

« THE » "TECHNICIAN"

NOVEMBER, 1935

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No. 2

Radio's Public Enemy No 1--Interference

By The Editor

During the past few years with the rapid development of radio equipment and the ever-increasing interest in DX reception, we have been ever more conscious of radio interference—man-made static! Some steps have been taken to curb radio interference in Southern California and the Radio Interference Engineering Bureau, supported by the various public utilities, is to be commended for the excellent work it has done, particularly in view of the fact that it has not been adequately equipped, either with instruments or personnel.

Radio is no longer a luxury—it is an everyday necessity and utility. We must face this fact and realize that man-made static must eventually be eliminated. The longer we delay this process the longer we allow improper installations of any type of electrical apparatus—the longer we allow profit-making concerns to increase their dividends by neglecting the radio interference created by their installations, the more difficult our job will be.

We must act quickly, intelligently and thoroughly. We must put forth all our efforts to bring pressure to bear upon the legislative bodies of our cities and states to make the offense of creating radio interference as serious and as easily prosecuted as any other willful and malicious disturbance of the peace, or damage to the property of others. Much of our radio interference could be easily prevented and a large majority of the remainder could have been rather easily and usually inexpensively prevented at the time of the design and installation of the disturbing equipment. Of course, many installations have been in use since considerably before we became radio-interference conscious and the only remedy is redesign and reinstallation of these

units. This is being done slowly by the more progressive and conscientious companies and public utilities but we must secure legislation with "teeth" in it to prevent present and future installations and production of equipment, which, due to low price or any other cause, is improperly designed or installed, thereby being a serious source of radio disturbance.

Frank Andrews, on his "Around the World" radio program over KFI, November 16, spoke at some length and very much to the point on many aspects of the interference problem, which may not be readily apparent to the average citizen and radio listener. Mr. Andrews said, "Radio interference is not malicious until the agency causing it refuses to remedy the nuisance. In many cases it is the result of an oversight but in most cases, it is down right negligence."

This is only too true. Mr. Andrews further states, "The American public bought a half-million long and short wave combination sets in 1933. In 1935 about five million long and short wave combinations have been sold—ten times the number for 1933, which represents a yearly investment by the American public of over \$350,000,000 poured into radio. This investment must be protected."

Mr. Andrews compares the deliberate generation of radio interference to the throwing of stones deliberately at your home all night, keeping your family awake. A great many owners of disturbing equipment are naturally reluctant to spend whatever money may be necessary to suppress the disturbance caused by their equipment, but you may be certain that if you stopped at a neighborhood establishment who had a neon sign

(Continued on Page 15)

EXCERPTS FROM MODERN RADIO SERVICING

Published by Alfred A. Ghirardi, Radio & Technical Publishing Company

23-21. "Fading" in Radio Receivers. Of all the complaints encountered in radio servicing, one of the most difficult to solve is that of fading of signals. By fading is meant the gradual falling off of volume to a low level, with equally slow recovery following. This phenomenon repeats itself periodically at short or long intervals. While fading is really a form of intermittent reception, it will be considered separately from the type of intermittent reception which cuts on and off rather abruptly. It should also be understood that we are not concerned here with fading due to the falling off of the strength of the signal from the broadcasting station. That is not the fault of the receiver—except in the case where the automatic volume control is not operating properly.

Usually, the repair of a receiver that has developed a condition of intermittent reception of any form is very difficult, for the trouble may be caused by an obscure defect or failure in practically any part of the entire receiver and the antenna system. Such repairs often tax the ingenuity of the service man and call forth from him every trick and resource that he has learned from experience. In addition they probably are the most time-consuming tests that he is called upon to make. However, experience with the failure of the same parts in certain models of receivers often helps to ease the task.*

In some cases, fading may be due to a faulty condenser that open-circuits intermittently, to a break in a wire-wound resistor (the break usually not being visible to the naked eye), or to a poorly soldered connection in some circuit. Almost every case of fading requires its own plan of attack and solution, and that which may be said about one receiver may not be true about another.

The best course of procedure is to place the receiver in operating condition. A broadcast station whose signal is known to be steady should then be tuned in. After this is done only one thing remains—wait for the fading to occur.

Before any testing or trouble-shooting is done, every bit of available information that may assist matters should be "ex-

* In this connection, the compilation of the common causes and remedies for troubles in over 500 models of various makes of radio receivers, which forms a section of the Field Service Data and Answer Book to Modern Radio Servicing (Radio Technical Pub. Co.) is extremely helpful, for it contains the common causes, and remedies for fading and intermittent reception for most of the receivers listed.

tracted" from the owner of the receiver. It may be found that the fading occurs when a light in the room is switched on or off, when someone walks across the room or closes a door, when a trolley car or a heavy automobile truck goes by, or when the receiver is turned off and on, etc.

Reception that has faded out and that can be brought back by snapping the receiver switch off and on is usually caused by a leaky or intermittently open-circuited by-pass condenser which breaks down under load, vibration, or after the receiver has been operating for a short period of time. A faulty resistance element in a volume control may produce the same symptoms. The difficulty with locating trouble of this nature is that it may disappear as soon as the chassis is disturbed for the purpose of making a voltage or resistance check.

One particular case is brought to mind in which a certain receiver would fade continually only when in its normal position, but as soon as any attempt was made to insert an analyzer plug into one of the sockets or to connect a voltmeter across any two terminals, the signal would come in with normal volume, and no fading would occur again until the analyzer plug or voltmeter terminals were removed and the chassis turned up right. In some instances, fading can be accentuated by pulling at the connecting wires of by-pass condensers or resistors. In these cases, locating the cause of trouble is comparatively simple. When fading does not occur until after the receiver has been in operation for some time or until after the chassis has been heated, the only logical procedure is to test each and every component in the receiver while it is warm. One simple method which may be employed, is to focus an ordinary electric heater on the underside of the chassis to heat the components while they are being tested with the receiver turned off. Another very effective method for accelerating the heating of all the parts mounted on the chassis, is to place the receiver in operation and then cover the entire chassis with a wooden box or corrugated paper carton to prevent circulation of air. This will cause the entire chassis to heat up quickly.

An idea of how many different failures may cause fading may be obtained from an analysis of the results of observations made on a particular model of receiver often afflicted with fading. In this parti-

(Continued on Page 20)

SPECIAL NOTICE — BANQUET POSTPONED

The Technician has just been advised that the Second Annual Banquet, tentatively planned for December 14, will be indefinitely postponed. This action, we understand, is necessary due to unforeseen conditions and circumstances entirely beyond the control of the officers and membership of the Certified Radio Technicians Association.

Plans were well under way and the trade in general was very optimistic regarding the success of this banquet and seemed to be very much in favor of such

a general get-together. However, the reasons presented by the Banquet Committee for canceling the arrangements for the banquet, are most sound and we have no choice but to report this action to all persons who have been advised of the banquet, either through these pages in the last issue or otherwise.

