RADIO FOR AUTO, BOAT OR CAMP

RADIO NEWS and The SHORT-WAVE

JULY, 25¢

SHORT WAVES CIRCLE THE GLOBE

NEW ALL-WAVE SETS

A Publication Devoted to Progress in Radio

Service Work
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Short Waves
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Electronics

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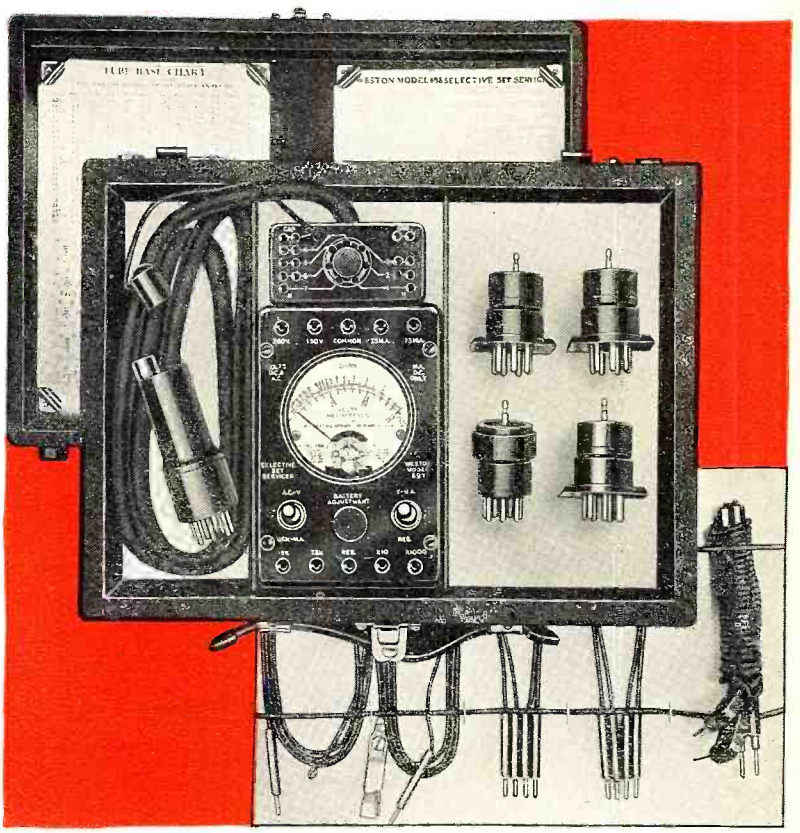
THE *New* WESTON *Model* 698 SELECTIVE SET SERVICER



Here is the new, compact and complete Weston Selective Set Servicer—the last word in field analysis equipment for the aggressive service man.

It is Weston designed, and Weston built throughout — yet offered at a price within reach of all. It employs the new Weston principle of Selective Analysis, which eliminates all danger of early obsolescence. And it is offered *complete* at this low price; including Model 697 Volt-Ohm-Milliammeter, the new Model 666 Type 1A improved Socket Selector Set, all leads, instructions, carrying case, etc. There is nothing more to buy. As for dependability and accuracy, the name it bears assures you of that.

You will want complete data on this dependable Weston field servicer. See it at your jobber's today. The coupon will bring all the facts... Weston Electrical Instrument Corporation, 615 Frelinghuysen Avenue, Newark, N. J.

WESTON *Radio Instruments*

WESTON ELECTRICAL INSTRUMENT CORPORATION
615 Frelinghuysen Avenue, Newark, New Jersey

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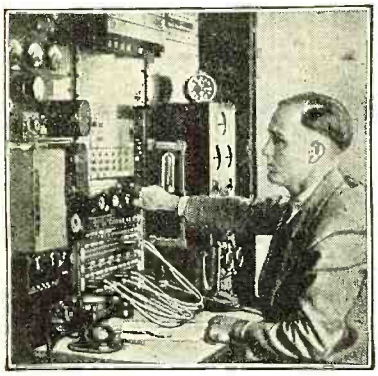
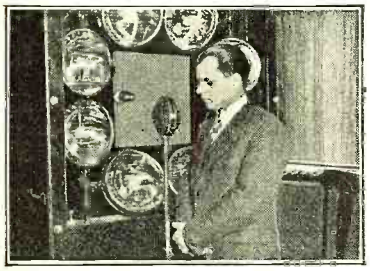
I'll train You Quickly for Radio's GOOD spare time and full time Jobs . . .



Broadcasting Stations employ managers, engineers, operators, installation and maintenance men for jobs paying up to $5,000 a year.

Set servicing has paid many N. R. I. men $200 to $1,000 a year for their spare time. Full time men make as much as $40, $60, $75 a week.



Television, the coming field of great opportunities, is covered in my Course.

Mail Coupon for FREE Information

Why slave your life away in a no-future job? Why skimp, why scrape, trying to pay your bills? I'll train you quickly for the live-wire field—the field with a future—RADIO. $40, $60, $75 a week—that's what many Radio Experts make. $5, $10, $15 a week extra money—that's what many of my students make in their spare time shortly after enrolling. My free book tells you about Radio's spare time and full time opportunities—about my tested training—about my students and graduates—what they are doing and making. Get this book. Be a Radio Expert. The Radio field is big enough to absorb many more properly trained men.

Many Radio Experts Make $40, $60, $75 a Week

Spare time and full time Radio Servicing. Operating Broadcast, Aircraft Radio, Commercial Land, Ship and Television stations, a Radio service business of your own. I'll train you for these and other good jobs in the manufacture, sale and service of Radio and Television apparatus. My FREE book tells you about the many money-making opportunities in Radio.

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You don't have to leave home and spend $500 to $1,000 to study Radio. I'll train you quickly and inexpensively right in your own home and in your spare time for a good Radio job. You don't need a high school or college education. Many of my successful graduates didn't even finish grade school. My amazingly practical 50-50 method of training—half with lessons, half with Radio equipment—gives you broad practical experience—makes learning at home easy, fascinating, practical and rapid.

Many make $5, $10, $15 a week extra in spare time almost at once

My book shows how my special training, instruction material, plans, ideas, and my nineteen years' experience training men for Radio careers have helped many students make $200 to $1,000 a year quickly in their spare time. My Course is famous as "the one that pays for itself."

Your money back if not satisfied

I'm so sure you will be satisfied with my training that I agree in writing to refund every penny of your money if you are not entirely satisfied with my Lesson and Instruction Service when you finish.

Find out what Radio offers you

Act today. Mail the coupon. My 64-page book will be sent free to any ambitious fellow over 15 years of age. It tells about Radio's opportunities—explains the eighteen star features of my Course—shows letters of what others are doing and making. There is no obligation. Mail the coupon in an envelope, or paste it on a 1c post card.

J. E. SMITH, President,
National Radio Institute
Department 4 GR, Washington, D. C.

Some Other Jobs N.R.I. Trains Men For

Broadcast Engineer.
Operator in Broadcast Station.
Aircraft Radio Operator.
Operator of Airway Beacons.
Government Radio Operator.
Ship Operator.
Serviceman on Loud Speaker Systems.
Installation Engineer on Lond Speaker Systems.
Sales Manager for Retail Stores.
Service Manager for Retail Stores.
Auto Radio Installation and Serviceman.
Television Broadcast Operator.
Television Engineer.
Set Servicing Expert.

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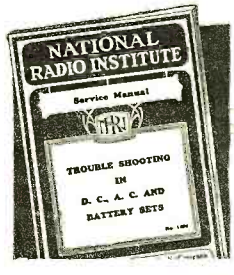

Let me PROVE that my Course is clear, easy to understand and fascinating to study. Send the coupon for a free lesson, "Trouble Shooting in D.C., A.C., and Battery Sets." This interesting lesson gives 132 ways to correct common Radio troubles. I am willing to send this book to prove that you too can master Radio—just as thousands of other fellows have done. Many of them, without even a grammar school education, and no Radio or technical experience, have become Radio experts and now earn two or three times their former pay. Mail the coupon now.

MAIL THIS for FREE 64 page book

J. E. SMITH, President
National Radio Institute, Department 4GR
Washington, D. C.

Dear Mr. Smith: I want to take advantage of your Special Offer. Send me your two books, "Trouble Shooting in D.C., A.C., and Battery Sets" and "Rich Rewards in Radio." I understand this does not obligate me. (Please print plainly.)

NAME.....AGE.....

ADDRESS.....

CITY.....STATE.....

M

ACT TODAY

Here's Proof

"Made $6,000 in 2 Years"

"Soon after the depression started, I found myself without a job, but I was well protected with N. R. I. training. I swung right to full time Radio servicing and I have made over $6,000 in a little over two years." —WM. SPARTIVENT, Sparty Radio Service, 93 Broadway, Newark, N. J.

"Made $17 In One Night"

"Who says there's a depression? I have made more money in Radio than ever before. I am busy day and night. Last night I made $17. Last week $45. I had a tough struggle at first but you fellows helped me back in the race and kept me going."—WILLIAM J. MAKI, Creighton Mine, Ont., Canada.

"$500 a Year in Spare Time"

"Although doing spare time Radio work only, I have averaged about $500 a year extra in addition to my regular income. Full time Radio work would net me many times that amount."—EDW. H. FAWCETT, Slough Rd., Ladner, B. C., Canada.

"Good Position, Good Pay"

"I am Chief Operator at Radio Station WSMK. This is a good position with good pay. I have advanced in Radio right along. I recommend N. R. I. to anyone who wants to be successful in Radio."—JOHN HAJDUK, JR., 3 Broxey Apts., Southern Hills, Dayton, Ohio.

