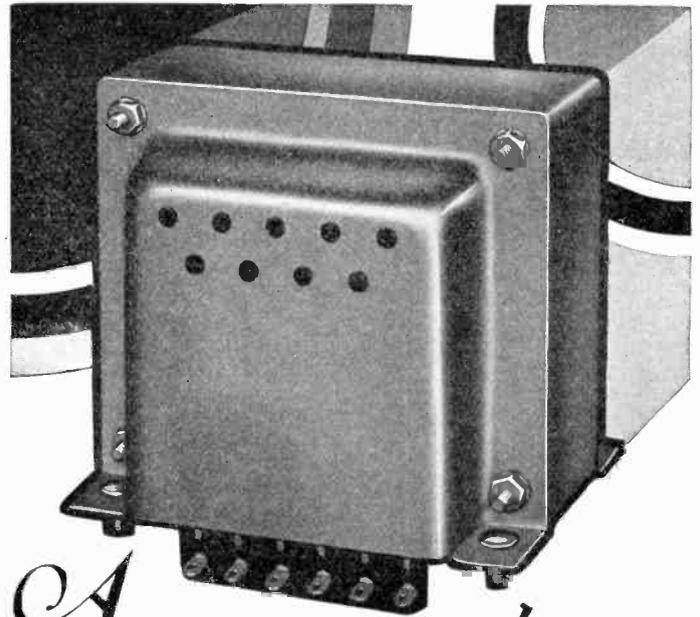
ELECTRICAL SCANNING FOR TELEVISION

(Continued from page 389)

the target by the primaries rather than by using the primary electrons themselves as accomplished by means of the target shown in Fig. 10-a.

The KH type of cell has not sufficient sensitivity to be used with light reflected from an object. The present cells are being used on transparencies. The light source employed is a 400 watt tungsten light, giving about 40 lumens incident on the cell. The total current is 20×10^{-6} amps., while that flowing in the target circuit is about 10^{-9} amps. The voltage amplification required with this sensitivity is about 50,000.

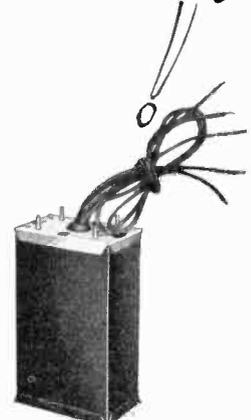
High vacuum dissector tubes prepared with sodium sulphur vapor cathodes sensitized by the Olpin process, give sensitivities of 6.5×10^{-6} amps./lumen. These dissectors require a light flux of about 2 lumens when they are built with an aperture to cathode area ration of one to 20,000 and with an amplifier having a gain of 50,000. Amplifiers flat to 400 Kc may be built with a noise level low enough to handle a target current of 2×10^{-10} amps, or to allow a voltage gain of 250,000. Therefore, a light flux of 0.4 lumen is ample under these conditions. Such a light flux is obtained with an F-2 lens when an object of equal re-



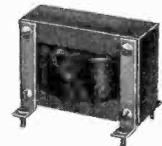
A POWER TRANSFORMER in KEEPING with KINGSTON tradition

Products of the Kingston organization have always been distinguished ones, and the high-lights of the Kingston Power Transformer place it entirely in keeping with Kingston tradition:

- a foundation of correct construction, both mechanically and electrically
- unusually effective terminal design, and a mounting that is practical and unique
- no mechanical vibration winding baked in varnish usually low temperature rise sizes available to meet your individual requirements



Kingston
Filter
Condensers



Kingston
Filter
Reactors

Kingston engineers, offering competent advisory service, invite correspondence regarding your problems.

KINGSTON PRODUCTS CORPORATION
Kokomo, Indiana, U. S. A.

KINGSTON
Specialists In Power Transformers,
Filter Condensers, Filter Reactors

1906

1931



Recommend Tubes

—not tube troubles!

THE success or failure of your sets today is largely a matter of tubes. With good tubes, your sets should make money for jobbers and dealers. With tube troubles, your sets will lose money for everyone concerned.

So why not equip your sets with good tubes, or at least recommend good tubes? You have too much at stake to overlook or ignore the question of the tubes used with your sets.

Fortunately, tubes are no longer a gamble. You can be sure of 1930 tubes. You can be sure of tubes produced during the past month or two, and not a year or two ago. You can be sure of tubes that incorporate the latest improvements and refinements known to the vacuum tube art.

Play safe! See that your sets are equipped with de Forest Audions—the oldest tubes on the basis of history and prestige, the newest and latest on the basis of improvements and refinements.

De Forest Audions are standard equipment in Crosley and Brunswick sets. Why not in your sets?

Let us tell you more about 1930 tubes and what they mean in terms of receiving set performance, merchandising and servicing. Better still, let us prove to you that de Forest Audions will help your sales.

Remember, there is no substitute for twenty-five years' experience

de Forest

(AUDIONS)

RADIO TUBES

DE FOREST RADIO COMPANY
PASSAIC NEW JERSEY

Export Department: 300 E. 45th Street, New York City, N. Y., U.S.A.

fecting power to the human countenance is illuminated at one foot with a 1,500 watt tungsten light. This sensitivity therefore approaches the order of that required for direct scanning.

Zworykin⁶ reports sensitivities of 25×10^{-6} amps/lumen. This sensitivity would permit direct scanning with illuminations that are not too bright to be used with animate subjects; dissectors having this sensitivity, however, have not been built as yet.

Dissectors Not Employing an Anode Screen

Dissector tubes may be built to operate without an anode screen. Fig. 9 shows the construction of such a tube.

The principal advantage of this type of tube is its simplicity. It has the disadvantage of giving a rather poor electron image, and has not been built thus far with aperture to cathode area ratio greater than one to five thousand.

Receiving System

The receiving system used in connection with the dissector tube is closely similar in principle to that proposed by Nicholson⁸ and Rosing⁷, and to that recently demonstrated by Zworykin⁶. The oscillite tube differs from Zworykin's Kinescope in the means used for focusing the spot and in the detail of the electron gun element.