Undoubtedly, an annual radio banquet is a desirable activity and would prove mutually beneficial to the entire trade. It is hoped that this custom can be renewed at some future time.

ELECTRICAL ODDITIES

(Taken from Coyne Industrial Bulletin, October, 1935.)

Do you know that according to "Believe It or Not Ripley," there is a town in the United States without a chimney? Yes, sir! Mason City, Washington, with a population of more than 3,000, has no chimneys. It is heated by electricity.

The New York "Times" news sign, which circles the building, is the most expensive to operate on Broadway. It cost \$120,000 and has 14,800 lights. It requires the services of two men full time to operate it. There are 78 of these running electric signs (electric newspapers) in the world.

When the British say that a wallpaper is "hot," or "not so hot," they may really mean it. Applying the scientific principle that body temperature depends largely on heat radiation to the walls and ceiling as well as to metal objects in a room, rather than on the temperature of the air in the room, an English manufacturer is producing a "heating wallpaper." In reality, a resistance metal of very fine copper-nickel wire, it is put into the walls of a room and is connected to the house current. Thermostatically controlled, it can be heated to any desired temperature up to 85 deg. F.

In the Aquarium in New York there is a six-foot length of "Electrophorus Electricus," or electric eel. This swimming central station regularly supplies

the necessary energy for lighting a couple of neon glow lamps three times daily. Two two-watt neon lamps are attached in parallel to antenna loops atop two aluminum wires submerged at the ends of the eel's 10-ft. tank. The eel used to keep the neon lamps aglow most of the time, but he recently became temperamental and reduced his generating time. Now he works only when tickled with a copper wire, and the tickling procedure is conducted at 11:30, 2:00 and 4:00 o'clock in the presence of spectators. Only one side of the neon bulb is illuminated, showing the discharge to be direct current. Experiments have indicated the voltage to be from 125 to 200 volts.

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A. PAUL, Jr., NOW ON KFI

(Editor's Note—The CRTA is very proud of the fact that its president, Mr. A. Paul, Jr., was chosen by KFI, one of the most popular stations on the Pacific coast, to deliver monthly lectures on technical radio subjects. The following is an address delivered by Mr. Paul on "Geophysics" at 9:45 Saturday evening, Nov. 23, on Frank Andrews' "Around the Radio World Program." The next subject Mr. Paul will talk on will be "Home Recording of Short Wave Broadcasts," on December 21. Be sure and listen for him.)

Geophysical Prospecting or Exploration is the name of methods used for studying the earth by use of physical apparatus and principles.

These methods are now in extensive use by large mining and oil companies for the discovery of new ore bodies and oil pools.

The explanation of the principles used, is a rather involved subject for discussion without the use of a blackboard. Perhaps when television arrives, I can give a much more detailed explanation, but tonight I will touch briefly on the various methods used and hope that those who are interested will be able to take full advantage of the subject, as there is a wealth of material available in the libraries of our cities.

The first method of locating mineral by geophysical methods I shall discuss, is the radio method. If we set up a radio transmitter with a loop aerial attached, and operate it in free space, the field pattern set-up will be absolutely uniform, just as the miniature waves caused by dropping a pebble in a large body of water will be uniform, as they go out in ever-widening concentric circles. Now, if in this body of water we have, let us say, a large rock protruding above the surface, the ripples in the surface of the water, caused, by dropping the pebble, will be distorted in the vicinity of this obstacle.

So, too, with radio waves, and thus it can be seen how, by carefully surveying the territory being prospected, and then with a portable receiver equipped with a direction-finding loop antenna taking readings at designated points, it becomes possible to plot the wave front distortion caused by an ore body. From this we can approximate its size, nature, and location.

This might be a good time to warn the listeners about so-called Treasure Finders. Almost every month some pseudo-scientific magazine features an article on "How to Make a Treasure Finder" for locating buried pirate treasures.

Probably 90 per cent of these are fakes, they usually consist of a wooden pole with a box on each end containing some radio tubes, batteries and various other gadgets and a pair of headphones.

All one has to do is don the headphones and then walk up hill and down

dale until a whistle is heard in the phones and there you are.

In some cases a modification of the previously described geophysical method is employed, and then, if the mass of conducting material is large enough, and if we can get near enough to it, we can detect its presence. Roughly speaking, we can by this method detect a mass of non-magnetic metal at a distance up to perhaps ten times the diameter of the mass. This is a very rough guess, probably much too pessimistic, but of the right order of magnitude.

Suppose we had a mass of gold three feet in diameter. Any mathematician listening in, might compute the value of such a sphere of gold at the current value of \$35 an ounce, and also the probable number of such masses available to look for. Now let us assume this is buried 20 feet deep, then we would have to get within 20 feet of a point directly above the treasure in order to get an indication on our treasure finder. Now if the treasure was broken up into small pieces, such as coins, insulated from each other, as such pieces usually are, the sensitivity would be much decreased, and we would have to be even closer in order to get an indication on our finder.

These devices are much more sensitive on long, thin objects such as pipes, but the trouble here is that Captain Kidd and his ilk did not forge their ill-gotten gains into long, tubular form for the benefit of future treasure hunters. Methods of this kind are much more sensitive on magnetic metals such as iron but these are seldom worth looking for, although they have been used to locate long-buried pipe lines whose exact location had been forgotten.

There are other methods of geophysical prospecting besides the radio method. Some of them are: the electrical method, where the direction of earth currents caused by the oxidation of ore bodies, are carefully mapped; another method is to introduce either alternating or direct currents into the earth and map irregularities in the electrical field caused by the lower resistance path offered to the flow of current by the ore body.

The gravity method employing a torsion balance or pendulum is also used;

(Continued on Page 12)

BOOK REVIEWS

Radio Field Service Data—A. A. Ghirardi and B. M. Freed—Radio and Technical Publishing Co., 45 Astor Place, New York City. \$1.50. This is the companion volume to Modern Radio Servicing and is a most valuable and time-saving addition to the service technician's library. in a convenient size to have around the over 750 models of popular radio receivers, data on auto ignition interference remedies, a list of I. F. frequencies of nearly 3000 receivers, tube charts, grid-bias resistance tables, RMA color codes, wire and miscellaneous tables. It is bound in a convenient size to have around the service bench, in the pocket or tool kit. It is so arranged and compiled as to be very easy and fast to use and we heartily recommend it to all as a work worthy of the past reputation of these outstanding authors.

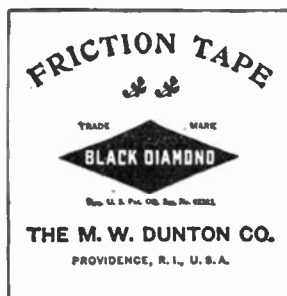
The Radio Handbook—Technical Staff of "RADIO" magazine Pacific Building, San Francisco, Calif.—\$1.00—This handbook is published with a view to furnishing a comprehensive, easily-read and understood treatise on current developments, new theories and principles, and serving to keep its readers abreast of the "radio times". The text has been written and compiled by the editorial staff of "Radio", the amateur and short-wave magazine. It represents the answers to questions which have been asked during the past two years. Each chapter has been prepared by a specialist on that subject. Theoretical explanations are minimized and emphasis is placed on practical methods. The novice, the technician, and the engineer will find this handbook a most valuable reference and operating help in the field of high frequency radio communication.