Vol. XVI
No. 1

RADIO NEWS

July, 1934

Edited by LAURENCE M. COCKADAY

S. GORDON TAYLOR
Managing Editor

WILLIAM C. DORF
Associate Tech. Editor

JOHN M. BORST
Technical Editor

SAMUEL KAUFMAN
Broadcast Editor

HOWARD S. PEARSE
Associate Editor

JOSEPH F. ODENBACH
Art Editor

THIS MONTH—

Holiday Radio

Short Waves

Distance Map

Set Building

All-wave Sets

NEXT MONTH—

Big things ahead in radio! Watch out for the August issue. It will be devoted to many new developments that are now just coming out of the laboratory. No wide-awake radio man can afford to miss this new data.

For Servicemen: New RADIO NEWS service instruments. Make them and use them yourself and be sure of the best.

For Short-Wave and DX Fans: The DX Corners will contain more new dope on short waves, including a world distance chart for the West Coast area.

Published Monthly by Teck Publications, Inc., *Washington and South Avenues, Dunellen, N. J.*

Lee Ellmaker
President and Treas.
Abner Germann
Secretary
H. D. Crippen
W. P. Jeffery
Advertising Management

EDITORIAL AND EXECUTIVE OFFICES
222 WEST 39th STREET, NEW YORK CITY, N. Y.

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LEARN RADIO FROM REAL RADIO ENGINEERS

HERE THEY ARE:
Dr. C. M. Blackburn, Chief Radio Engineer, Grigsby-Grunow Company (Majestic),
Kendall Clough, Chief Engineer Clough-Brengle Co. (Radio Engineers and Manufacturers)
Karl Hassel, Chief Engineer, Zenith Radio Corporation,
Homer Hogan, Gen. Manager, Radio Station KYW, Chicago,
R. MacGregor, Service Manager and Sales Engineer, Transformer Corporation of America (Clarion),
H. C. Tittle, Chief Radio Engr., Stewart-Warner Corporation,
F. D. Whitten, Service Manager, Chicago Plant, Philco Radio and Television Corporation,

NRA MEMBER U.S. WE DO OUR PART

LET THESE ENGINEERS RIGHT FROM THE HEART OF THE BIG RADIO INDUSTRY *Train You at Home for*

GOOD PAY RADIO WORK

MANY R-T-I TRAINED MEN MAKE $35 TO $75 A WEEK

If you're dissatisfied with small pay — work that's getting you nowhere—lay-offs and uncertain income — here's an opportunity that's too good to miss. At the cost of only the time it takes you to mail the coupon, you can get my big FREE book, "RADIO'S FUTURE AND YOURS." This book tells how you can learn at home to make more money almost at once in Radio — whether you want to make Radio your life's work, or use it to pick up an extra $5 to $20 a week in your spare time.

"RADIO IS GROWING BY LEAPS AND BOUNDS"

says *Radio Craft Magazine*. It has forged ahead even in depression years. Where only a few hundred men were employed a short time ago, thousands are employed today. Where a few years ago a hundred jobs paid $35 to $75 a week — there are thousands of such jobs today. And more new jobs being created all the time — *full time jobs and spare time jobs*. Get my book and see how easy it is to learn at home for this good-pay work.

R-T-I TRAINING IS "SHOP TRAINING" FOR THE HOME

It comes to you right from the Radio Industry — right out of the factories where Radio sets and other vacuum-tube devices are made. It was planned and prepared for you by big radio engineers IN these factories, most of whom are the Chief Engineers of these great Radio plants. And NOW these same engineers are actually supervising R-T-I Training. Which means that trained the R-T-I way, you'll be trained as the Radio Industry wants you trained — just as the Radio Industry, itself, would train you if it was doing the job.

4 BIG WORKING OUTFITS INCLUDED

These are probably the biggest and most expensive Working Outfits ever included with a home-training Course. You use them to build up testing equipment — to experiment with — to do actual Radio work. It's Shop Training for the home

SOUND PICTURES, P. A. SYSTEMS, PHOTO CELLS, TELEVISION, ETC. ALL INCLUDED

Radio service work is just the starting point in R-T-I Training. From there we take you up through the very latest developments in Radio, and then on into the new and larger field of Electronics—Sound Pictures, Public Address Systems, Photo Cells, and Television. This feature alone makes R-T-I the outstanding home training in Radio.

YOU GET "QUICK RESULTS"

C. E. Head, 431 Third St., Alexandria, La., says: "Made my first money 11 days after starting your training — cleared $14.25."

Frank E. Klemann, Lisle, Ill., writes: "Doubled my pay in less than six months."

Harry L. Stark, Ft. Wayne, Ind., writes: "Now making three times as much money as I was when I started your training."

AGE OR LACK OF EDUCATION NO HANDICAP

You don't have to be a high school graduate. It isn't necessary that you should have finished the grades. My Training in Radio is so simple, so easy, and so practical, that it offers every man, regardless of age, education, or previous experience, the chance to get out of a small-pay, no-future job, into good pay, big future work in Radio.

YOUR MONEY BACK IF YOU ARE NOT SATISFIED

That's my way of doing business. And I'll give you that agreement in writing — an agreement to refund every penny of your tuition if, on completion of my Training, you are not entirely satisfied.

INVESTIGATE! Learn why R-T-I Training is different. Find out why R-T-I Trained men get "Quick Results" and "Big Results". Send today for my big book "Radio's Future and Yours". The book is free.

RAY D. SMITH, *President*
Radio & Television Institute, Chicago

"We OK Radio and Television Institute home training"

say these 30 LEADING RADIO MANUFACTURERS

and they are talking to YOU

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RADIO and TELEVISION INSTITUTE, (R-T-I)
2130 Lawrence Ave., Dept. 4B, Chicago, Ill.

Without obligation of any kind please send me a copy of "Radio's Future and Yours." I am interested in your home training and the opportunities you say exist in the great field of Radio for the R. T. I. Trained man.

Name_____

Address_____

City_____ State_____

DOTS • • • • • *and* – – – DASHES

Short but Interesting Items from the Month's Radio News the World Over

New Inter-City Radio Links

NEW YORK—Both the RCA Communications, Inc. (in cooperation with Western Union) and the Mackay Radio and Telegraph Company (in cooperation with the Postal Telegraph Company) seem to be going in for the high-speed competition for inter-city, wire-radio message business. The Mackay Company has extended its services to include the cities of Washington and Boston in their system. The other cities being served are New York, Chicago, New Orleans, San Francisco, Los Angeles, Seattle, Portland, Tacoma, Oakland and San Diego. The new telegraph service is available at any Postal telegraph office and the Postal Telegraph Company also collects and delivers messages for Mackay Radio. The RCA Communications, Inc. has also opened up new radio telegraph wire services between Boston, New York, Washington, San Francisco, Chicago and New Orleans. Construction permits have been filed for authorization to include Seattle, Los Angeles and Detroit in the RCA network. The Western Union Telegraph Co. will serve as depots for these inter-city services as well as for the sending of radiograms via RCA.

RMA Convention at Chicago

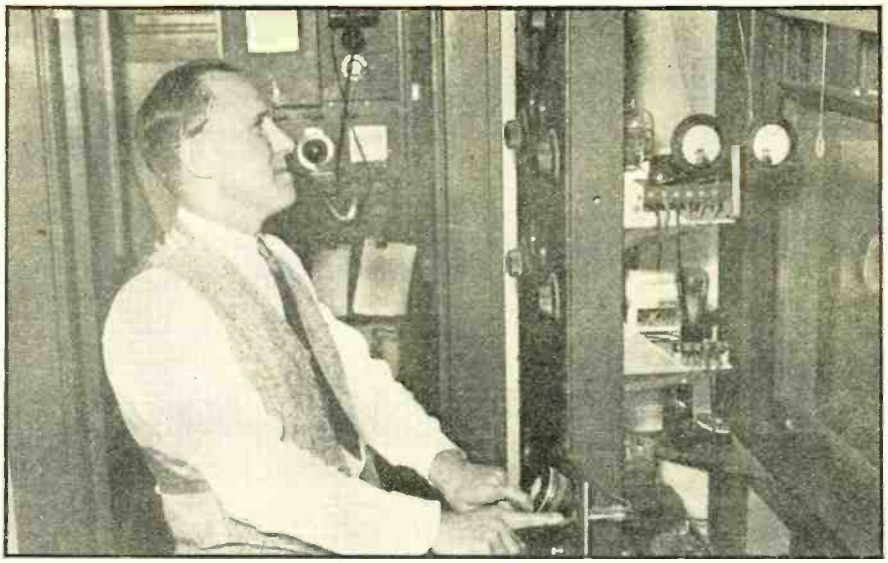
CHICAGO—Celebration of the tenth anniversary of the Radio Manufacturers Association, to be observed at Chicago in June with a national meeting of the radio industry at the Hotel Stevens June 11th to June 14th. There will be many joint meetings of manufacturers and jobbers, discussing national trade promotion, merchandising and other important and mutual problems. Stimulation and promotion of radio business will be the keynote. No radio, phonograph, refrigeration and other household goods or musical merchandise will be demonstrated or on show at the industrial gatherings. This will eliminate the heretofore familiar features of the "trade" shows.

Radio Cars Answer Call in 20 Seconds

NEW YORK — Police Commissioner O'Ryan of New York City staged a demonstration, recently, at the Columbia Radio Playhouse when he sent in a call "I want a policeman," from the stage, during an interlude in a musical broadcast. Twenty seconds after the call ended over the police department radio transmitter, in response to this telephone call, four uniformed men entered the radio theatre in answer to their chief's summons. The men caught the call, while on patrol-car duty, near Broadway and 47th Street. Three cars answered the call.

Marconi Calls "Electric Woman" Genuine

ROME—Marchese Guglielmo Marconi, famous radio inventor and scientist, said today there was no doubt as to the authenticity of the phenomena of the "electric woman" Signora Anna Monaro, according to the *Times*. From Signora Monaro's breasts, several times nightly while she sleeps, there emanates enough light to illuminate a room, it is said.