The magnetic focusing principle, as has been stated before, permits all electrons having a common point source to be focused back to a point on the fluorescent screen. The electron gun element has been designed with the idea of securing the greatest possible number of electrons through a given sized aperture, and limiting the angle of this beam to that which can be accurately focused. This element as shown in Fig. 3 comprises a helical filament coated only on the inside. A shield is placed over this filament having in it a hole the same diameter as the filament helix. The anode is tubular in form, and positioned in front of the cathode. A ring grid is positioned about mid-way between the filament shield and the anode.

The merit of this type of element lies in the fact that the anode tube is located approximately at the focal point for the electrons leaving the emitter. The anode voltage required to give this focal point at the entrance to the anode tube may be any voltage between 1500 and 2500 volts for the tubes we are using at present.

An interesting effect has been noted with regard to the operation of these tubes. They function only when secondary electrons are emitted from the fluorescent screen. Sometimes a black spot will appear on the end of the tube due to that point charging up negatively. It will be recognized that an unstable condition exists here and that a point on the fluorescent screen will either assume a large negative or a large positive potential with respect to the anode. This effect is not bothersome at all; in fact, it is necessary to have very high current density in order to observe it.

The deflection coil system used with the oscillite tube is exactly similar to that used with the dissector tube. The power required in these coils for maximum size pictures may be generated with a 210 tube. The amount of power required in the focusing coil is quite negligible. One type of scanning generator used at the receiver embodies a helium glow tube feeding a 210 power tube. The circuit required to get the requisite amount of power from a 210 tube into an entirely inductive load has been developed over a period of several years. The details will not be given here. These generators are synchronized by coupling them with the main picture frequency circuit since as explained earlier in the paper, the requisite pulses are induced at the transmitter.

* * * * *

Having described an electrical television system which transmits reasonably good pictures, it remains to compare this system with its predecessors and to list the limitations and difficulties to be met before satisfactory television service may be had.

Perhaps the weakest link in the present system is the relatively inadequate sensitivity of the transmitter. Of course this limitation is not peculiar to this system; nevertheless, it is a

limitation for which the present system does not offer a complete solution. The problem is not difficult however. Means for its solution are already in sight. It is believed to be a problem in which a gradual improvement will be realized and in which a few months' research will suffice to improve the sensitivity to a point where vaudeville skits, for example, may be televised with a resolution of 40,000 elements. Furthermore, it is not necessary that we should await this development before beginning commercial service, since motion picture film may be transmitted at the present time.

Another problem still awaiting solution is that of increasing the light intensity at the receiver. This light intensity is insufficient as yet to allow projection of the image, although it is quite ample for a four to six inch picture.

Without question, the worst difficulty facing television workers at present is that due to the very severe wave band requirements. The writer feels, regarding a solution to this problem, that a system of television can, and undoubtedly will be devised, which does not require such a wide band. It is not his belief that anyone will ever succeed in modulating a wide band of frequencies on to a carrier thereby to narrow the band. Any attempts made along this line are thought to be doomed to early failure. Frequency is a secondary and not a primary property of an electrical medium. The amplitude is the only variable which may be affected in the existing electrical media. Since frequency denotes a specific amplitude variation it should not be surprising to find that some other type of amplitude variation would effect the frequency. On the other hand, the information content of an image, while considerably greater than that of music or voice, is not a sufficient amount greater to justify more than about ten times the width of frequency band^o. The writer somewhat diffidently predicts that television approaching human vision in perfection will, in the not too distant future, be obtainable on a frequency band of 50 kilocycles. Very definite progress has been made along this line which cannot, however, be reported yet. Suffice to say that the writer's prediction is based on something more than hope.

LOOKING AHEAD WITH RADIO

(Continued from page 376)

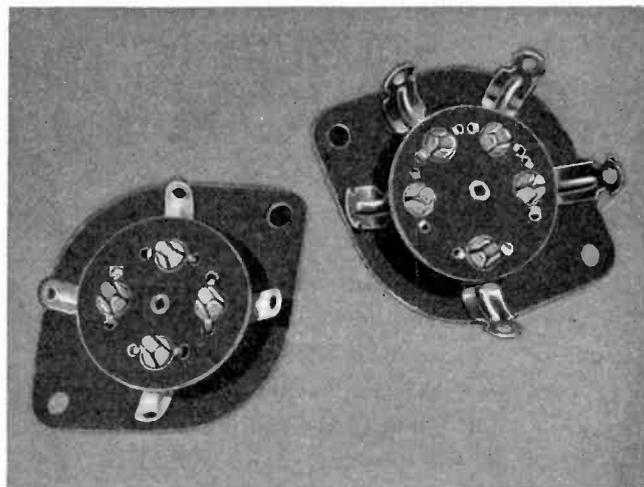
quirements are fully appreciated and understood.

One field of much promise is a reading device for the blind, whereby a photo-electric cell can scan actual printed matter and reproduce same in the form of cords which, after some practice, may be interpreted by the blind "reader." The idea is by no means new, dating back at least a decade; but with the improved photo-electric cell, together with the improved amplifying means at our disposal, it is at least practical today. A simpler version is one making use of sound films, containing the speaking voice, which may be "read" by blind persons.

Which brings us to other human considerations. Recently, we have been shown that fever may be artificially introduced in a patient, by means of high-frequency energy, and that such forced fever is instrumental in bringing about certain curative results. We may look forward to many radio tube applications in the therapeutic field from now on, some for use by doctors only, and others for home use in the hands of the laity. Already, one large radio set manufacturer has seen fit to produce the radio knife or high-frequency device which burns its way through flesh, for bloodless surgery.

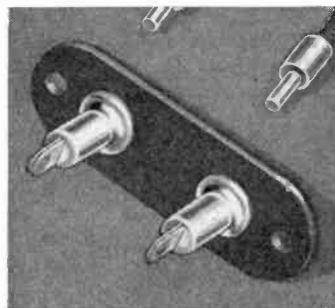
There are hundreds, even thousands, of potential uses for radio technique and radio equipment. The field is still a virgin one. However, it is necessary to engage in some original research and development, if one is to obtain the ultimate market. Too long has the radio industry at large "let George do it," with the result that royalties or patent suits have inevitably come along at a later date, when manufacturers have sought to get into newly created fields. The new applications of tomorrow are now being created. You can be developing your own future market, in addition to the obvious radio market. Or you can count on paying royalties for operating under the patents of others, when the time comes. The decision is largely of your own making.