OPTIMISTIC PREDICTION

The president of the National Electrical Manufacturers' Association, in an address delivered at the Waldorf-Astoria Hotel in New York, to the executives of the companies exhibiting at the National Radio and Electrical Exhibit, predicted that in 1935 consumption of electric energy would equal, or pass, the all-time peak of 1929. He further predicted that 1936 will create a new peak and will start the revival of capital goods purchased by the utilities during 1935. He predicted that in 1937 the electrical industry in all its branches, will attain complete recovery . . . that by 1938 the electrical industry will have the greatest volume of business in its history, far surpassing all our peak volumes.



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L. A. RAILWAY STILL, AGAIN AND YET IN THE DOG HOUSE

The Los Angeles Railway apparently regards the people of Los Angeles as martyrs, believing in the old admonition to "turn the other cheek" and after that to "take it on the chin." Either that, or they believe the citizens of Los Angeles to be complete nitwits who will take, take, take and take some more without fighting back.

They are going much too far in trying the patience of this community, which has been most indulgent with this public utility (?) who still operates its antidiluvian instrumentalities of death up and down our streets on poorly maintained tracks.

This company, furthermore, would not pay the slightest attention to its employees for a living wage, discharging those who had courage and intestinal fortitude enough to call the company's bluff. Many of these men have been replaced by incompetents at starvation wages. In many cases two men have been replaced by one making the danger of the opera-

tion of their vehicles, almost of the horse-car vintage, even more dangerous to the life and property of not only passengers on that equipment, but passengers of other vehicles and pedestrians. The Illustrated Daily News, Tuesday, November 26, said a great deal in a very few words and most appropriately named the cars of the Los Angeles Railway, "antiquated Juggernauts." This editorial went further in reminding us of the insistence with which this company demanded 7c fares with the promise of this and the promise of that, years ago. Since then, no apparent or consequent attempt has been made to improve the service of this necessary public utility.

A few days ago when a one-man yellow death trap brazenly sailed through a stop signal at Sixth and Main streets, several people were seriously injured when it crashed into a P. E. car. The P. E. car, fortunately, was not overturned as was the yellow car, undoubtedly due to the fact that it was of a later design and operates on standard gauge tracks, rather than the back yard gauge of the Los Angeles Railway.

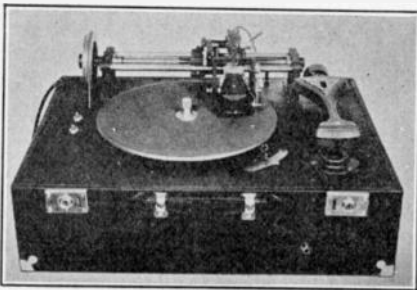
The personal experience of your editor has undoubtedly been the experience of all our readers in time and time again watching these cars "barge" serenely through a stop signal many seconds after the last bell had rung or start up from a dead stop after the second bell had sounded.

Why is this brazen disrespect for law and life allowed to continue? Unfortunately, we cannot answer that question and no one else seems to be able to answer. Moreover, this company is responsible for a large amount of the radio interference which is ruining radio reception for countless thousands of persons. Again negligence in properly maintaining equipment is the cause while maintenance money pours into the coffers of those in the house of have.

NEW MIKE STAND

The manufacturers' floor stand model of the Universal Microphone Co., Inglewood, Calif., will now carry the option of a new adjustable, self-balancing tripod base. The new device will enable the stand to fit into a large or small space, and will not be so heavy as the regular stock model, which, however, will continue as a catalogue item.

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ELIMINATING TRAFFIC SIGNAL INTERFERENCE

By J. R. STREN, Radio Service Engineer

Radio interference from traffic signals is a common cause of disturbance on both home and automobile radio receivers. Generally, however, nothing is done about it largely because people who are bothered with this type of interference either do not know where it comes from, or, if they do, they assume that it cannot be eliminated. Even servicemen have hesitated to approach the problem for lack of a definite plan for going after this business.

On the other hand, my own personal experience as a serviceman has convinced me that there is a profitable field here for the fellows who will go after it. Just as they did in my town, many city officials will be glad to cooperate if you go to the trouble of explaining the matter carefully and even demonstrating how much radio interference an innocent-looking traffic light can actually cause. With the number of lights now used in the average town or city, I hardly have to point out what a juicy slice of business can be had if you obtain the job of eliminating interference from them. Certainly it is a field well worth the time and effort required to win it.

Complaints regarding traffic light interference should be made to the local police commissioner, public works commissioner, city electrician or contractor—whoever is in charge according to your local set-up. This information can easily be obtained at city headquarters.

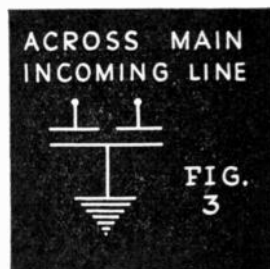
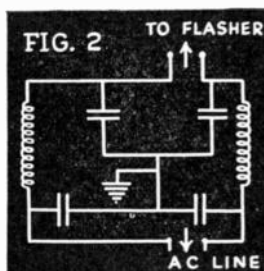
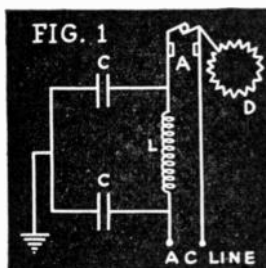
The yellow caution light or blinker (flasher) is usually the worst offender. This is good for the serviceman, for such lights are generally installed at minor traffic intersections in residential districts where many radio receivers are in use. The red and green lights operating at regular 10 or 30-second intervals do not often cause really serious interference.

Fig. 1 shows one type of contactor. D is a saw-toothed disc operated by a small motor. A represents the contacts in series with the flasher lights. Choke L consists of approximately a $\frac{1}{2}$ -pound roll of No. 18 bell wire (up to a 5-amp. circuit), wound on a core of about $1\frac{1}{2}$ in. diameter. Condensers C are from 1 to 1.5 mfd. 220-volt AC ratings.

More obstinate cases of traffic light interference will require the filter shown in circuit 2. If interference still persists after using such a filter, add circuit of Fig. 3. The combination of either circuits 1-3 or 2-3 will eliminate radio noises from this source in just about

every case. The values of condensers and chokes in Figs. 2 and 3 are the same as those for Fig. 1.

As is well known, much of this interference elimination work is experimental up to a certain point. It means working by the method of "cut and try." However, if the serviceman has the filter parts shown in each of the three diagrams he will be well equipped to go out and show real results.