NEW ULTRA-SHORT-WAVE RADIO-CONTROL FOR AIRWAY BEACONS

Engineers of the Airway Section of the Department of Commerce are testing out a new method of remote control for radio-beacon transmitters, usually located miles from the airports themselves. The device pictured above is a remote-control transmitter, operated from a dial telephone system which sends out impulses received by the beacon station and which automatically turn "on and off" the radio-beacon transmitter, with no operator present. Photo shows Operator G. Muehl operating the device at a Washington airport station

Visit Steinmetz Home

SCHENECTADY—Nearly 3,000 persons recently accepted the invitation of Joseph LeRoy Hayden, foster son of the late Charles P. Steinmetz, the electrical wizard, to visit the big brick house adjoining Steinmetz's private laboratory and conservatory. This was the first time since Steinmetz's death in 1923 that these buildings have been made available for public inspection.

National Electric and Radio Exposition

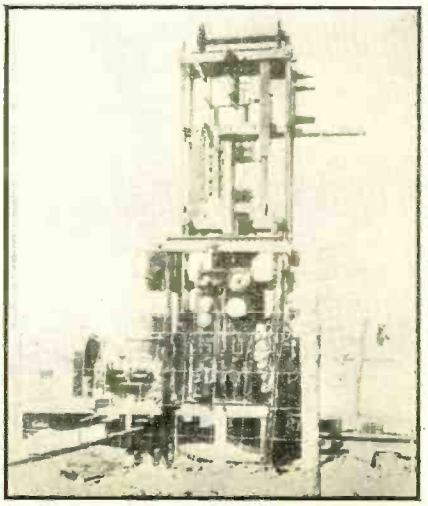
NEW YORK—The New York Madison Square Garden will be the home of the 1934 National Electric and Radio Exposition for a run of eleven days beginning Wednesday, September 19th, including Saturday, September 29th. Radio interest and business is increasing at such a rate that it is believed this will be the largest radio exposition on record.

Electric "Eyes" Stop Elevator Cars

NEW YORK—Electric eyes now join the ranks of elevator operators! Two electric eyes, known technically as photo-electric tubes, are entrusted with stopping each of

TESTING EACH STOP

Engineers test the electric-eye "stops" for accuracy at Radio City. With a carpenter's level laid across the floor of the car and the building floor, they can ascertain the degree of perfection with which the photo-electric cell brings the elevator car to a stop



TRANSMITTING POWER BY RADIO

These columns contained, a couple of months ago, a report of an experiment to transmit radio power through the air to run a train. This photograph shows the apparatus in question. In recent tests, surrounded with great secrecy, the inventor, M. C. Gregory, at Boise City, Oklahoma, was reported as successfully transmitting, by short waves, enough power to drive a small rail motor-car a distance of seven miles. With bigger equipment the inventor hopes to be able to operate a five-car train soon, with no material connection between the supply of power and the cars themselves

the 36 high-speed elevators in the 69 story Radio Tower in Radio City, New York City. Up and down the 850 feet of darkened elevator shaft, two electric eyes ride on each fast-moving car. The tubes' uncanny "sight" brings the car to a stop level with any desired floor with an accuracy unsurpassed by the most experienced human operator, according to Westinghouse engineers.

Round-the-World Broadcast

NEW YORK—A globe circling radio broadcast reception party was recently demonstrated over the Columbia network, when listeners recently were "taken," via a broadcast program, to England, France, Germany, Holland, Norway, Sweden, Austria, Spain, Czechoslovakia, Italy, Hungary, Belgium, Switzerland, Japan, China, Indo-China, East Indies and the Philippines. The overseas reception was done in the RCA Communications laboratory at Riverhead and also at the laboratory in Bolinas, California, near San Francisco.

Will Television Be a Future War Spy?

LONDON—Aerial and naval warfare of the future, including television, to spy out movements of troops, etc., was recently demonstrated to the British War Office and Air Ministry at the Baird Television headquarters here. Officials were shown the methods for sending back, from an airplane television transmitter, photographs of the battle field showing troup movements and positions of artillery.

Byrd Alone in World's Coldest Spot

LITTLE AMERICA—Admiral Byrd recently radioed from his self-imposed "hermitage," 123 miles south of Little America, "Quite likely this base is the coldest spot ever occupied. The temperature this morning was 58 degrees below zero."

Historic Radio Station to Close

CORNWALL—It has been announced the famous radio station at Poldhu, near the Lizard, Cornwall, England, is to be closed down. This was the station used for transmitting the three famous Marconi "dots" heard across the Atlantic Ocean in the first wireless transmission over this area.

New Electronic Guard for Federal Prison

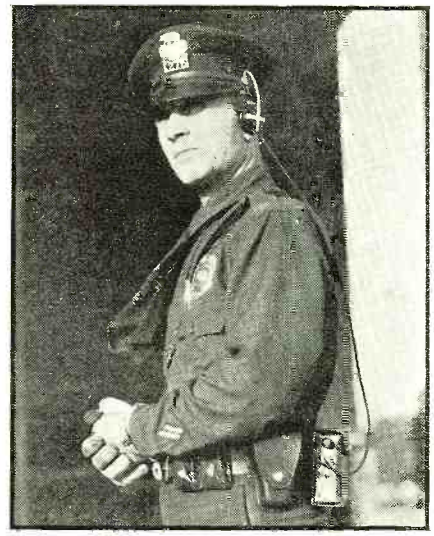
LOS ANGELES—Invisible walls that "see" and unseen gates that "speak" are being installed at Alcatraz prison, island penitentiary in San Francisco Bay to guard America's 200 most dangerous criminals. Photo-electric cells are being placed along the top walls and escaping prisoners would break the light beam and set off a huge horn alarm. Gateways are being equipped with machines sensitive to the presence of metal and if a prisoner passes, with a knife, gun or other metallic weapon concealed on his body, it automatically releases terrific sound waves from a large siren.

Queer-Acting "Mike" Puzzles Radio Engineers

NEWARK—An announcer at WNEW thought he had hallucinations last week when he heard orchestra music coming from a microphone in the studio. An investigation by engineers brought the discovery that the signals came from the microphone and that by turning the microphone in either direction the volume could be easily controlled. No orchestras were on the air or in rehearsal at the time. The chief engineer also finally discovered that the broadcasts of the 5-meter experimental short-wave transmitter atop the Empire State Building, New York City, were being picked up by the delicate condenser microphone which in some peculiar and unexplained way was acting as a receiver. A number of other radio stations reported the same strange radio phenomena and at present engineers are delving into this newest of radio puzzles.

Midget Police Radio Worn on the Belt

LOS ANGELES—Two enterprising inventors, Ralph Gordon and Roy Hunt, have contrived a new one-tube radio receiver, weighing less than 44 ounces complete, that can be used by the police force for listening-in to headquarters, in somewhat the same manner that police cars



now utilize much larger portable equipment. The tiny earpiece is attached to the officer's cap. Patrolmen on foot can, therefore, be called to the exact scene of a crime from the central police station with this equipment.

Aviators' SOS in Bottle

HAMILTON, ONTARIO—A bottle recently drifted ashore at Burlington Beach believed to be a clue to the fate of the two lost airmen who disappeared, six months ago, on a flight across Lake Ontario to Fort Erie. The SOS read: "Help. We are the two air pilots in the lake. We are floating." A lighthouse keeper's daughter picked up the bottle. If this had been a radio SOS help could have been summoned quickly and the lives of the two aviators would probably have been spared.

To Test Radio Echoes from the Moon

LONDON—Efforts to discover whether radio waves really escape from the earth and are echoed back to us from the moon and other parts of the solar system are soon to be started by Professor E. V. Appleton of the University of London. He plans to enlist the aid of thousands of radio amateurs and short-wave enthusiasts throughout the world to time the echoes of powerful signals which he will endeavor to pass through the outer layers of atmosphere into space. If this reflection does occur, radio listeners may catch the echo in a little over 2½ seconds after the signal is transmitted, as the distance to the moon and back is roughly half a million miles. The British Broadcasting Company is to cooperate in this work and will send out the test signals from the Empire transmitter at Daventry. A world radio research league is being formed to assist in carrying out the project.

Animals Ruled by Radio Coils Placed in Their Brains

NEW HAVEN—Dr. Richard U. Light of Yale and Professor E. L. Chaffee of Harvard report recent experiments in which a small coil of copper wire was inserted in the brain of a laboratory monkey and the wound left to heal with the coil inside the brain. Whenever this monkey (with the radio coil in its brain was exposed to radio impulses from a transmitter, a definite kind of convulsion instantly followed. The coil picked up induced electric currents which affected the chosen brain centers. Another monkey with the coil connected to a different part of the brain immediately fell asleep whenever the signals were transmitted.

CONGRESS GETS NEW PUBLIC-ADDRESS SYSTEM

The members of Congress will have no excuse for not maintaining order in the future, a new high-powered public-address system having recently been set up. It is reported that Speaker Rainey's gavel resounds through the chamber like crashes of thunder and his demands for order and recognition of members is plainly heard above any other sounds in even the most stormy sessions

RADIO NEWS INDEX

Radio News
July, 1934

SUMMER RADIO

Latest indications are that this summer is to witness the greatest expansion of interest in radio broadcasting so far encountered. At no time has there been such excellent equipment available for utilizing radio at home, in the country, at the seashore, or while touring or cruising by auto or boat

MORE than 17,000,000 families will use radio regularly throughout this 1934 summer season, including both those who stay at home and those who vacation in the country or at the shore. This figure is believed to be a peak radio audience for any other previous time, including the *winters* and *summers* of 1932 and 1933. Radio, therefore, will offer to every family this summer a wealth of added radio program material to make the holiday season more enjoyable than ever. There's no such thing as a summer radio slump, nowadays.