Be that as it may, the future of our industry looks mighty



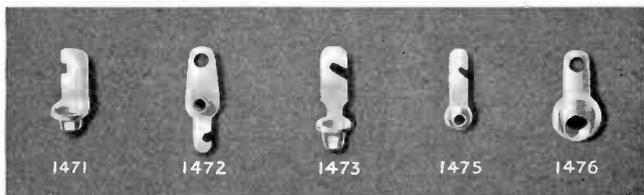
New and Better—these CINCH Radio Sockets!

Leading manufacturers have been quick to adopt these inexpensive, fool-proof radio sockets. Improved contact points, positive constant contact on all prongs, assembling ease, soldering accessibility, prompt shipment and low prices! Five different types. Write for samples and prices.



The CINCH Improved, Money-Saving TIP-JACK

Serves better . . . costs less! Rigidly mounted in bakelite . . . cleanly marked according to their purpose. The inserted tip finds the center naturally. Scientific principle makes vibration impossible! Three or more contacts can be supplied, instead of two, if desired. Samples and prices on request.



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The answer to all soldering lug needs! Complete range to choose from . . . immediate shipment . . . lowest prices. Special designs provided for special requirements. Perfect soldering results assured by a special solder coating. Without obligation, write for samples and full details . . . today.

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COMPANY

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for 100% satisfaction out of your equipment you want the best tubes obtainable for all around service.

Engineering and production devoted exclusively to manufacture 250-281-210-866-845-13 Types. Also Special Tubes of Larger Types.

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Taylor Vacuum Products Co.
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promising. Big things are in the making. Television is not far off. A greatly expanded field is being opened up. Those who have made the most of the past 12 months of breathing spell, by learning of and correcting their mistakes, but strengthening their organizations, by preparing for bigger and better production, may reap the benefits in the no distant future. After all, we have only paused for a second breath.

DISTRIBUTORS PLAN EXPANSION

(Continued from page 382)

True name of company
Street Address
City State
Individual, partnership or corporation ownership
If individual, state name
If partnership, state names of partners
If incorporated, under laws of what state
On what date
Capital stock authorized—Amount Issued
(Pref'd) (Common)
Amount outstanding
(Pref'd) (Common)
Amount Paid in Cash Property
Officers and Directors with titles, giving past and present business connections
Nature of business
Description of product or service
Is sample submitted hand made or taken from factory production?
If hand made, when will you be in actual production?
Do you own the patent rights to your product?
If not, when were patents filed?
If so, give patent numbers? When issued
Do you protect your distributors against patent infringement suits, how?
How is product distributed?
Do you guarantee exclusive territories for distribution?
What are the details of your distributors proposition, including the price, whether FOB factory or delivered, terms, discounts, service allowances, etc.
Do you furnish reserve parts on a memorandum basis?
Who pays for handling and service charges for defects in apparatus or design?
What advertising and sales promotion assistance do you intend to give your distributor?
How rated: flat sum allowances or percentage of purchases
What protection do you give your distributors on their inventories if the prices are reduced or how do you protect your distributors against obsolescence of models?
Description of office or factory
Are premises leased or owned by company?
If owned, give amount of equity in buildings
Amount of incumbrance
Brief History of Company
Give at least two bank references:
Give names of at least three companies from whom you purchase materials so that inquiries can be made regarding standing in the trade
Give names of at least three of your present customers to whom you are selling your line
Have you any competitors making the same product to your knowledge?
If so, give names
Kindly attach balance sheet, current sales literature, sample of distributors contract, etc.
Date Information given by
Title or Capacity

Paul C. Staake, Advertising Manager of National Union Radio Corp., 400 Madison Ave., New York, was given a "Tilden luncheon" by the National Union executives last month in honor of his winning the tennis tournament conducted by the East Orange Tennis Club. Staake was awarded a silver loving cup for his championship playing. He went through the entire tournament without losing a set. Staake joined National Union in August, coming from DeForest Radio Company, where he was also Advertising Manager.

NEW BATTERY FOR RURAL SETS

(Continued from page 383)

scientist, every research man, every physicist who has had anything to do with batteries, has made serious attempts to use the air we breathe to depolarize them instead of oxygen-bearing minerals which must be obtained at considerable labor and cost. But this is the first successful application of this principle.

The Air Cell battery essentially is a high-capacity battery. At the moment it does not appear practical to utilize the principles of air depolarization in smaller sized units. As a consequence, the Air Cell battery must not be considered a competitor of the dry cell, or that it encroaches in any way on the natural field of usefulness of the dry cell. Rather, it provides an additional battery, capable of performing tasks hitherto beyond the ability of batteries, and therefore that it opens up and widens out the field of usefulness of batteries in general.

The Eveready Air Cell "A" Battery has a rated capacity of 600 ampere-hours. A 2-volt receiver, using seven tubes, two of them being output tubes, consumes approximately .55 ampere from the "A" battery. This means that the new battery will run such a set for well over 1,000 hours, or on the basis of three hours per day, a whole year.

Compare this for a moment with the dry cell; not that the dry cell is practical for use with 2-volt tube sets, for it isn't, but comparisons are enlightening. The best dry cell "A" battery for a 7-tube, 2-volt set would consist of eight cells, connected two in series and four in multiple. Assuming that the owner succeeds in making this complicated connection correctly, which is assuming a lot, and assuming further that the filament rheostat always is precisely and accurately adjusted, and in all other ways giving the dry cell "A" battery all the breaks, it will run the 7-tube set three hours per day for about 80 days. In the course of a year, the set would consume 4½ battery installations, totalling 36 dry cells, costing \$18.00 at list price. One Eveready Air Cell "A" Battery, easily connected, will deliver a full year's service under the same condition of three hours per day usage, and its cost is less than half the cost of a year's supply of dry cells. Further than this, the owner can not accidentally shorten the life of the battery or the tubes by mis-adjustment of the rheostat, because Air Cell sets have no rheostats.