In my own work along these lines, I have dispensed with the "cut and try" method in favor of the Sprague Interference Analyzer. This is the last word in noise elimination work—one as valuable in ordinary home interference jobs as it is when approaching traffic light prob-

(Continued on Page 18)

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AN OUTSTANDING I. R. E. MEETING

The Los Angeles Section of the Institute of Radio Engineers held its regular monthly meeting November 19, 1935, in a science lecture hall of the L. A. Junior College on North Vermont Avenue.

The subject of this meeting was "Measurement of Radio Set and Loud Speaker Characteristics." The speakers were Dr. C. R. Daily and Dr. D. P. Loye, both of Electrical Research Products, Inc. Before the meeting, several members of the section gathered together for an informal dinner at the Bella Napoli Cafe.

Chairman Dr. John F. Blackburn called the meeting to order at 8:00 p. m. and conducted the business of the evening, which included a report of the nominating committee by Norman B. Neely, chairman of the committee. Nominations for officers to serve during the year 1936 were as follows: For chairman, Dr. C. R. Daily.; for vice-president, Mr. Linden; for secretary-treasurer, L. W. Howard. The activities of a special committee were reported by T. E. Nikirk. The meeting was then turned over to Dr. C. R. Daily, chairman of the Meetings and Papers Committee, who was also the first speaker of the evening. The speakers had previously set up an extensive display of technical equipment for demonstrating the methods of making many tests on receivers and loud speakers. After a preliminary description of the equipment and its uses, Dr. Daily introduced Dr. Loye, who made some very interesting measurements for the benefit of the members and guests present.

After the papers had been delivered, several questions were asked by those present and ably discussed by the speakers. It was unanimously agreed by those present that this was one of the most interesting and instructive meetings given by the section in some time. Approximately 150 members and guests were present.

AMERICA HAS MORE RADIOS

An item of importance, which should prove interesting to all radio enthusiasts draws attention to the fact that over 23,000,000 radio sets or approximately one-half the total number of sets in the world, are owned by residents of the United States. America ranks second in set ownership, with 6,549,049 sets, with Germany, Russia, Japan and France following in the order mentioned.

A. PAUL, Jr. NOW ON KFI

(Continued from Page 6)

radio is used here in order to get absolutely accurate time signals.

The seismic method is often used for the location of oil. This method consists briefly, of causing a sound wave in the earth by exploding a charge of dynamite. Then by means of a number of geophones located at strategic points, the various echoes from deep-lying strata are picked up, amplified, and recorded on film. The highly trained geophysicist can read these time marks and from them, he can get a pretty good idea of the rock structure deep in the earth's interior.

All these various methods can be divided into two main classes, those adapted for short distance work, in geologically complex regions, and those adapted for large-scale work, in comparatively simple regions. The former class, which includes chiefly, the electrical and magnetic methods, and also the radio method, so-called, is usually of greatest service for ore exploration work. The second is best for large-scale, deep explorations such as that with which the petroleum geologist is concerned.

This latter class includes the gravitational and seismic methods. This division, however, is in no sense absolute, since the choice of a method depends in every case upon the nature of the terrain and other similar factors.

It is difficult to make hard and fast statements about so new a subject as applied geophysics, but one which can be made without fear of contradiction is that it is now a most valuable and important science and will become much more so in the future.

2GB BREAKFAST CLUB

The Los Angeles Breakfast Club, which recently acted as host to A. E. Bennett, director of 2GB, Sydney, and president of the Australian Federation of Broadcast Stations, furnished the idea for the 2GB Breakfast Club. But, instead of only once a week, the Sydney affair is on the air every day. And, instead of initiating the audience "in the flesh" the 2GB co-masters of ceremonies, Albert Russell and Reg Morgan, initiate listeners over the air as their applications are received via mail. The wooden horses "Ham 'n Eggs," take part in the performance, which includes a half hour of mirth and melody with theme songs and incidental music as well as the gags and initiation ceremonies.

RADIO AND TELEVISION PREDICTED IN 1883

The transmission of sound and images through the ether, producing sound from light, X-ray, and other present-day scientific wonders are not so new or modern if we accept the account of an Atlantean civilization of 12,000 years ago as described in a startling manuscript recently published under the title, "A Dweller on Two Planets," by the Poseid Publishing Company of Los Angeles.

This remarkable prophetic narrative was said to be "dictated to 17-year-old Frederick Oliver in 1883 by a discarnate mentor who signs himself "Phylos—the Tibetan, otherwise named in fullness, Yol Gorro, author of this Book," and who claims to have been an inhabitant of the lost Atlantis some 12,000 years ago.

Whatever the reader's view point on the supposed existence of Atlantis may be, he cannot escape the fact that the 17-year-old boy who had had no technical training whatever, could not then have known about the scientific wonders which the vacuum tube has made possible. Yet he describes them in detail. For instance:

"At the appointed hour we went to the place designated and . . . were ushered into a small apartment. By a table almost hidden by books sat the Rai, listening to a well-modulated voice which was relating the latest news of the day, but the owner of which was not visible. The Rai turned . . . to a case shaped something like a modern music box and turned a key with a soft snap. On the instant the voice of the unseen speaker ceased in the middle of a word and I knew that . . . I had heard one of the news recitals of which I had so frequently read."

And yet we consider the news broadcast a modern invention!

It is declared that the Atlanteans developed properties of light unknown to modern science, one of the discoveries being that light could be made to yield sound. A great organ, in the Royal City, is described as producing music of transcendent beauty. In vacuum tubes of this instrument the rays of many-hued lights played from point to point, the colors changing as the notes changed.

Both sound and images were transmitted by wireless, according to this account. An instrument, called a naim was used as an instrument of communication in which appeared the life-size image of the person addressed, who, in turn saw

(Continued on Page 15)

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HAPPY BIRTHDAY

The Radio Transcription Company of America early in December will observe its sixth birthday. C. C. Pyle, one-time sports promoter, is president of the organization, which produces eight transcribed radio programs throughout 39 weeks of the year, as well as a separate series not distributed via the bloc sales plan. The main activities of the firm center in its Hollywood studios where the writers, producers and talent have all been recruited from the ranks of local radio. One of the newest series is 39 programs adapted from James Fenimore Cooper's "Leather Stocking Tales." The narrator is Dr. Charles Frederick Lindsley, professor of English literature at Occidental College and announcer on the "Calling All Cars" broadcasts.

RADIO CENTRAL CASTING BUREAU

A new radio development is seen in the formation of the Radio Central Casting Bureau with headquarters in Suite 580 of the Chamber of Commerce Bldg., with H. E. Noid in charge. The group will register those of the speaking voice classification, including announcers, narrators, masters of ceremonies, drama people, writers, producers and others. It will function for radio similar to the operation of central casting for the film industry. Radio stations, transcription studios, artists' agencies and personal appearances of artists will utilize the new bureau. Though the purpose of the bureau is primarily for radio drama, and allied branches, it is conceivable that in time the registration of technicians might become a part of its activities.