Radio will furnish *news of what is going on* to the most out-of-the-way places as well as *giving light entertainment and music for dancing,* the country over. All-wave and short-wave sets will bring radio programs from all over the world right into your camp. Automobile radio will insure plenty of entertaining news and music while touring. Portable sets and marine radio receivers will cover those inaccessible picnic places as well as bring radio to all pleasure craft on the water. This summer season, therefore, sees the greatest expansion of radio, since its beginning, for entertainment purposes.

Radio dealers and servicemen should be on their toes and ready to supply their customers with complete information regarding these types of equipment for summer use. They should know just the right types of equipment for each use and should be ready to supply such equipment on short notice. The wide-awake serviceman will have an excellent opportunity for servicing equipment of this type and for getting sets into proper operating condition for their summer customers. The rural serviceman also will have an excellent opportunity for this service work and should not be "caught napping," as vacationists will carry their radio equipment with them and will have to rely on local sources for repair, in case of damage or accident. Here is an excellent opportunity to increase summer radio sales, at the same time to give people a service that will enhance the value of radio to them, in the future.

In this issue is shown a (*Continued on page* 39)

—IN THE GOOD OLD SUMMER TIME

Auto-radio receivers are now so efficient and inexpensive that they are an important part of the equipment for any holiday spree

HOLIDAY LISTENERS

William C. Gittinger

¶ Everyone will use radio this summer, although only a relatively small percentage of the population will be away from home in any one two-week period and they will take or find radio on the job

ONLY 10 out of 100 radio listeners will be on vacation during any two-week period this summer. Eight of those ten will take radio with them—or meet it when they get there. And the other two will be more than compensated for by the steady increase in radio homes since January first. These are a few of the significant figures presented by the Columbia Broadcasting System in its recent study of the summer, 1934 radio audience, a survey of vacation habits conducted by Ross Federal Research Service. There had been too much *speculation* about the trend of summer listening and not enough *facts*—and it was felt to be high time to do something about it. This survey resulted—carried out on a nationwide scale, by direct investigation in thousands of homes, in cities and towns from coast to coast.

Statisticians carefully analyzed these findings and presented the results in a form which is believed to be distinctly on the conservative side. Taking as a base the 18,000,000 homes which will be radio-equipped by July 1, 1934, the following figures result:

90.3% or 16,254,000 radio families will be right at home during any 2-week period in July and August.

8.2% or 1,476,000 radio families will take radios with them on their vacations or listen to radio programs when they get there.

98.5% or 17,730,000 radio families (or the sum of the two above) will be continuously exposed to radio broadcasting during the summer of 1934.

And this total audience of 17,730,000 families exceeds the "peak winter audience" of any previous year!

One of the most interesting trends in the sale of new sets is the rapidly increasing *variety* of sets the public is buying. This does not mean variety in make or brand, but variety in the *purpose* for which the set was designed and sold. It was not many years ago when every set was designed to be placed in one corner of the living room—and to take up a good deal of space in that corner, too. Today, quite a different type of set occupies the place of honor in the living room—and its modern brother and sister sets are "stepping out" in a manner undreamed of before.

For instance, the new study shows that: Nearly six million (5,900,000) midget and portable sets—sets that slip into the luggage compartment of a car or even a suitcase—have been sold since 1930.

A million automobile sets will be in use this summer—even on a basis of only 200,000 new installations between January and June 1934. Present Detroit activity makes this estimate look painfully conservative. At least 45% of the total 1,000,000 launches, motor boats, and yachts in the United States are being radio equipped.

A current estimate indicates that 8 out of 10 summer hotels now have radios in guest rooms, dining rooms or hotel lobbies.

Makers of road maps for one of the largest gasoline and oil distributors report that 9 out of 10 roadside stands, lunchrooms, dance halls, auto camps, etc., now offer radio as an attraction.

These sets are an important part of entertainment facilities; their large audiences are intolerant of poor reception, and such sets must constantly be maintained in *perfect* operating condition. Moreover, many of the sets that are widely used today are subjected to hazards of usage unknown to the sedentary living room set. They are

PORTABLE SETS FOR HOLIDAYS

The modern portable type receiver may be used in the car, on boats or carried to location

roughly treated at picnics, camps and beaches, they are jounced and jiggled in automobiles, motor boats and suitcases. The automobile set, especially, is new and rather mysterious to many owners. And whereas set owners might attempt to service their easily accessible living room sets, they are willing to concede that the variety and intricacy of most modern sets warrants and requires the services of an expert. Here is an excellent opportunity for the wide-awake service organization.

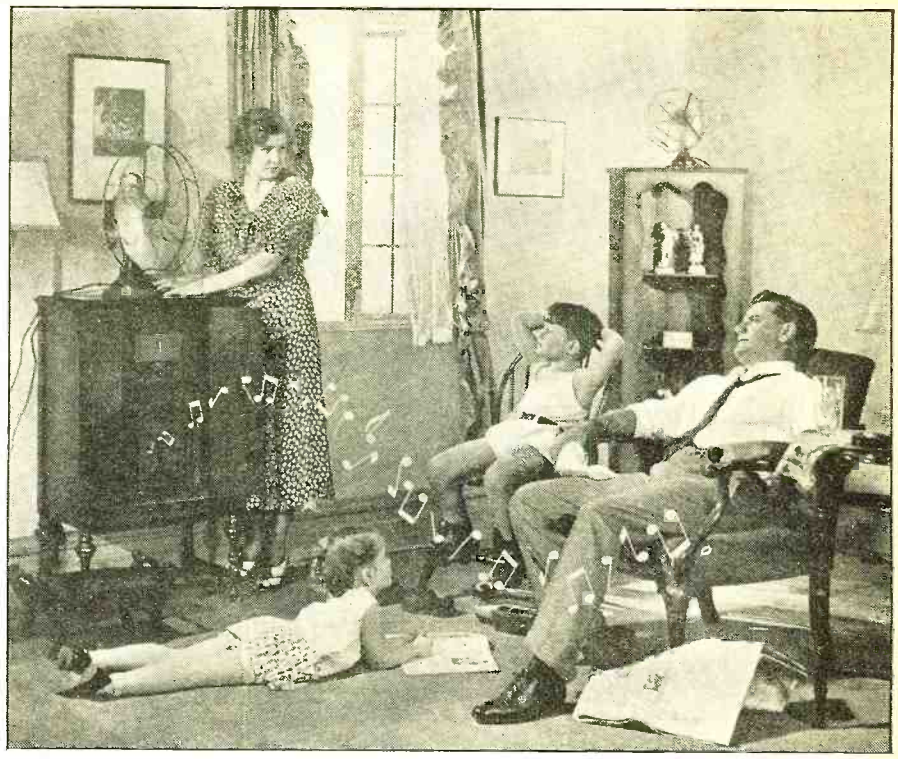
A number of other interesting sidelights on summer radio listening habits were brought out in the Columbia study. In the matter of listening hours, for instance, the survey says: "It is a matter of common knowledge, based on consumer studies over a period of years, that the average American family stays up later in the summer than in winter. Various estimates place the retiring time from half an hour to an hour later. In Daylight Saving areas, that differential tends to be further increased. While any exact measurement of this difference is hardly practical, it is reflected in nearly every study of the summer audience, by hours, which has been made. One study, which included all but the Pacific Time Zone, showed the following increase in the size of the summer audience compared to the winter audience in the same areas. The figures are averages for all areas covered, and are based on local time throughout:

10:00-10:30 P. M.: Summer audience averaged 11.8% larger than winter audience.

10:30-11:00 P. M.: Summer audience averaged 26.3% larger than winter audience.

11:00-11:30 P. M.: Summer audience averaged 46.2% larger than winter audience.

11:30-12:00 M.: Summer audience averaged 91.5% larger than winter audience for the same period of listening.



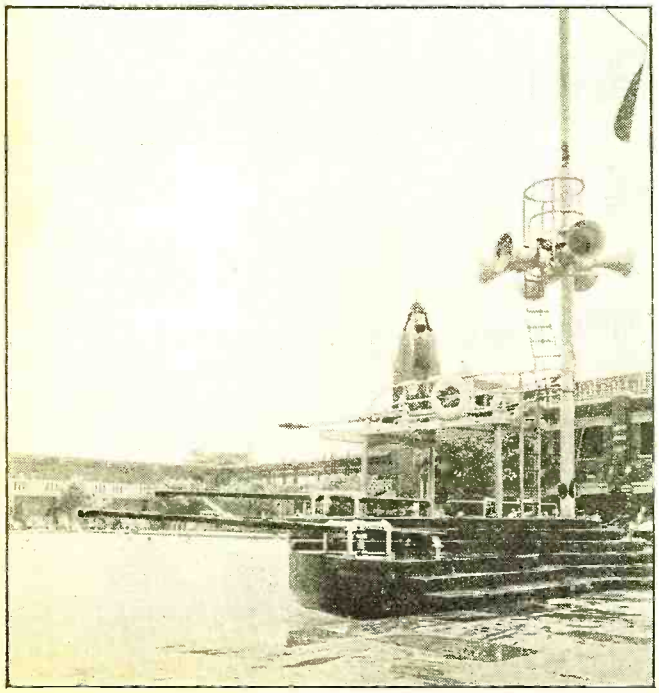
"An interesting correlation with this "extra hour of listening" is to be found in the records of electric-current consumption, in the summer months. These records indicate a higher electric load, for every hour of darkness, during the summer than during the winter. Apart from fans and refrigerators (which are more than offset by electric heating systems and devices in the winter), the principal factors in the residence electric load are electric lights and radio receiving sets."