The battery consists of two cells, built in one container and permanently connected in series. The nominal voltage of the battery is 2.5 volts. While the voltage is not absolutely constant in the strictest sense of the word, the decline in voltage from beginning to end of life is only a fraction of the decline in the dry cell, and is well within the permissible leeway between the tube's upper safe voltage limit and its lower satisfactory operating limit. Consequently, an Air Cell receiver requires no adjustable rheostat, this troublesome and comparatively costly device being replaced by a simple, inexpensive fixed resistor built into the set, to cut the 2.5 volts of the battery down to the 2.0 volts required by the tubes.

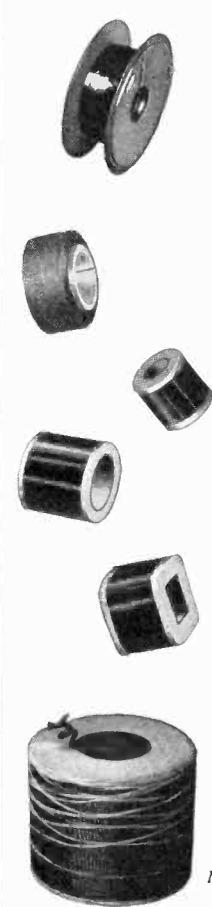
The only filament control required by such a set is a simple off-on switch, just like an AC set. With such a set, the power from the Air Cell battery can be snapped on without danger of damaging the tubes when the battery is new, and with full working filament voltage available at the tubes until the battery has delivered practically all of its rated capacity.

It can be seen from what has been said that it is the constant battery voltage which makes the Air Cell set as simple to operate, and as dependable in its operation as an AC set, and which makes the Air Cell set free from the limitations and the weaknesses responsible for the failure of the dry battery set. It should also be plain that without the Air Cell "A" Battery, a 2-volt tube set would not possess these essential features. On the other hand, the Air Cell battery can not be used to run any existing types of battery receivers. It can not substitute for a 6-volt storage battery for sets using 201-A tubes, because its voltage is only 2.5, and if two of them were connected in series to obtain 5 volts, the demand for current by such a set is beyond the current-producing ability of the Air Cell battery, which should never be subjected to a current drain in excess of .75 ampere. It can not substitute for dry cells on 199-tube sets, because the voltage is too low for these tubes. It can be used ONLY with the new 2-volt tubes.

The battery uses a liquid electrolyte, but is built, and will be shipped dry. In the dry state, it is inert; no depreciation occurs. Consequently, it may be put in service at the end of any elapsed time after manufacture, and still deliver its full quota of ampere-hours.

To energize the battery, it is only necessary to fill it up with water. It takes about six quarts. Distilled water is not necessary; any water suitable for drinking purposes will do.

It weighs about 25 pounds dry and 37 pounds when filled with water. It is 13½ inches long, 6¾ inches wide and 10 inches



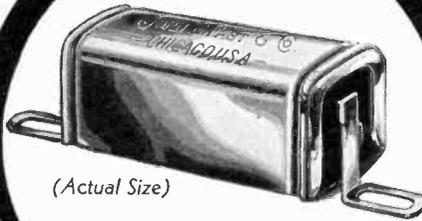
UNIVERSAL Automatic Coil Winding Machinery

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UNIVERSAL coil winders have been designed and developed by an organization specializing in winding machinery since 1892. Six distinct types of machines are available—to produce any required type of coil, spool-wound or self-supporting, cotton or paper insulated. Entirely adjustable for various sizes of coils, these machines never become obsolete. The many special features and automatic controls insure precision-wound coils at lowest possible cost.

**UNIVERSAL WINDING
COMPANY
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*Manufacturers of coil winding equipment
covering practically every phase
of the radio industry*



(Actual Size)

The Outstanding BY-PASS CONDENSER

Again Fast has anticipated the industry's needs . . . and offers this tiny by-pass condenser which conserves chassis space, assembling time, and first cost. Completely enclosed. Moisture proof . . . leak proof . . . trouble proof.

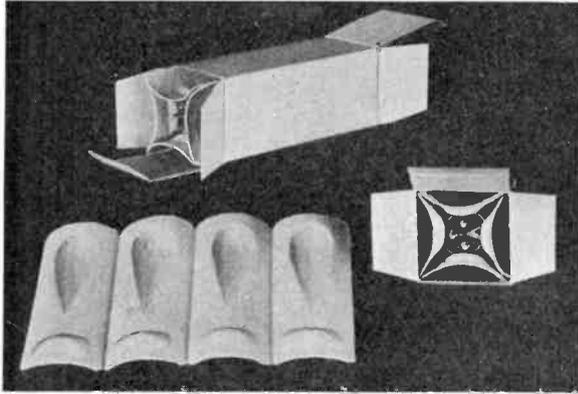
Quick deliveries on any quantity.
Samples and specifications on request.

FAST

Specialists in Radio Condensers
JOHN E. FAST & CO.
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The LAST WORD

More Safety
Less Cost



HOLED - TITE RADIO TUBE WRAPPER which is revolutionizing tube packing.

Check these features:

- 1 Wrapper is light and form fitting and designed especially for each size of tube. Consequently, it provides suspension and perfect protection.
- 2 Suspension packing protects against lateral shocks and distortion of elements.
- 3 Tube can be tested without removing from carton, without tearing or defacing the wrapper.
- 4 Wrapper is easily and quickly handled, even by unskilled packers.
- 5 Wrapper costs less than any other packing.

Holed-Tite Wrappers are made for all types of tubes to fit the standard bulb sizes.

Write for samples and prices today. Protect your tubes; save money.



Holed-Tite pad for packing standard cases of 25-50-100 radio tubes. Pad comes in 3 sizes. Do you want samples?

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Say You Saw It in Radio Industries

high over terminals. It is built in a hard rubber molded container provided with four flat smooth faces.

* *

Ernest Kauer, president of the CeCo Manufacturing Company, accompanied the group of New England business men who helped to make up the party of industrialists, executives and bankers who on October 7th, began a tour of important research laboratories in the East and Middle West. The tour was arranged by the National Research Council for industrial leaders who are keenly interested in the meaning of the work of these centers of scientific development to America's industrial future.