AEROVOX CATALOG

A larger and still more varied line of condensers and resistors is featured in the 1936 Aerovox catalogue, just off the press. Several pages have been added over previous editions, particularly to accommodate the rapidly growing assortment of exact duplicate replacement condensers for servicing standard radio sets, to feature wire-wound vitreous-enamel Pyrohm Jr. and Slideohm resistors, and to introduce a superlative carbon resistor. In the strict sense, this is a new catalogue, replete with added items and many revisions, so as to bring the entire line of electrolytic, paper, mica and other condensers, as well as several types of resistors, up to the anticipated 1936 standards and requirements. A copy may be had from local jobbers or direct from Aerovox Corporation.

MILLER IRON CORE I. F. TRANSFORMER

Designed to have twice the selectivity and gain of an air-core type, a new iron core intermediate frequency transformer with duo-lateral wound coils has been developed by the J. W. Miller Company, Los Angeles, for distribution through regular trade channels. The rustless and corrosionless core of uniform quality is known as "Crolite," a finely divided magnesium alloy imbedded in a ceramic body. The mica compression type tuning condensers assembled on a special ceramic base are adjustable from the top of the shield. Aluminum, rather than the less expensive zinc alloy, is used for the shield, which measures only $1\frac{1}{2} \times 1\frac{1}{2} \times 3\frac{1}{2}$ in. overall.

Miller engineers point out that a single-stage intermediate amplifier using Miller iron-core transformers can be designed to have the selectivity and gain of a two-stage air-core type with approximately half the inherent noise level, resulting in a better signal-to-noise ratio. The iron-core i. f. transformers are available in all standard frequencies.

AUTO RADIO AN IMPORTANT FIELD

The extent to which auto radio servicing has grown to be a distinct and specialized field by itself may be seen by reading Ghirardi's masterful handling of this subject in his newly-published "Modern Radio Servicing" book. Ghirardi has found it necessary to devote some 116 pages out of 1300 to auto radio alone in order to adequately cover the subject. In complete detail he tells what equipment and qualifications are necessary for efficient auto radio installation and service work, the special constructional features of present-day radio receivers, and how to install them. He also describes the various auto radio antenna systems in use and the methods for installing them. Particular attention is paid to the elimination of ignition system interference in the various types of cars by a rigid scientific analysis "sure-shot" system he outlines in detail.

RADIO DENTISTS

Experimenters in the field of dental science report that the use of ultra high frequency radio waves to kill germs of decaying teeth have been highly successful. The teeth were exposed for periods of five minutes to an hour.

RADIO AND TELEVISION PREDICTED IN 1883

(Continued from Page 13)

a reflection of the person speaking. Such instruments were reported by Phyllos to have been in general use and were used over distances of thousands of miles.

It is difficult to remember that the detailed descriptions of these instruments were written by an untrained boy of 17 in 1883. So faithfully are they described that the present-day radio expert will recognize some of the appliances and characteristics of the sets in use today.

Other inventions, employing the use of forces not known today are clearly described and, if we are to believe Phyllos, will soon become realities in the world of today.

Social, psychological, and political developments are discussed with an equal degree of prophetic insight in this remarkable book.

Whether the book is considered as an uncanny attempt at prophecy or is read seriously by the scientific student or is considered only as an unusually interesting, fantastic story, it is well worth a careful reading, especially when it is remembered that the manuscript was written by a boy more than 52 years ago when the radio and television were still undreamed of.

RADIO'S PUBLIC ENEMY NO. 1—INTERFERENCE

(Continued from Page 3)

working all night and switched it off at every opportunity, the owner of that sign would lose no time in either forcefully ejecting you from the premises, having you arrested for trespassing, or both. Yet, this offense would be no worse than his refusal to service his equipment which is ruining educational and entertaining radio programs for dozens and possibly hundreds of families.

You who read this are urged to put your shoulders to the wheel, along with all the rest of us who are rebelling at the flagrant and malicious trespassing upon our "radio property" and do all in your power to impress your customers, acquaintances and associates with the necessity for immediate action against these public bandits who are responsible.

Uncle Sam wants you to own a home.

Uncle Sam asks you to own a home.

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BAY CITIES RADIO TECHNICIAN'S ASSOCIATION

JIM HESTER, President HENRY JAMES, Vice-Pres. ROBT. L. SPERRY, Sec.-Treas.

Conducted by HENRY JAMES

On Wednesday, November 13, we met at a new location, Bob Sperry's residence on Santa Monica Boulevard, Santa Monica, California.

The meeting opened on time, at 8 o'clock sharp, with the association business. After the business meeting, the meeting was turned over to Mr. Scott Hall. Mr. Hall demonstrated National Union's new cathode-ray oscilloscope in a very interesting and instructive manner, showing various set-ups and results which could be obtained. During

the intermission questions were asked and answered while those present enjoyed beer.

Later, we had some more work and explanation, after which we adjourned.

This meeting was one of the finest which we have had. Everyone turned out, including a dozen guests and friends. The next meeting will be November 26, at which time we will have Mr. Hall with us again to lecture on visual alignment of radio receivers. We know that this lecture will be up to his past performance. Anyone who wishes to come is cordially invited to do so.

RADIO FELLOWSHIP IN NEW HEADQUARTERS

Mel Ryder, chairman of the Radio Fellowship, announces the acquisition of a new luxurious club house and listening post for the Fellowship. It is located on the beach front at Santa Monica and consists of a fine ten-room house, tastefully and comfortably furnished, large enclosed surrounding grounds, a swimming pool, dressing rooms and showers for bathers and a multi-car garage with additional quarters above. There will be several DX listening-post rooms, construction, test and research laboratories, transmitter room and executive meeting facilities. In addition to this, the club house is adequately and conveniently equipped for social and recreational activities by members. Serious-minded persons, conscientiously interested in joining this outstanding group, may address the secretary, Mr. Frank Andrews, in care of the Technician.

BLIND FLYING

The Dept. of Commerce has recently indicated its intention of surveying sites for twelve new air ports, which will be equipped with radio compass systems for blind approaches.

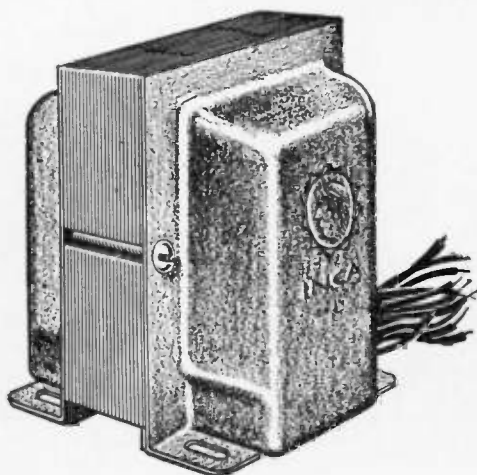
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INCA Transformer products are available through all the better jobbers on the Pacific Coast. These jobbers are now supplied with a stock of all the new INCA bulletins as listed below:

- L-11— Transmitting and public address transformers.
- L-14— Transformers for service and receiver replacement.
- L-12— Type "T" high-fidelity audio transformers and power equipment for transmitting and public address.
- L-9 — "TA" and "TS" series high-fidelity midget remote amplifier transformers.
- NL-8— INCA hook-up and fixture wire.
- L-2 — Doorbell and Signalling transformers.