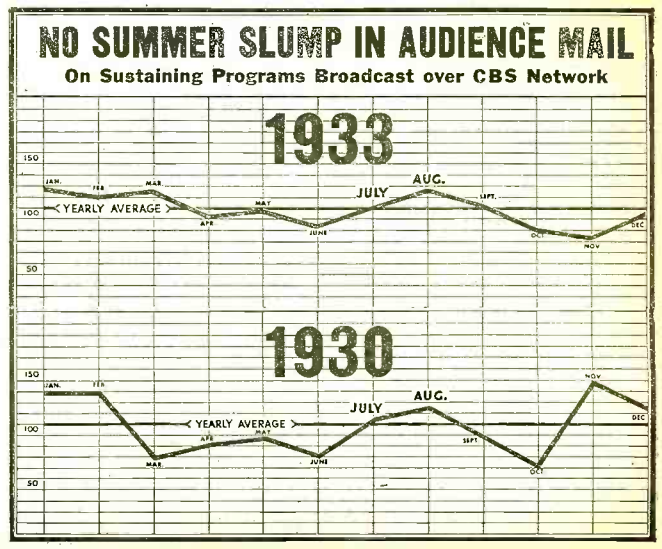
It was also found that audience mail, in response to Columbia's own programs, not only *did not fall off in summer but approximated the year's average in July and rose above it to a definite peak in August!* On this point, the new study published two charts, one made in 1930, the other covering the year 1933. In each case, the monthly mail response to non-commercial programs was plotted. To eliminate variables which would affect the validity of the result, all programs which made any special inducement for mail were eliminated. The charts are presented with this comment:

"The analyst will find special interest in the remarkable similarity of both curves during the interval from April to October. The agreement between the two curves, month by month, for these six months, is doubly significant in view of the fact that they represent two entirely different groups of programs, separated by a three-year interval. It is difficult to find commercial programs which, during twelve consecutive months, did not vary in respect to their inducements for audience mail. Two were presented in the 1930 study. In both of (*Continued on page* 37)

RADIO AT SUMMER RESORTS

Many holiday seekers will find radio installed in a big way at amusement places where it feeds the P. A. System

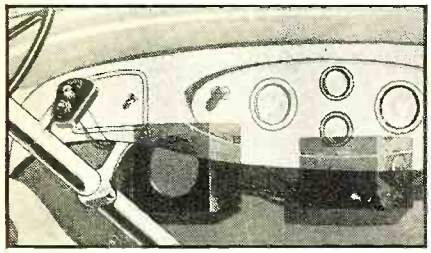




Newest PORTABLE SETS *(for Auto and Boat)*

Latest Set Simplifies Installation

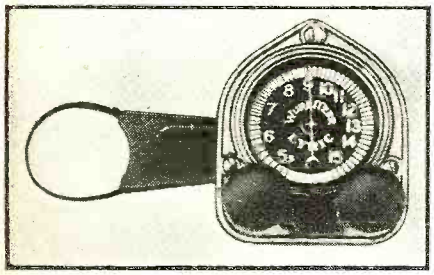
Announcement is made of the new Stromberg-Carlson model 33A automobile set designed for easy and quick installation. The large speaker, 8¼ inches in diameter, is mounted in a wooden case to obtain the maximum in tone values, and to reduce mechanical vibration when operated at full volume. The radio container and the speaker case are each mounted by a single



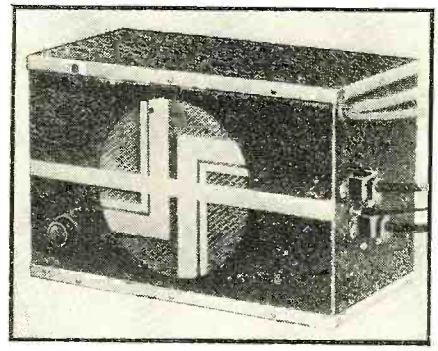
bolt. The power supply employs the self-rectifying type of vibrator converter. The key to lock the remote control unit also serves as the volume control. The six tube superheterodyne circuit uses the following type tubes: one 78, one 6A7, one 6B7, one 37 and two 41 type tubes in a push-pull power output stage.

A Self-Contained Model

The Wurlitzer-Lyric model 460 motor car set is combined with the loud speaker



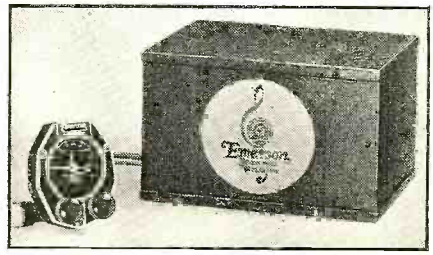
and the B eliminator in the one metal container which measures 11 inches by 7 inches by 5½ inches. The case is attractively finished in black crackle with silver trim and the speaker grille is of modernistic design with silver trim. The remote control (airplane type dial) is finished in black and silver. The manufacturer points out the following features of this six tube receiver: a six-inch dynamic type speaker, improved



superheterodyne circuit, three watts undistorted power output, delayed automatic volume control, noise elimination circuit, and tone control. The tuning dial is calibrated in kilocycles and is brightly lighted for easy selection of stations.

A New "Dashboard" Six-Tube Super

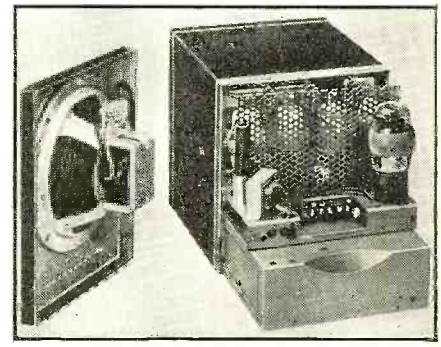
Motor car radio enthusiasts will be interested in the new Emerson model 965 single-unit superheterodyne automobile receiver. The tube equipment includes two 78's, one 6A7, one 75, one 41 and one 84 type recti-



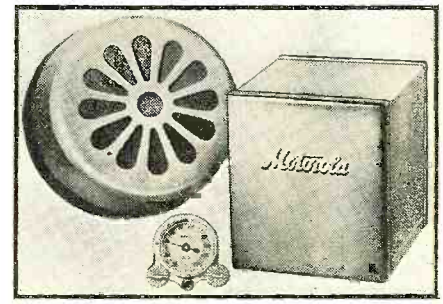
fier. The superheterodyne circuit employs two tuned r.f. circuits, diode detection, an electron-coupled oscillator and delayed automatic volume control. The intermediate frequency is 175 kilocycles. To mount the receiver it is only necessary to drill two holes. In addition to the tubes the set comes complete with noise suppressors.

New Six- and Eight-Tube Car Receivers

The photograph directly below shows the new Motorola Dual-Six motor car set. This is a single unit job with the speaker, receiver chassis and power unit enclosed in one metal case. The set utilizes the following type tubes; two 78's, one 77, one 75, one 42 and one 84 type rectifier. The second illustration covers the Motorola model Twin-8 automobile receiver. The large size dynamic type speaker is enclosed in a separate container. This circuit has the following tube equipment: two 78's, one 77, one 85, one 37, two type LA tubes and one 84 type rectifier. Due to the design and construction of the Twin-8 set, it can be installed either in the engine or driver's compartment. Both receivers are equipped with the new universal type of remote con-



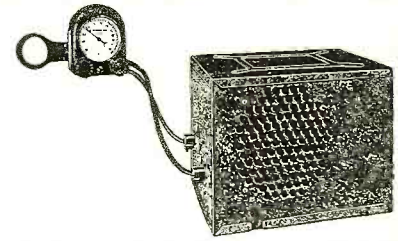
trol which can be quickly and easily mounted on the steering post or instrument



panel. A tone regulator is operated from the remote unit.

A Compact Five-Tube Design

The illustration covers the new Crosley Roamio model 5A1 five-tube motor car receiver, equipped with automatic volume control, the new synchronode power supply

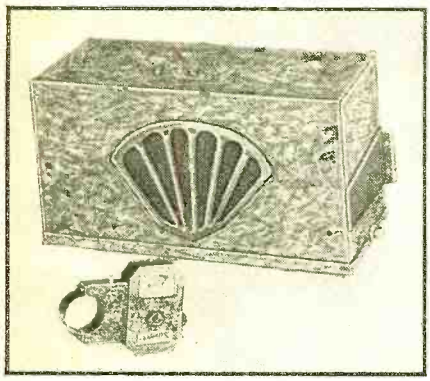


unit, tone control, airplane type dial and a six-inch full floating dynamic type speaker. The set is of single unit design and the superheterodyne circuit uses the following type tubes: three 78's, one 6B7, and one type 41 power tube. A kit of ignition noise suppressors for an eight cylinder car, are included with the receiver.

A Single-Unit Set

The new Lafayette six-tube superheterodyne motor car set measures 12 inches by

6¼ inches by 5½ inches. The set has been designed for simplicity of installation and ease of operation. The radio chassis, loud speaker and B eliminator are housed in the one metal case. This metal container is

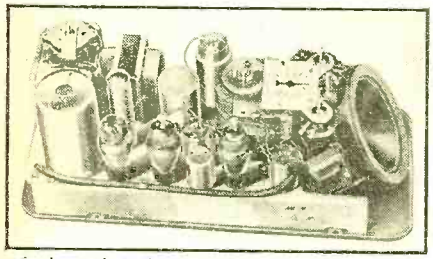


so arranged for mounting that it may be hung on brackets from the underside of the instrument board or placed on the floor board alongside of the driver's seat. The manufacturer advises that the reproducer employed in this car set, although small in size, is designed to handle large volume and provide fine quality. The total current drain is 4.85 amperes. Six tuned circuits are used, and the various vacuum tubes and their functions are: one type 77 as a combined first detector and oscillator, two type 78's for the r.f. and i.f. amplifier stages, one type 75 as second detector, automatic volume control and first a.f. amplifier, one type 41 in the power output stage and one 84 type rectifier tube.