Laboratories visited included Bell Telephone Co., Newark; General Electric Co., Schenectady; General Motors Co., Detroit; U. S. Air Service Eng. Div., Wright Field, Dayton; American Rolling Mill Co., Middletown, Ohio; Aluminum Company of America, Pittsburgh; Mellon Institute of Industrial Research, Pittsburgh; U. S. Bureau of Standards, Washington; National Cannery Association, Washington.

R.C.A. PERFECT 'BIG BEN' DEVICE

Engineers, working in the laboratories of the R.C.A. Victor Company have perfected an unusual device which, when amplified, exactly duplicates the magnificent tonal sonority of the world famous "Big Ben" chimes located in the tower of the House of Parliament in London.

This unassuming looking mechanism, inclosed in an ordinary wooden box, employs a lever which sets up the necessary vibrations by opening and closing a circuit. Installed in the tower of the courthouse at Camden, and broadcast through 9 banks of 20 amplifiers each, this synthetic "Big Ben" received its baptism recently as a part of celebrations during which Camden was dedicated the "Radio Center of the World." The ponderous "tolling" of this scientific alarm clock reverberated over the city and the surrounding countryside for nearly ten miles. Music also was broadcast in this fashion, as were several speeches, which could be clearly heard for miles around. During the same day, a two-way communication experiment with an R.C.A. Communications plane flying over the city was picked up by a radio receiver and re-broadcast from the tower.

Some idea of the enormity of power which is represented by these 180 amplifiers may be gained through a comparison with the power developed in an ordinary radio receiver. The average receiver such as is in use in the home, is capable of developing two or three watts of audio-frequency energy. The amplifying system which was used for the "Big Ben" demonstration developed 600 watts of undistorted audio-frequency energy.

Mr. Alfred R. Pettitt, the R.C.A. Victor Engineer who conceived the "Big Ben" device, pointed out the utilitarian possibilities of such an amplifying system.

"What we achieved the day of the Camden dedication was more in the nature of a demonstration of what could be accomplished," said Mr. Pettitt, "not only in imitating 'Big Ben' but also in reproducing its tone with fidelity and clarity. Think of what such an installation, modified, of course, to suit local requirements, would mean to a small church or courthouse in the smaller towns. They would be able to call people to service with chimes that are as richly mellow and musical as those in the famous cathedrals abroad. In fact they could 'play' any of the famous chimes that they wished. The county courthouse may have its clock strike the hours with all the old dignity of a 'Big Ben.' Speeches and music for parades may be furnished for patriotic occasions."

Mr. Pettitt declared that the R.C.A. Victor engineers were at present busy perfecting a complete and easily operated installation which they expected would soon be available for the many purposes he had mentioned.

"Don't be surprised, then," he said, "if one of these days you hear the chimes of a famous European cathedral ringing through the mountains of Kentucky, or across the plains of the Dakotas, for such seemingly amazing occurrences are rapidly being made commonplace by the radio and its many possibilities."



The Board of Directors of the Institute of Radio Engineers has nominated the following candidates for offices of the Institute for the coming year: For President, R. H. Manson; for Vice-President, C. P. Edwards; for Managers 1931-33, L. M. Hull and A. F. Van Dyck.

* *

Dr. J. Barton Hoag, Associate Professor of Physics of the University of Chicago, is engaged in a series of experiments attempting to develop a hundred watts on a half-metre. More power to you, Doctor!

* *

Six lectures on Electron Theory, and the Theory of Conductors and Dielectrics are being conducted by the University College of the University of Chicago. Following is the data on these lectures:

Three Lectures on Electronics

Friday Evenings, 7:00 to 9:00 P. M. First meeting November 7. November 7—Classical Electron Theory and Positive Rays.—Arthur J. Dempster.

November 14—Modern Conceptions of the Electron.—Arthur H. Compton.

November 21—Television and the Electron.—J. Barton Hoag.

Fee—\$1.00 for the series of three lectures. Make checks payable to the University of Chicago.

Three Lectures on the Theory of Conductors and Dielectrics

Friday Evenings, 7:00 to 9:00 P. M. First Meeting December 5. December 5—Conduction in Gases.—Arthur J. Dempster.

December 12—Conduction in Liquids and Solids.—Ralph D. Bennett.

December 19—Conduction in Dielectrics.—Ralph D. Bennett.

Fee—\$1.00 for the series of three lectures. Make checks payable to the University of Chicago.

These lectures cover the latest theories and will be given by men from the Department of Physics of the University of Chicago who are recognized authorities in their respective fields.

These lectures will be given in the auditorium, second floor, Engineering Building, 205 W. Wacker Drive.

* *

A course in engineering economics is offered by the Armour Institute of Technology. The class will meet Tuesday evenings, from 7:00 to 9:00 P. M., having gathered initially October 28. Professor E. H. Freeman, the Instructor, is an authority on the subject, having taught it for a number of years. This course covers those fundamental features that are necessary in applying economic principles to engineering questions.

A study of this subject should be of assistance to every engineer, no matter what work he may be doing. These lectures are being given in Room 1200, the Engineering Bldg., 205 W. Wacker Drive, Chicago. The course fee is \$10.00 for the ten lectures. Checks should be made payable to Armour Institute of Technology.

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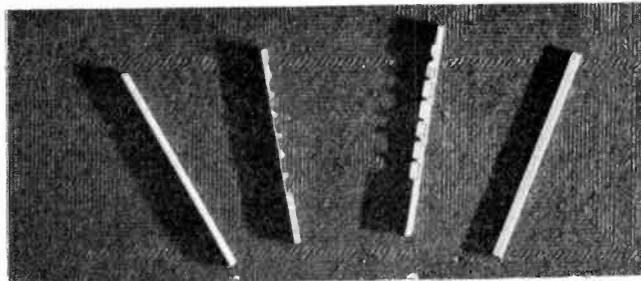
J. W. JOHNSTONE LEAVES ON SURVEY

Throughout all the radio industry, there are few men better known than Johnny Johnstone, Public Relations Chief of National Broadcasting Company.

One of those men is his brother, J. W. Johnstone, internationally known electrical engineer of Philadelphia and points north, east, south and west.