If your jobber cannot supply you with these bulletins,
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Inca Manufacturing Division

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TRAVELING THE TERRITORY WITH MILTON

Well, well, well, little kiddies from radio-technical land. Here we are once again, only this time with a nice long stocking hanging from the mantle piece waiting for Santa Claus to come down the chimney.

The old Traveler takes this opportunity of wishing all his many friends a very Merry Xmas; but a very special one to all the Mr. and Mrs. of our radio colony. Among whom are:

Mr. and Mrs. Andy Lovinger of Lovinger's Radio Service

Mr. and Mrs. Emil Minder of Pico Radio Shop.

Mr. and Mrs. Ray Ogborn of Ray Ogborn Radio Service.

Mr. and Mrs. Edward Bower of Bower and Button.

Mr. and Mrs. Raymond Rusthoi of Manhattan Radio Service.

Mr. and Mrs. Harvey Cooper of Camino Radio Shop.

Mr. and Mrs. Harry Le Goube of Washburn-Walker.

Mr. and Mrs. Albert Ezor of Pioneer Radio Service.

Mr. and Mrs. William Denells of The Music Shop.

Mr. and Mrs. Kenneth Landgraf of B-T Radio Shop.

Mr. and Mrs. Allan Stuart of Radio Specialties.

Mr. and Mrs. Henry LePla of the Radio Electric Shop.

Mr. and Mrs. Bill Morrow of Robinson Radio Shop.

Mr. and Mrs. Bob Brown of Bob Brown Radio Service.

Mr. and Mrs. Ben Jacobson of Ben Jacobson Radio Service.

Mr. and Mrs. Oscar Waldenschmidt of Waldy's Radio Service.

Mr. and Mrs. Clarence Shippey of Shippey's Radio Service.

Mr. and Mrs. Roy Tate of Roy Tate Radio Service.

Mr. and Mrs. Ray Southstone of Ray's Radio Service.

Mr. and Mrs. Larry Cole of Radio "Doc" in Pasadena.

Mr. and Mrs. Paul LeFebvre of the Radio Service Shop.

Mr. and Mrs. Roy Wallick of Wallick's Radio Service.

Mr. and Mrs. Don Goodwine of Harry W. Weber of South Pasadena.

Mr. and Mrs. "Is" Motley of The Radio Shop.

Mr. and Mrs. Bill Hansen of Hansen Music Co.

Mr. and Mrs. H. O. Whisman of Hansen Music Co.

Mr. and Mrs. Bill Wilhelms of Hansen Music Co.

Mr. and Mrs. Leonard Lossieff of Star Bicycle and Radio Store.

Mr. and Mrs. Harry Gilbert of Harry V. Gilbert's Radio Shop.

Mr. and Mrs. Beryl Steele of Harry V. Gilbert's Radio Shop.

Mr. and Mrs. Leon Johnson of Johnson Radio Service.

Mr. and Mrs. Bill Manning of Manning Radio Service.

Mr. and Mrs. William Bowell of Bay Radio Service.

Mr. and Mrs. Bill Starr of Coast Electric Co.

And to all the mothers, fathers, families and friends of our radio fraternity—a hearty Merry Xmas!

ELIMINATING TRAFFIC SIGNAL INTERFERENCE

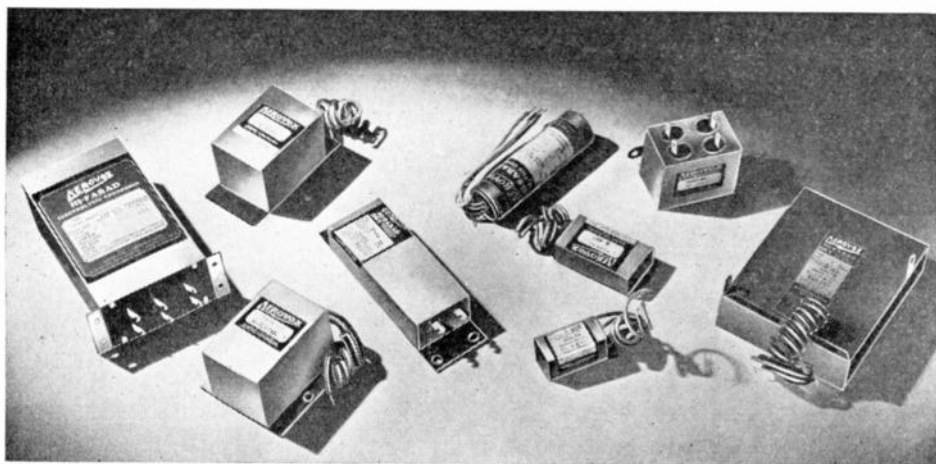
(Continued from Page 10)

lems. Simply by cutting this Analyzer into the circuit and then applying various filter banks by turning the dial you are enabled to find in short order the exact filter combination to produce best results. After working "cut and try" for several years with many loose filter units, I find that the Sprague Interference Analyzer reduces my working time on a job by more than half.

After the correct filter combination has been determined these units can be installed directly in the signal box if there is room or in a metal container fastened outside of the box. The traffic light maintenance crew will often dig up a container and attach it to the signal box for you. Westinghouse makes a good weather-proof marine box which is ideal for the purpose.

A car radio, close to the control box, is a great help while working on the job, or have a helper stand near a window of an adjacent house so he can signal to you while he is listening to the radio. By listening to the radio you can tell at once when you have hit upon the proper filter combination to eliminate the interference.

This sort of work represents a broad field warranting real consideration from every serviceman who is looking for ways and means of expanding his business along practical, profitable lines—and it is one which will become increasingly important as more auto radios are used and as short wave reception becomes even more popular with the consequent necessity for still more sensitive home receivers.



Exact Duplicate Replacement CONDENSERS

Widest variety of card-board and cartridge electrolytic replacements.

Standard and special types of metal-can electrolytics for any replacement need.

Single and multiple sections . . . condenser filter banks . . . by-pass groups.

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WHEN set owners insist on restoring their set to original factory status with precisely matched replacements . . . when service jobs must "stay put" . . . when you are really thinking about profits—you simply must have AEROVOX Exact Duplicate Replacements. ☼ Remember, they have exact physical dimensions and design of initial set equipment. ☼ And they possess that service-plus quality always expected of AEROVOX-labelled units.