A Universal Receiver

The RCA Victor "Portette" model M-116 superheterodyne receiver can be used

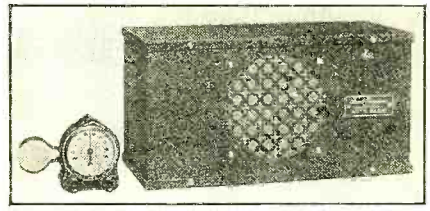
in the home or in the automobile. It is designed to operate from either 110 volt 60 cycle lighting supply or from the automobile storage battery. Two distinct and independent power circuits, for excitation



of the tubes from either of these supply sources are contained in this receiver. The battery circuit embodies a synchronous vibrator mechanism of the full-wave type whereas the a.c. operated circuit employs a tube rectifier. These functions are interchangeable by simply turning a switch accessible from the outside of the case and by substituting power cords. This new type of receiver should find great favor with tourists, marine radio enthusiasts and commercial travelers. Receiver chassis, reproducer and the two B battery eliminators are enclosed in a light-weight metal cabinet finished in Morocco brown, the dimensions of which are: 17½ inches long by 7¼ inches high by 8 inches wide. All controls are located on top of the case permitting easy adjustments. The tube equipment comprises one 78, one 6A7, one 6B7, one 41 and one 1V type rectifier.

A Superheterodyne with Built-In Power and Speaker

An interesting announcement for motor car radio enthusiasts was recently made concerning the new Freed-Eisemann model 464 automobile receiver. The tubes employed in the circuit comprise one 78 for the r.f. stage, a 6A7 for the combined oscillator and first detector, one 78 for the i.f. stage, one 75 for the second detector, one



12A5 for the power stage and a 6Z4 type rectifier. The frequency of the intermediate amplifier is 177 kc. The full-vision airplane type illuminated control unit is designed for attachment to the steering column. The control unit is connected to the radio by two flexible drive cables; one cable rotating the tuning condensers and the other operating the combined on-off switch and volume control. The receiver measures 12 inches wide by 7 inches high and 7 inches deep, the weight is 22 lbs.

A Unique Motor-Car Receiver

The General Electric model B52 portable car set illustrated below, is a new design in automobile receivers. It is made to operate from either the car storage battery or 110 volt 60 cycle a.c. line supply. It can be placed anywhere in the car, or moved around from place to place as desired, either in the car, the boat or the home. The set is equipped with two separate power units. The receiver chassis, speaker unit and the power units are enclosed in the one metal case measuring 17½ inches long by 7½ inches wide by 6¾ inches high. It employs a superheterodyne circuit and is equipped with tone con-

trol, automatic volume control and an airplane type illuminated dial.

Compact Receiver

Description—The Allied Radio six-tube motor car set measures only 8¾ inches by 6¼ inches by 6 inches. It is of single unit construction and is designed for easy in-

stallation in any make of automobile. It is also adapted to marine installation. It is equipped with vernier illuminated airplane type dial and the tube equipment is as follows: one 6A7, one 41, one 75, two 78's and one 84 type rectifier.

Car Radio with Extension Speaker

The new Sparton model 36 auto receiver is housed in a heavy stamped steel case, cadmium plated. The six-inch electrodynamic type speaker is enclosed in a wooden container made for single hole mounting. This is quite a convenience as the speaker can be quickly dismounted and connected to an extension cord for use at picnics and

(*Continued on page* 37)

THESE SETS ARE FINE FOR BOATING HOLIDAYS

The receivers shown on these pages can be equally well applied to boats and automobiles. They solve the problem of the summer vacation while touring or cruising

110 VOLT A. C. SUPPLY *for* CAR *or* BOAT

Nat Pomeranz

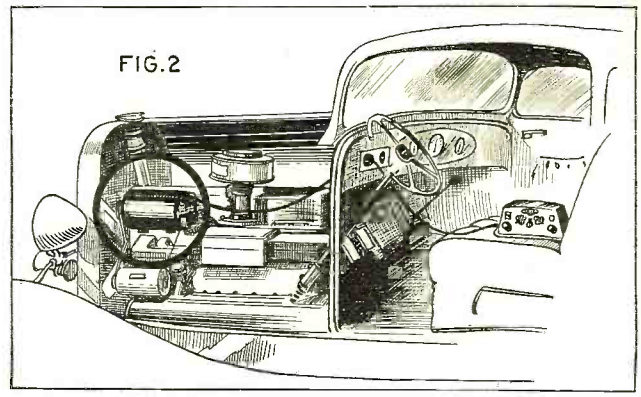


FIG.2

THE author recently held an interesting radio conversation with Mr. Thomas W. Rochester, chief engineer of the New York City Police Department, the man to whom the people of New York City are indebted for its efficient police radio installation. Our talk concerned itself with mobile radio receiver and transmitter installations and, logically enough, the new alternator power device which operates from an automobile or a boat motor fan-belt to produce 110 volts 60 cycles alternating current, came in for its share of attention.

Mr. Rochester said he had worked with inductor-alternator generators years ago but that the difficulty in the past, when applying this type of power device to mobile equipment was that the variable speed of the motor car engine resulted in corresponding variations in the voltage output, making it impossible to apply the device to any practical use.

Recent developments, however, have rectified this condition by taking the excitation current from the car charging generator. As the speed of the car motor increases—but I am getting ahead of my story and it will be best to start from the beginning.

The Powerack generators recently placed on the market are of this type and supply 110 volts alternating current. They are available in five models, rated at 100, 150, 250, 350 and 500 watts. These generators operate from the motor fan-belt of a pleasure car, truck or a motor boat and offer plenty of power for operating a.c. radio receivers, public-address system, neon signs, portable lights and numerous other devices that will suggest themselves.

There are four windings on the stator section of this new generator. Two of these windings placed opposite to each other are for excitation purposes. The remaining two stator windings collect the alternating current. The rotor of the unit consists of solid laminations. The regular battery charging generator delivers the required excitation voltage of from five to seven volts (depending upon the speed of the charging generator) to the two excitation windings of the Powerack. The fan-belt of the motor rotates the toothed rotor section of the alternator which in passing the field magnets, forms an easy path for the magnetic field to one of the stator windings and thereby induces an e.m.f. in the stator windings that collect the alternating current. This e.m.f. varies with the excitation current and the speed of the rotor. The frequency of the a.c. output also depends on the speed of the rotor.

All this, of course, is also proportionate to the ratio of the number of turns in the collector windings to the number of turns in the exciter windings. Therefore, with the proper application of this ratio, approximately 110-volt, 60-cycle alternating current is obtained. While not absolutely constant the output voltage variations are held within the range required to effectively operate any a.c. equipment, whether radio receiver, electrical sign, etc. In many homes the line voltage varies 15 to 20 volts during the day and present day transformers, receiving and transmitting tubes are designed to operate over this range.

At a running speed of the car motor just sufficient to start the charging generator the voltage output of the Powerack is approximately 96 to 108 volts, depending on the model employed. When the motor is turning over at a driving speed of 25 miles per hour, the output voltage of the device reaches its highest point of approximately 120-128 volts at full load. This is due to the fact that at this speed the car or motor boat charging generator delivers its highest output voltage. At higher speeds, the output voltage of the charging generator decreases causing a corresponding decrease in the output voltage of this alternator. The characteristic output voltage curves at different speeds for Models 22, 24 and 26 are shown in the chart in Figure 3.

As mentioned previously the frequency of the power device varies with the engine speed. This is better explained by the following formula: The frequency is equal to the speed, times the cycles per revolution divided by the number of seconds. This unit is four pole job which means two cycles per revolution and as an example at a speed of 1800 r.p.m. this figure multiplied by 2 gives the sum of 3600. This sum divided by 60 provides the answer of 60 cycles at this speed. Therefore, with the change in speed at which the rotor turns, the frequency can vary from a minimum of approximately 50 to a maximum of 200 (at a driving speed of about 50 miles per hour) cycles, but never lower than 50 cycles. This will not effect the power transformer since these units only overheat when they are operated on (*Continued on page* 60)

THE NEW ALTERNATOR

Driven from the fan belt of an automobile or marine engine, this alternator provides up to 175 watts output; ample power for P. A. systems, standard a.c. receivers, etc.

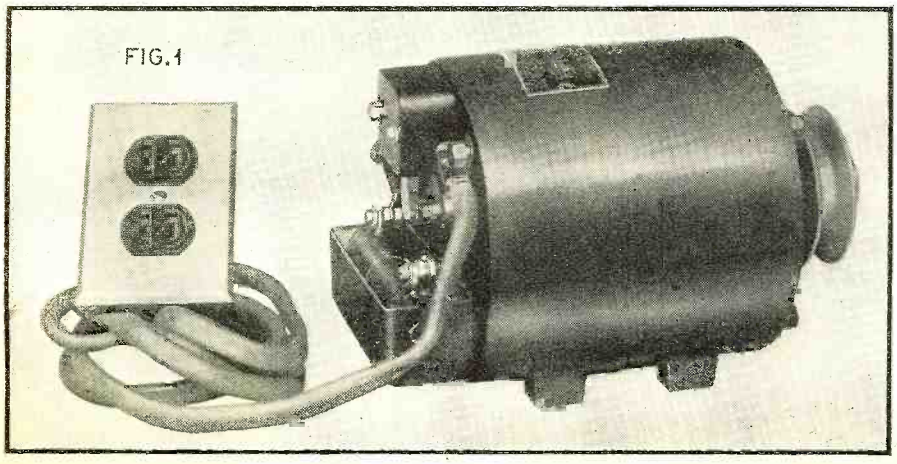


FIG.1

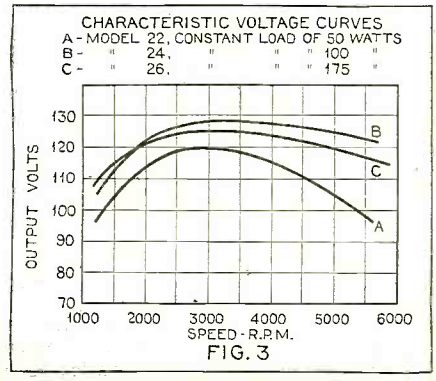
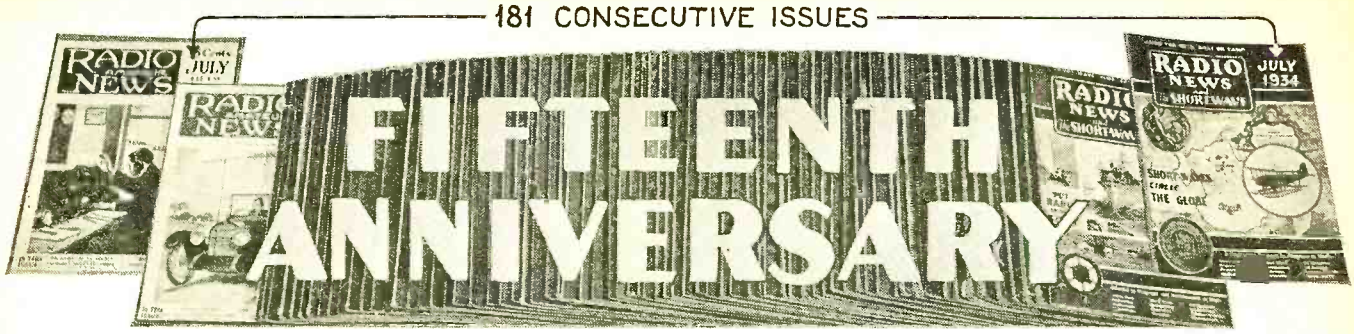