J. W., also known as Johnny, has just left for South America to conquer the ether in the interests of Lyric Radios.

Equipped with a specially built and converted short wave



Compared with a match

RATHER than talk in thousandths of an inch, let's compare CROLITE products with a match. Above, the latest forms of A.C. tube cathode insulators—round, notched and flat. Below, ordinary match photographed to same scale. And remember, precise mechanical, electrical, thermal and chemical characteristics, irrespective of size, are positively obtained when you specify.



Write for data regarding CROLITE and its many applications to radio tubes, coils, terminal strips, condenser insulation, etc. Samples cheerfully submitted.

HENRY L. CROWLEY & CO., Inc.

Specialists in Severe Service Materials

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Our large and modern plant affords excellent facilities for the speedy production of your requirements in etched and lithographed also embossed metal specialties. A large variety of stock dies enables Radio Manufacturers to effect great savings on escutcheons, for regular models, Midget sets, and auto radio sets.

Cut slightly over half actual size.

Send your blueprints—our Art Department will gladly submit original sketches for your approval.

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MANUFACTURERS OF

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PIEZO ELECTRIC CRYSTALS

"The Standard of Comparison"

FOR USE IN:

- (a) Constant Frequency Test sets.
- (b) Piezo Oscillator Test Circuits.
- (c) The Laboratory where a source of constant frequency is desired.

Prices for grinding crystals, fully mounted to your specified frequency:

500 Kc to 1500 Kc (plus or minus 500 cycles)
\$55.00 each.

150 Kc to 200 Kc (plus or minus 60 cycles)
\$55.00 each.

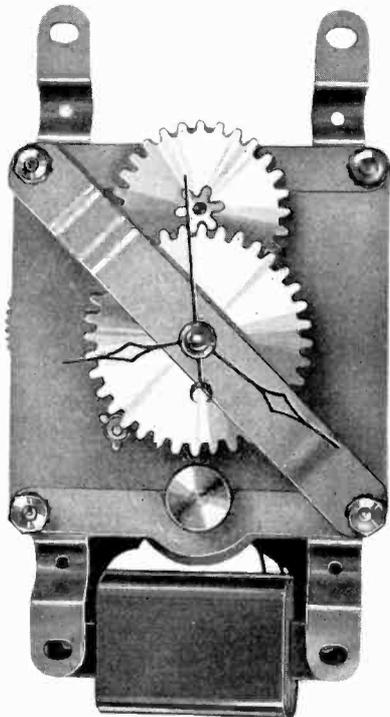
Prices for grinding crystals to other frequencies supplied upon receipt of your specifications. All crystals absolutely guaranteed regards to accuracy of frequency and output. Deliveries made within two days after receipt of your order.

SCIENTIFIC RADIO SERVICE

"The crystal specialists"

P. O. Box 86 Dept. C. Mount Rainier, Maryland

INSTALL ELECTRIC CLOCK MOTORS IN YOUR NEW SETS!



AN ADDED FEATURE FOR 1931 RADIOS

Furnished with housing also.

Manufactured By

ELECTRIC CLOCK CORP. of AMERICA

Dept. R 500 S. Throop St. Division of FAY MFG. CO. CHICAGO

Lyric, he sailed aboard the Western Prince Oct. 24, bound first for Buenos Aires where he hopes to make his first attack on bad reception and broadcast conditions prevalent throughout almost the entire length of South America at certain seasons.

"There is little that can be said to the layman at this time," Johnstone said before leaving, "because of the very small amount of knowledge we have on South American conditions.

"The ether there is patriotic and changes regularly with each revolution—sometimes getting too enthusiastic and having one of its own.

"We have known for years that there were so-called dead and fuzzy spots at certain seasons across the entire width of the broadcast band. We have known that heat and dampness had much to do with them. But we haven't learned a great deal about other contributing factors, nor how to solve the problems we understand at this time.

"To delve deeper into the partly understood problems and to go further—into the unknown—will be the object of the Lyric Survey.

"South America has become of such importance to the radio industry that more must be known about their reception conditions as soon as possible.

"There is no reason why our southern sister continent should not enjoy the same clear radio broadcasts we have come to expect in America. There are a great many problems to be coped with before this is possible, but we hope within three years to have overcome most of these.

"The results of this survey will also be of tremendous importance in parts of the Americas where the same conditions prevail in a lesser degree."

CABINET SIZE IS IMPORTANT IN RADIO REPRODUCTION

By RAY H. MANSON

Chief Engineer, Stromberg-Carlson Tel. Mfg. Co.

During the past three years the public has learned to appreciate the improvements in audio reproduction of a broadcast receiver that have been made possible through the correct use of the Electro-Dynamic type of speaker, when mounted in a full-size radio cabinet.

The few radio receiver manufacturers who have acoustical laboratories and advanced design of equipment for measuring the sound pressures from loudspeaker and radio receiver know from actual tests the great importance of adequate size of baffle area in the correct reproduction of the low frequencies or fundamental bass notes in musical reproduction. Even though the receiver chassis and loudspeaker are designed to give a fairly low response, reducing the size of the cabinet will limit this response.

Other things being equal, the larger the radio cabinet, the better the audio reproduction, and reducing of cabinet size down to the miniature or clock type shape will reduce the true bass response, resulting in very inferior reproduction of both speech and music. Thus, there is a practical minimum limit in the dimensions of a radio cabinet, which must be equalled or exceeded if the reproduction is to be truthful and natural. For example, a cabinet 27 inches wide, 32 inches high and 18 inches deep will on the average cut off all frequencies below 80 cycles and a cabinet only 13 inches by 13 inches by 8 inches will omit tones below 250 cycles or middle "C" on the piano. Listeners may imagine that lower fundamental tones are present, but it is only the harmonics of these tones that they hear. This drawing on the imagination is what makes radio tiresome as well as unnatural, and is avoided by ample cabinet size together with correct instrument design.

Henry S. Tenny President of the Rola Company with plants in Cleveland, Ohio and Oakland, California, has at last solved the problem of bringing the two factories closer together with the recent purchase of a Stinson Junior Cabin plane. Mr. Tenny holds a private pilot's license and has been an aviation enthusiast for many years.