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EXCERPTS FROM MODERN RADIO SERVICING

(Continued from Page 4)

cular model, different components were found to cause fading on many different occasions. The 0.1 mfd. audio coupling condenser was found to be the most frequent cause, as it open-circuited. The variable condenser stator plates were mounted on porcelain brackets. A sudden jolt would snap the porcelain, permitting the stator to shift with the least vibration, causing fading. The r-f coil secondaries were wound very tightly, and extreme changes in temperature or excessive vibration of the dynamic speaker would cause the coil terminals to snap at the lug. This would make and break contact, causing fading. Numerous condensers in the r-f portion of the receiver would open-circuit or become leaky, producing the same symptom. It is evident that troubles of this kind can only be found by keen observation and attention to the smallest details which might pass unnoticed by the novice. Often, the observation of any unusual effects accompanying the fading gives a clue to the source or type of trouble.

Perhaps the most frequent cause of fading is defective screen-grid tubes. When these tubes are tested with the ordinary set analyzer, the difficulty is seldom disclosed; but if they are checked with a good a-c tube tester, poor ones will be revealed immediately.

Some receivers employ a type of r-f coupling system in which a choke in the plate circuit of the tube is coupled to the tuned secondary by a small coil consisting

of a few turns mounted at one end of the secondary. Should these coupling coils become loose and "float" from side to side because of vibration, the coupling will vary and fading will result. In some few cases this winding is held in place by strips of friction tape which dry up and permit the coil to "stray."

OLESON ACTIVITIES

November personnel changes in the Otto K. Oleson sound studios, Hollywood, include the appointment of Sam Bartlett as production manager. Art Davis, formerly with Western Electric in Hollywood, joins the recording manufacturing division. C. C. McDonald will continue as supervising engineer. The Oleson studios have just placed on the market a heart-beat amplifier for medical laboratories and hospitals. It has also launched a new marketing arrangement in the form of sales of parts and kits for professional recording machines which it will distribute in addition to its line of recording apparatus, both portable and bench mount. Mr. Bartlett will immediately direct a series of transcriptions called "Congo Bartlett in Ethiopia," and will augment it with a weekly five-minute disc on current news from Ethiopia.

GIANT RECTIFIER TUBE

A giant rectifier tube capable of rectifying enough electrical energy to light every home in a city of 65,000 people was recently demonstrated at Milwaukee. This tube has an output of one million watts at 25,000 volts d. c.

TRANSCRIPTION PRODUCERS AND RECORDING ENTHUSIASTS!

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PERSONALS

Gerry Miller, formerly with Radio Supply Company and Radio-Television Supply Company, is now employed by the C. C. Lagevin Company with offices in the Richfield Building. This company handles sales for Western Electric sound equipment and General Electric radio instruments and precision parts. We know that Gerry's great number of friends wish him every success in his new capacity.

John K. Hilliard, engineer with M. G. M. Studios, formerly with Fox Films, Inc., and past chairman of the Los Angeles Section of the Institute of Radio Engineers, recently returned from New York. Mr. Hilliard was sent to New York by his company to personally supervise the installation of a high-fidelity sound projection system in one of the leading theatres in New York City. He reports satisfactory completion of the installation and is now back on home territory.

Frank Munson, well-known C. R. T. A. member, formerly service manager for Hulbart Radio & Electric Company, has recently been added to the staff of the rapidly-growing Radio Specialties Company on West Eighth Street. Mr. Munson spends his daylight hours in the company's sales rooms and invites his host of friends to see him there.

John A. Orme, vice-president of the C. R. T. A., is now employed in the service department of the G. A. Ekleberry Service Shop on La Brea.

V. Karl Hatfield is now the proud papa of a brand new baby, Joan Susan. Mother, a baby and father are all doing nicely, although Karl had some bad moments, we understand. Congratulations to the Hatfields!

A. Paul, Jr., now quite active in the electrical transcription field, has been very active in air check work for some of the outstanding programs on the chain broadcasts, as well as local stations. Mr. Paul also appears at regular intervals as guest speaker on the Frank Andrews "Round the World" short-wave program every Saturday evening at 9:30.

Richard G. Leitner, well-known radio engineer and consultant, is still in New York City on business, but is expected to return shortly.

Hatfield and Son, Radio, on North Vermont, are the proud possessors of a new modern radio service truck.

Carl Haverlin, commercial manager of KFI-KECA, recently was sent to New York on official business for KFI. He is expected to return shortly and we know his many friends will welcome him back to sunny California again.

Freeman Lang has taken his radio equipment off his cruiser, "Content," and installed it in his Hollywood sound studios for a general overhaul and testing period while the craft is in drydock.

E. K. Barnes, now on the technical staff of Freeman Lang, and one time director of KHJ, has gone to the desert to recuperate for two or three months.

TRANSCRIPTIONS FOR 2GB FROM HOLLYWOOD

2GB, Sydney, Australia, in October purchased several series of Hollywood-made transcriptions through its American representative, including the following:

Thirty-nine episodes of Tarzan from Edgar Rice Burroughs, Inc.; 104 Watanabe and Archie and 6 Dickens' Christmas Carols from Freeman Lang Studios; second series of Sunday Players and 15 Adventures in Christmas Tree Grove, Mertens and Price, Inc.; 13 True Tales from Titan; 13 Portraits in Literature, from Earnshaw Radio productions; Sons of the Pioneers series, from Standard Radio, Inc.; 13 each of Shikari, Hacienda, Heiney and Limey and Aladdin, from Ambassador Radio Productions; and the script for 39 Ripley mysteries and 50 of the Robert Sherwood air magazine series.

POWER FROM THE SUN

A. G. Burns, President of the Congress of National Inventors, recently stated that experiments are being made by the Society of Electrical Engineers to harness the sun's power and hope to place 200 billion volts of electrical energy at man's disposal. Already, great electrical charges have been directed for 26 miles, according to Mr. Burns, and transmission of huge volumes of power, sans transmission lines, may easily be expected to be put into practical use within the next few years.

CERAMIC-DIELECTRIC CONDENSERS

Possessing those prime characteristics of non-porosity and great electrical and mechanical strength, combined with exceptionally high dielectric constant, a new ceramic development introduces some striking possibilities in the condenser art. Indeed, dielectric constants of the order of 50 to more than 170 are reported for this new material by its developers and manufacturers, Henry L. Crowley and Co., ceramic specialists of West Orange, N. J.

The extraordinary dielectric constant makes possible a simple condenser with say, a 1-in. square of crolite dielectric, faced with metal plates on both sides, offering capacities as high as 400 MMF. Such condenser construction is practically immune to leakage and voltage breakdown. In fact, samples have been subjected to voltages of 1200 D. C. and 440 A. C., without leakage. Also, they have been placed on potentials as high as 30,000 A. C., without breakdown, although, of course, arcing has taken place around the dielectric plate or through the air. Hence voltage breakdown of the condenser dielectric can now be eliminated from consideration.