FIG. 3



Fifteen years of radio development and improvement wrapped up in 181 consecutive issues of RADIO NEWS is an accomplishment to be proud of. The magazine is now being sought eagerly in more than 75 countries, in addition to its large circulation in the United States. A short résumé of its history follows

THE publication of this issue marks the 15th anniversary of RADIO NEWS; a total of 181 consecutive issues have gone to press since the magazine's inception in 1919. In this decade and a half RADIO NEWS has reported and recorded the swift and dramatic strides made in all phases of the science, art and industry. The cavalcade of invention, development and improvement during this period is reflected in the magazine's volumes which have kept readers informed of every advancement and have pointed the way for future trends.

RADIO NEWS has pioneered the advance of the early amateur radio experimenter and has always fostered research and development both as a hobby and as a vocation. Many of the leaders in the industry today have gotten their first introduction to radio through its pages. RADIO NEWS has pioneered the successive developments of the multi-tube set, the a.c. tubes, hearing apparatus for the deaf, application of electronic principles to industry, television, automobile, aircraft and marine radio, radio prospecting equipment and the extension of broadcasting on the short waves. It is read not only in the United States but in more than 76 foreign countries. It is read by engineers and experimenters, by the trade and is of special interest to the modern dealer and serviceman. Radio inventors, both private and connected with large industrial laboratories, sing its praises. Army and Navy radio officials of many governments subscribe to RADIO NEWS. Commercial operators the world over find it their friend and informer. The short-wave fan and the DX hobbyist know it solves their problems and welcome it for its accurate station lists and time-tables.

The first issue of the magazine, dated July, 1919, was published under the name of "Radio Amateur News." But the middle name was soon dropped as the field rapidly grew in scope and the publication was subscribed to by many industrial and scientific readers. The purpose of the magazine originally was to fill the demand of early radio experimenters for information on the then new and interesting art.

The World War had trained many young men in radio and had initiated them into the secrets of radio-telephone transmission and along with the advent of broadcasting, the magazine helped them to carry on their radio experimentation after the war as a hobby. Since 1919 constantly growing numbers of readers sought RADIO NEWS for its enlightening articles on radio's new advances and for specific information, both from a standpoint of technical design and maintenance, on the new advances as they were being made. Galena detectors and single-tube receivers with headphones soon gave way to multi-tube sets and loudspeakers. The magazine has recorded every phase of this development. Multi-knob radio cabinets, studded with binding posts and switch-contact points, later gave way to neater and more efficient sets with simplified tuning methods. The advent of battery eliminators and in turn the a.c. tube brought countless new experimenters to the radio community and contributed to the swift growth of the industry. Broadcasting, too, showed great progress. Programs gained in entertainment value as the biggest names in the amusement world joined radio's ranks. The development of network broadcasting assured listeners everywhere of receiving the best available talent. And now, with short-wave international broadcasting gaining rapidly in popularity and with television somewhere in the offing, the industry is starting another great surge ahead to higher achievement, and RADIO NEWS still remains the alert observer, the informing friend of scientists and amateurs alike, presenting authoritative reports on each bit of progress.

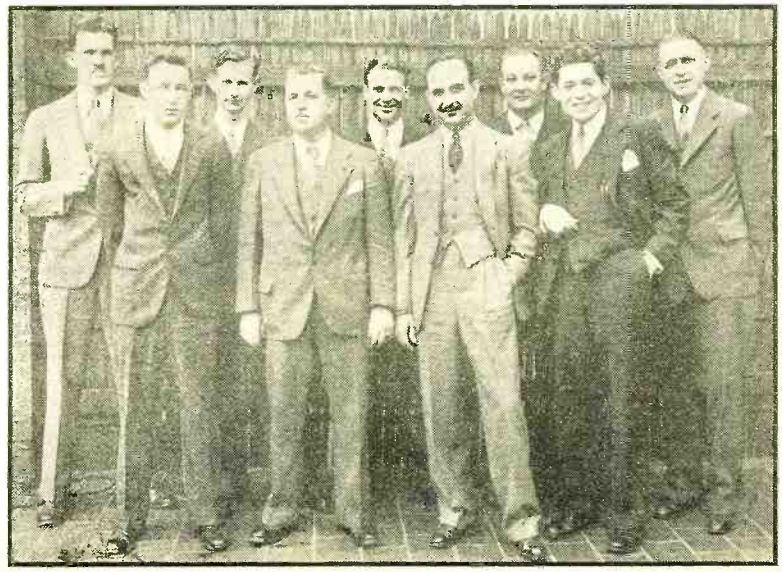
In 1925 the publishers inaugurated their own broadcasting station, WRNY, with headquarters in the Hotel Roosevelt, New York City. A sister station, W2XAL, operating on the short waves, was launched during the same year, becoming one of the world's first short-wave broadcasters. These stations were among the best known in that period.

In May, 1929, Arthur H. Lynch, formerly editor of *Radio Broadcast*, was appointed editor of RADIO NEWS. The ownership of stations WRNY and W2XAL was transferred to the Curtis aviation interests under the name of Aviation Radio Stations, Inc. A few months ago WRNY was combined with WHN, along with WQAO and WPAP, to effect a full-time station for Loews, Inc., and Metro-Goldwyn-Mayer, theatrical and motion picture interests.

(*Cont'd on page* 49)

MEN WHO ARE MAKING RADIO NEWS

Front row, left to right, Robert Becker, Laurence M. Cockaday, Leo Morey, Samuel Kaufman. At rear, left to right, S. Gordon Taylor, John M. Borst, Howard S. Pearse, Joseph F. Odenbach, William C. Dorf



PIONEERS

Official RADIO NEWS Listening Post Observers

LISTED below by States are the Official RADIO NEWS Short-Wave Listening Post Observers who are serving conscientiously in logging stations for the DX Corner.

In the United States of America:

Alabama, J. E. Brooks; **California,** E. G. DeHaven, C. H. Canning, E. S. Allen, A. E. Berger; **Colorado,** Wm. J. Vette, F. Erich Bruhn; **Florida,** E. M. Law, James F. Dechert; **Georgia,** James L. Davis, S. H. Armstrong, Guy R. Bigbee; **Idaho,** Bernard D. Starr; **Illinois,** Philip Simmons, E. Bergeman, Robert L. Weber, Floyd Waters; **Indiana,** Freeman C. Balph, J. R. Flannigan; **Iowa,** J. Harold Lindblom; **Kansas,** C. W. Bourne, Wm. Schumacher; **Kentucky,** Wm. A. McAlister, George Krebs; **Maine,** R. I. Keeler; **Maryland,** Howard Adams, Jr., James W. Smith; **Massachusetts,** Armand A. Boussy, J. Walter Bunnell, Harold K. Miller, Donald Smith, Elmer F. Orne, Arthur Hamilton, Roy Sanders; **Minnesota,** Dr. G. W. Twomey; **Mississippi,** Dr. J. P. Watson, Mrs. L. R. Ledbetter; **Missouri,** C. H. Long; **Nebraska,** P. H. Clute, G. W. Renish, Jr., Harold Hansen; **New Hampshire,** P. C. Atwood, A. J. Mannix; **New Jersey,** William Dixon, R. H. Schiller, William F. Buhl; **New Mexico,** G. K. Harrison; **New York,** R. Wright, I. H. Kattell, Donald E. Bame, Albert J. Leonhardt; **Nevada,** Don H. Townsend, Jr.; **North Carolina,** H. O. Murdoch, Jr., W. C. Couch, E. Payson Mallard; **North Dakota,** Dr. F. C. Naegeli; **Ohio,** Oker Radio & Electric Shop, R. W. Evans, C. H. Skatzes, Donald W. Shields; **Oklahoma,** H. L. Pribble, Robert Woods; **Pennsylvania,** Edward C. Lips, K. A. Staats, C. T. Sheaks, George Lilley, John A. Leininger, F. L. Stitzinger, Hen F. Polm, Chas. Nick; **South Carolina,** Edw. F. Bahan; **Tennessee,** Charles D. Moss, Adrian Smith; **Texas,** Heinie Johnson; **Utah,** Harold D. Nordeen; **Vermont,** Joseph M. Keeley, Eddie H. Davenport; **Virginia,** Gordon L. Rich, G. Hampton Allison, D. W. Parsons; **Washington,** A. D. Golden, Glenn E. Dubbe, Chas. G. Payne; **West Virginia,** Kenneth Boord, R. E. Sumner; **Wisconsin,** Willard M. Hardell, Walter A. Jasiorkowski.