WITH THOSE WHO SELL

—And What They Are Doing

An announcement of importance made by Eugene R. Farny, President of All American Mohawk Corporation this week was that Mr. B. W. Jaffe, formerly Southwest Regional Manager for All American Mohawk Corp., is concentrating his efforts on dealer promotional work for the Cushway Distributing Corporation. The center of his activities will be in the metropolitan area of the Chicago district.

* *

C. G. Erickson, for many years associated with the piano industry, is now New England Manager, Gross-Brennan, Inc., Stromberg-Carlson radio representatives. Prior to his connection with the Gross-Brennan organization, he was in the finance business for a year and a half. Mr. Erickson has had a wealth of retail and wholesale selling experience.

He was affiliated for nine years with Hallett and Davis as retail salesman, special salesman, and Manager of their Hartford retail store. During his three years with the American Piano Company, he served as Wholesale Representative covering all their lines from Maine to Georgia.

Mr. Erickson has a thorough knowledge of the radio dealer's problems. Many present day Stromberg-Carlson dealers are concerns which he contacted during his piano days.

A. W. Chamberlain, Boston Manager, continues to hold down that post, and will function as in the past.

* *

On the recent return of J. H. Wimberly, Jr., Advertising Manager of the All American Mohawk Corporation from Omaha, Nebraska, the appointment of the Andrew Murphy & Son was announced as the new distributor for the entire state of Nebraska, and Western Iowa for Lyric Radio.

* *

A. E. Odlin, director of the C. & A. Odlin Timber and Hardware Company Ltd., Atwater Kent radio distributor for New Zealand, was a visitor to the Atwater Kent factory in Philadelphia last month, at which time he made a tour of inspection through the great 32 acre plant, and discussed selling, advertising and promotional plans for this year's radio season.

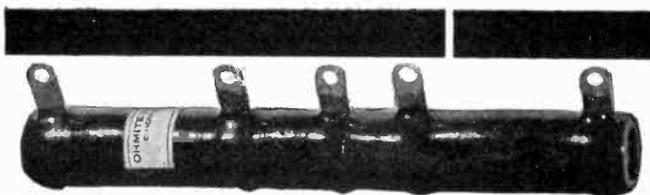
* *

The Ware Manufacturing Corporation announces the appointment of Musical Products Distributing Company, Inc., of 22 West 19th street, New York City, as the exclusive distributors of the Ware Bantam receiver for all the metropolitan area of New York with the exception of northern New Jersey. Musical Products is one of the major distributing houses serving the territory and the Ware is the only midget type of receiver which it will offer to its clientele. The Ware Company reports a brisk consumer interest in the diminutive type of receiver and anticipate that a substantial percentage of its total sales for the year will be concentrated on that model.

* *

Ross D. Siragusa, President of Transformer Corporation of America, E. J. Dykstra, Sales Manager and E. S. Fisher, Assistant Sales Manager, have recently completed a nation-wide trip for the purpose of personally introducing the new Model 60, Clarion Junior, to Clarion distributors.

Mr. Dykstra announces the appointment of the following new distributors in northwest territory: Northwest Radio Co.—Portland, Oregon; Domestic Electric Appliance Co.—Seattle, Wash.; Inland Radio Co.—Spokane, Wash. and Oakley & Sons—Boise, Idaho.



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Ohmite's claim for superiority can be fully sustained by operating tests in your own laboratory or X-ray examination.

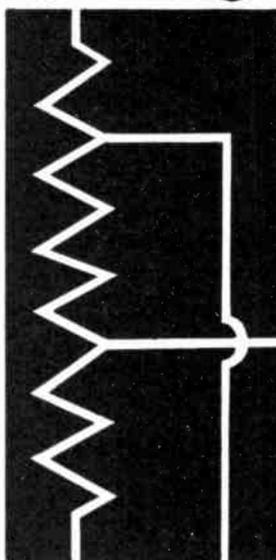
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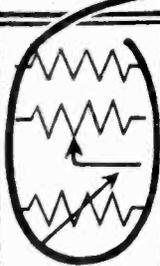


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Front row, reading from left to right: R. D. French, General Manager, General Outdoor Advertising Co., Chicago; F. H. Wellington, Treasurer, Colin B. Kennedy Corporation; Colin B. Kennedy, President; C. J. Gale of the Studebaker Securities Co., Chicago; James DePree, General Sales Manager, Colin B. Kennedy Corporation

Back row, reading from left to right: Ogden Johnson, Account Executive, General Outdoor Advertising Co., Chicago; E. M. Craig, Kennedy Factory Representative; Mr. Truen, Wm. Oaten and Clayton Stratton of the Kennedy-Detroit Co., Detroit, Mich., Distributors of Kennedy radio receivers; J. Howard Haley, Assistant to Colin B. Kennedy; W. E. Hathaway, General Manager of the Southern Kennedy Co., Kennedy Distributors for Baltimore, Md. and Washington, D. C.; and Larry Wall, Advertising Manager, Colin B. Kennedy Corporation, South Bend, Indiana

FREE BOOKLETS AVAILABLE

The following booklets, pamphlets and catalogues have been received during the past month, and may be secured gratis by writing the Service Dept., *Radio Industries*:

"Fastenings," issued by Parker-Kalon Corporation, New York City, is a most interesting and helpful booklet, compiled with the assistance of 14 prominent manufacturers in various fields. The latter have co-operated with Parker-Kalon by providing the information given in this booklet in the hope that others may benefit by knowledge of the ways in which they have solved difficult assembly problems and attained greater fastening economy. Officials concerned with design and production, especially, should find the material most informative.

Technical Bulletin No. 13.1, issued by Acheson Oildag Company, Port Huron, Michigan. A discussion of the method in which a three-electrode vacuum tube functions, how secondary electrons are produced and the manner in which a substance such as "Aquadag" Graphited Water may be employed to retard their formation.

Technical Bulletin No. 171.1, issued by Acheson Oildag Company. Describes a "method of making electrical contact with ebonite and soft rubber for insulation tests."

"The Versatile Service of Bakelite Resinoid," issued by the Bakelite Corporation. This interesting booklet explains the chemical nature of the resinoid, the various processes it goes through, and its innumerable industrial applications.

Bulletin No. 10A, issued by Jenkins & Adair, Inc. Describes the uses, construction and dimensions of Types GA-200 and GA-500 Variable Attenuators.