A most favorable power factor is obtained with crolite dielectric. Moisture absorption is nil. The extreme compactness made possible by high dielectric constant, overcomes normally expected manufacturing and service difficulties. The material can be fabricated in thin sheets or tubes, for ready application to condenser design. It takes the place of mica, and, being fabricated under rigid control, is positively uniform. Crolite dielectric can also be used for trimmer condensers, as a base.

REFRIGERATED FLIES

An unusual use for mechanical refrigeration was reported in a recent "Industrial Bulletin" issued by the Arthur D. Little Laboratories, Cambridge, Mass. We quote directly from their bulletin:

"Although our own record in converting wastes and nuisances to profit is one upon which we pride ourselves, we gladly take off our hats to an industrial engineering friend of ours for a superlative achievement in this field which has just come to our notice. A client of his raised mushrooms and fertilized his beds with manure. This practice resulted in the hatching out of vast numbers of flies which were extremely difficult to get rid

of. The engineer recommended the installation of a suction fan which passed both air and flies over some refrigerating coils in such manner as to chill the flies and then drop them in a dormant state into large milk cans. The installation was made and the flies eliminated as a nuisance.

"The canned flies are now shipped to frog raisers. Upon receipt, the cans are immersed in a brine solution, which chills the flies and again renders them dormant. In that condition they are fed to the frogs. The mushroom grower now realizes from the sale of flies nearly as much as from the sale of mushrooms."

WLW PHENOMENA

Some forty years ago Tesla showed the possibility of wireless power transmission although it is still commercially impracticable. However, the spectacular phenomena in the locality of WLW, the Crosley Radio Company, 5000 watt transmitter are very interesting. This station, designed to put 500,000 watts into its antenna, a tall steel structure of the "Vertical Radiator" type, at times, due to momentary impulsing, causes surges of up to four times this amount or nearly 3,000 horse power. If a circuit is tuned to the frequency of the transmitter in the immediate vicinity of the antenna, the circulating current setup in the circuit is powerful enough to light lamps or even run household appliances. Also, anywhere within a few miles of the station any insulated piece of metal picks up a charge from the outbound waves. People hear WLW programs from rain spouts, metal roofs, home fixtures, etc. In one case the station engineer had to put, not a lightning rod, but a "radio rod" on a farmer's roof nearby. They grounded the metal roof of the barn to the earth below with copper wires to prevent danger of its being set on fire when it picked up too high an electrical charge and sparked to its wooden sides.

DUCHESS SELECTS HAT BY TELEVISION

The Duchess of Kent sat down in a luxurious armchair the other day and chose a new hat which was being exhibited six miles away.

It was made possible by television, which gave an experimental fashion parade staged in Crystal Palace for the benefit of those few busy housewives who now have televisions.

Looking into the receiving set before her, the duchess quickly discarded the hats unsuitable to her mode and chose one particularly becoming.

EQUIPMENT ELIGIBILITY BOOKLET ISSUED BY F.H.A.

"The Federal Housing Administration at Washington, D. C., outlined the policy it will follow in regard to the eligibility of equipment and machinery obtained under the Modernization Credit Plan in a booklet just released," according to F. W. Marlow, District Director for Southern California, Federal Housing Administration.

"The booklet lists types of equipment and machinery that have been ruled eligible for loans up to \$50,000 for apartment houses, multiple-family houses (two or more separate dwelling units under the same roof), hotels, office, business or other commercial buildings, hospitals, colleges, orphanages, schools, and manufacturing or industrial plants. It also gives the policy, in detail, in regard to loans up to \$2,000 on other types of property.

"Copies are available at the Federal Housing Administration, 756 South Spring Street, Los Angeles, California.

"General principles which govern the Housing Administration's determination of eligibility for equipment and machinery are explained in detail. Salient points on eligibility are:

"The article should have a unit value sufficient to justify the application of time payments to its purchase. (It is suggested that loans should not be for periods that make any monthly payment less than \$5.)

"The article should be of a durable nature with a reasonable expectancy of useful life longer than the term of credit extended for its payment. It must be purchased and installed as a part of the equipment of the structure, or of the business conducted therein, within the United States or its territories or possessions.

"Hand tools, small portable appliances, fragile articles, furniture (unless built in), furnishings, removable decorations, installations meant to be or by their character necessarily temporary, are ineligible.

"Loans for the purchase and installation of replacement parts for eligible equipment and machinery are insurable, but a loan merely for the repair of a machine is not insurable. For instance, the cost of welding a fly-wheel may not be made the basis of an insured loan, but

the purchase price and installation cost of a new fly-wheel would be insurable.

"Appurtenances that are physically separate from a major eligible unit, but are usable only as a part of such unit, are themselves eligible.

"Any item, ineligible because of some disqualifying characteristic, does not become eligible merely because it can be used with an eligible item or is bought therewith."

ELECTRICAL AND RADIO STATISTICS

(From October Coyne School Bulletin)

The last month showed the greatest increase in business since the Federal Recovery program was made effective. The following one-line editorials present a brief and graphic survey of the industrial situation:

General Business—

General Business up 17 %
Steel Production up 50 %
Electric Power Output up 12 %
Industrial Production up 20-30 %
Stock Exchange Sales up 300 %
Construction Program up 20 %

Radio Outlook—

60-100 % set production increase
Sales up 450,000 sets over 1934
Third quarter indicates increase of 20 %
Industry products continuing sales pace

Broadcasting—

September broadcasting tops 1934 by 20 %
Desirable hours sold out on net works
Chains show \$525,000 over 1934

Miscellaneous—

Sales of battery receivers doubled
Metal tube shortage still continues
Factory production vigorously pushed
12 % of new receivers metal tubes
Refrigeration in biggest year in history
Many changes in next year's models.

RADIO CONTROLLED PLANE

The British Air Ministry recently disclosed developments in the radio control of airplanes. These "robot" planes are capable of practically any maneuver that a humanly guided craft is capable of. The plane may be controlled from any point up to ten miles distant and tests have shown perfect control with speeds of one hundred miles per hour with a climb of ten thousand feet. The tests have been made over water as well as land and the radio controlled plane need not necessarily be visible to the operator.



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| 5. Commercial Ohmmeters | 24. Aligning and Neutralizing T-R-F Receivers. |
| 6. Capacity and Condenser Tests | 25. Aligning Superheterodynes (Cathode-Ray) |
| 7. Output and V-T Voltmeters | 26. Repair of Individual Parts |
| 8. Tube Checkers | 27. Auto-Radio Installation and Servicing |
| 9. Constructing Tube Checkers | 28. All-Wave Receiver Servicing |
| 10. Commercial Tube Checkers | 29. Marine Receiver Installation and Servicing |
| 11. Voltage-Current Set Analyzers | 30. Electrical Interference Reduction |
| 12. Point-to-Point Testing | 31. High-Fidelity Receiver Problems |
| 13. Constructing Set Analyzers | 32. How to Sell Your Service |
| 14. Commercial Set Analyzers | |
| 15. Service Test Oscillators | |
| 16. Constructing Test Oscillators | |
| 17. Commercial Test Oscillators | |
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