Bulletin No. 6D, issued by Jenkins & Adair, Inc. Describes the apparatus, advantages, operation, maintenance, studio technique and accessories of Type C Condenser Transmitters for broadcasting, recording, announcing and sound measurement work.

"Full Automatic Straight-A-Way and Return Type Plating Machines," issued by the Meaker Co., Chicago. Contains a great

deal of valuable information on the advantages to be derived from the use of full automatic machinery for plating, galvanizing, pickling, cleaning and finishing. Of particular interest to some is the chapter devoted to chromium plating with full automatic machines.

Catalog of Goat Radio Tube Parts, Inc., Brooklyn. This publication could more aptly be called "handbook" rather than "catalog," inasmuch as it is elaborately complete and rich in data on a wide range of tube parts.

The Westinghouse General Catalog, 1931-1932, comprised of 1352 pages presenting descriptions and illustrations of apparatus representative of the myriad of products manufactured and sold by the Westinghouse Electric and Manufacturing Company, has been announced recently by that Company.

The Cornish Wire Company has prepared a convenient and interesting data sheet, explaining in simplified form the provisions of the 1930 "National Electrical Code," as related to the installation and wiring requirements of radio equipment.

* *

The nation's leaders of industry, business, and scientific research paid homage to the late George Westinghouse, founder of the many Westinghouse industries, in the dedication of a memorial to the industrial leader in Schenley Park, Pittsburgh, on Monday afternoon, October 6.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912,

OF RADIO INDUSTRIES, published monthly at Evanston, Illinois, for October 1, 1930.

State of Illinois, County of Cook—ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Chester A. Darling, who, having been duly sworn according to law, deposes and says that he is the Publisher of the RADIO INDUSTRIES and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Chester A. Darling, 520 N. Michigan Ave., Chicago, Ill.; Managing Editor, George Gruskin, 520 N. Michigan Ave., Chicago, Ill.; Business Manager, Thomas Liddell, 520 N. Michigan Ave., Chicago, Ill.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Chester A. Darling, 520 N. Michigan Ave., Chicago, Ill.; Hortense M. Darling, 3732 Irving Park Blvd., Chicago, Ill.; Thomas Liddell, 520 N. Michigan Ave., Chicago, Ill.; Hugh C. Frisbee, 5844 Broadway, Chicago, Ill.; Eve Norris Frisbee, 1914 Chase St., Chicago, Ill.

3. That the known bondholders, mortgagees and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is — (This information is required from daily publications only.)

CHESTER A. DARLING,
Publisher.

Sworn to and subscribed before me this 1st day of October, 1930.

RUTHE E. HANNAN.

(My commission expires April 16, 1933.)

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Professor of Physics Indiana University

The Fundamentals of Radio

(372 pages, 402 figures.)

"An excellent text-book of radio written so that a minimum of mathematics is required for its comprehension. . . . it will be of value to the amateur who wants to know how the radio works." "The book throughout contains that fine blending of theory and practice which makes the theory vital and the applications understandable. . . . the author has replaced the dead wood found in many books with up-to-date discoveries and inventions." "If such a bureau (government) could recommend a list of hit-the-point books Ramsey's Fundamentals of Radio would surely be included."

Experimental Radio

(255 pages, 168 figures, 128 experiments.)

"All experimenters here is your book at last!!" "Truly the finest book on radio which has come to our desk in many a month. . . . A royal road to knowledge." "The book is actually a group of some 128 experiments covering most every imaginable phase of radio within the range of the average experimenter. The book commends itself to service men, custom set builders, testers, and experimenters." "Experienced engineers will find Ramsey's outline useful for refreshing their memories on specific points." "In general Ramsey manages to supply that missing fact which seems to be hidden in other books."

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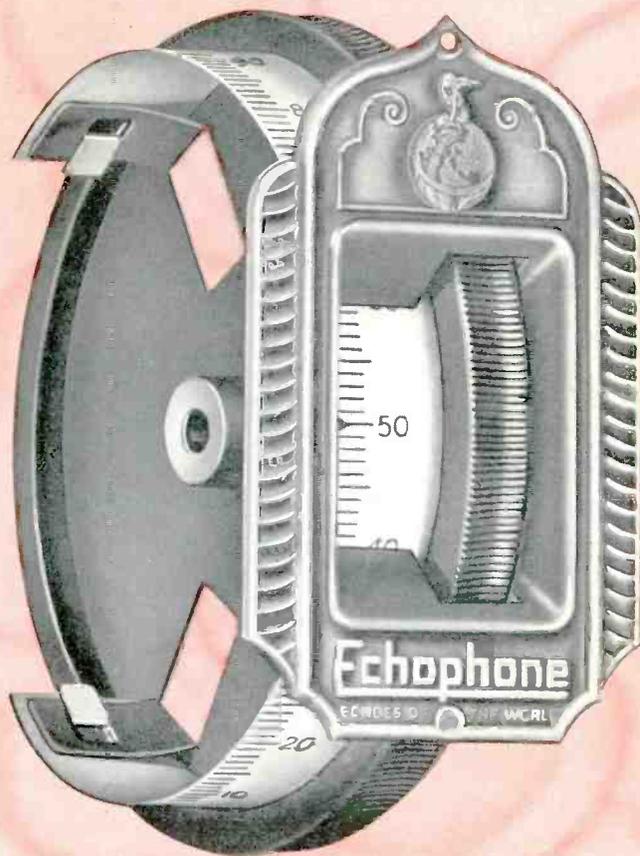
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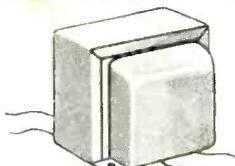


In the last analysis the customer's yardstick is the one by which radio values will be measured. In his judgment tone quality comes first.

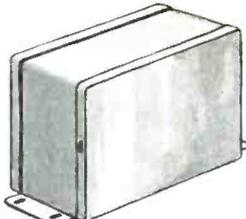
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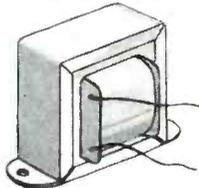
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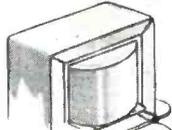
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