Applications for Official Observers in the remaining States should be sent in immediately to DX Corner. Listeners outside of the United States who feel that they would like to serve in this capacity are also requested to file their applications as soon as possible before final appointments are made.

S. W. TIME SCHEDULE

LAURENCE M. COCKADAY

IN the 16th installment of the DX Corner for Short Wave, we find a leading feature entitled "World Short-Wave Time Table," in which are listed the month's International Short-Wave Best Bets. This time table contains a list of short-wave stations logged during the last month in the RADIO NEWS Westchester Listening Post in Pelham. Another feature is seen below entitled "Short-Wave Sure Shots." It lists (for American listeners) a number of short-wave stations easily received at various times of the day and indicates the time of their best reception in America for both a.m. and p.m. Wavelengths and frequencies for the calls shown are given in the station location list.

Reception Conditions This Month

O. R. N. S. W. L. P. O.'s tell us that the 49-meter band has gotten quite noisy, and we agree with them. But the 19- and 25-meter bands have shown up with tremendous volume. The 31-meter band also has been excellent until sometime after dark, however. During the next thirty days we look for a continuation of these conditions with some startling DX records to be hung up on the shorter wavelengths.

Outstanding Short-Wave Reception Features

Again we have to give the Byrd short-wave broadcasts and rebroadcasts credit. Another item that is creating considerable interest is the Seth Parker Expedition with the call letters KNRA. Another item that was filled with interest was the transmissions along the route of the recent trans-continental flight of the dirigible "Macon," with a special reference to the control stations along the route. Other features of interest to short-wave fans were the I.D.A. special programs for DX'ers, from a number of stations all over the world.

COC Transmissions

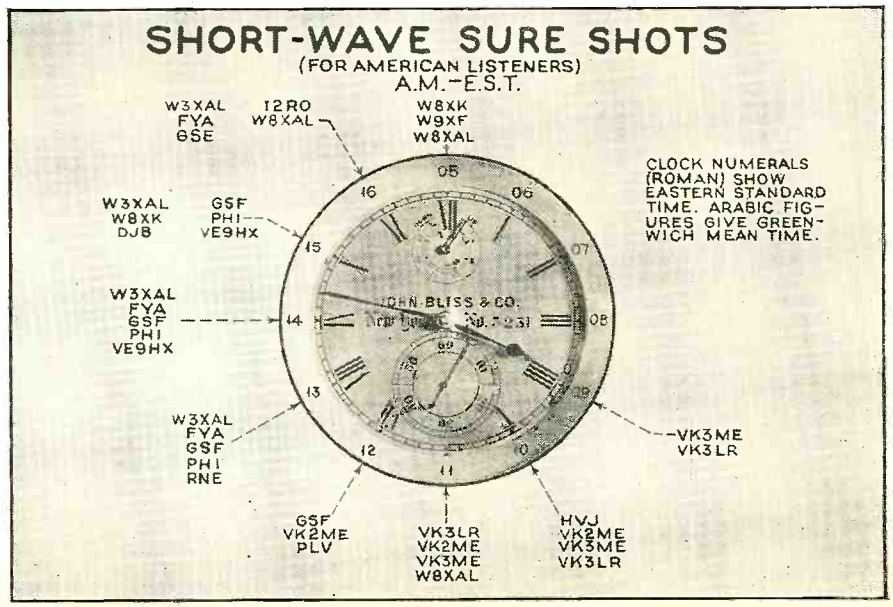
An official communication from short-wave radio station COC, P. O. Box 98, Havana, Cuba, states that this station is on the air, daily, from 4 to 6 p.m., E.S.T., on 6010 kc. (They have been heard before and after this, however.)

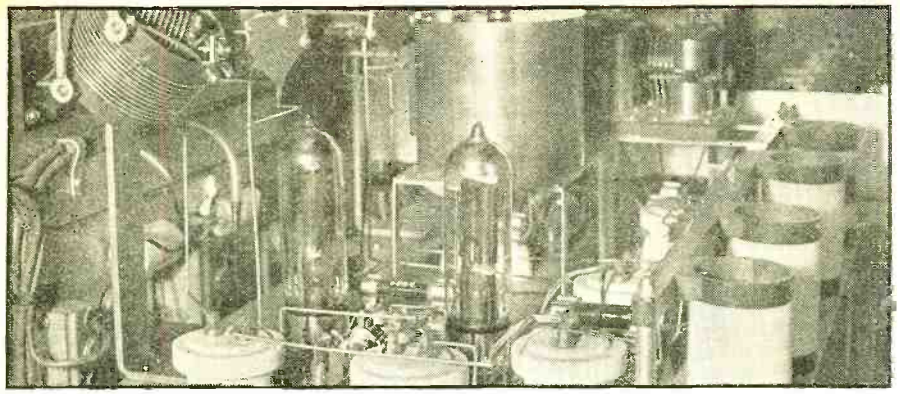
W8XAL Transmissions

An official communication from radio station W8XAL states that they are transmitting on 6060 kc., from Cincinnati, Ohio, from 6:30 a.m., E.S.T., to 1:30 a.m., except on Sundays, when they start at 7 a.m. and sign off at 1 a.m. the following morning.

Columbia Short-Wave Schedules

An official communication from the Columbia Broadcasting System states that W2XE, New York, is on the air daily on 15270 kc. from 11 a.m. to 1 p.m. on 11830 kc. from 3 to 5 p.m., and on 6120 kc. from





PART OF THE TRANSMITTER, HAS-HAT, BUDAPEST

A portion of the tube circuits at Station HAS-HAT located in the Research Laboratories for Electrical Communications of the Royal Hungarian Post Office Authority. The transmitter's total output is 5 kw. and the antenna employed is directional, pointed westward so it should be heard in America, generally

6 to 11 p.m. Station W3XAU in Philadelphia is on the air daily on 9590 kc. from 8 p.m. to 1 a.m. All time is E.S.T.

LCL Transmissions

An official communication from the Director General of the Administration des Telegraphs du Royaume de Norvege, at Oslo, states that short-wave station LCL, on the island of Jeloy, transmits daily from 16 to 22 G.M.T. A dipole antenna is used with a power of 1 kw. The frequency is 6990 kc.

VE9CS Transmissions

An official communication from radio station VE9CS, at Vancouver, B. C., states that they are on the air, daily, from 3 to 4:30 p.m., P.S.T. On Tuesdays, also, from 8:30 to 10:30 p.m., P.S.T., and on Sundays from 10:45 to 6 p.m. and from 7:30 p.m. to 10 p.m., P.S.T. The frequency is 6070 kc. and the power varies between 2 and 10 watts.

HI1A Transmissions

An official communication from radio station HI1A, Santiago de los Caballeros, Republica Dominicana, states that they are on the air, daily, on 47.8 meters or 6272 kc., from 8 p.m. to 12:30 p.m. On Sundays they run a special program for short-wave listeners at 1 a.m. They have a regular program, on Sunday, from 4:30 p.m. to 12 midnight, local time (Meridian 70). They have a power of 7½ watts and their air slogan is "La Voz del Yaque."

HAS-HAT Transmissions

An official communication from the Research Laboratories for Electrical Communications of the Royal Hungarian Post Office Authority, at Budapest, states that this station is 30 miles southwest of Budapest and transmits, irregularly, from 5:45 to 23 G.M.T., on a wavelength of 43.86 and also on 21.92 meters. The output power is 5 kw. and the antenna directed towards the west.

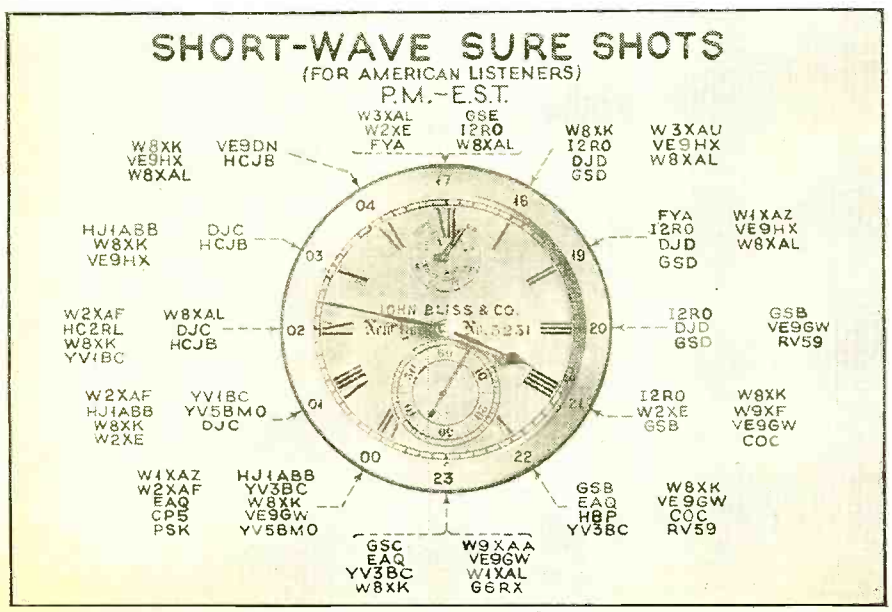
British Empire Transmissions

An official communication from the British Broadcasting Company states that the Empire transmissions will be as shown in this month's "World's Short-Wave Time-Table," with the following alternatives: GSC or GSA may be substituted for GSB; GSD may be substituted for GSE; GSC may be substituted for GSB or vice versa.

Listening Post Observers and Other Fans, Get Busy!

Listed below is some partial information regarding stations heard and recorded by our World-Wide Listening Posts. Can you supply actual Time Schedules for them as well as correct frequencies, etc.? There are some "hard ones," so get busy and try your skill in logging these stations correctly:

JMK (some say it is J1AA) on 15760 kc. Some reports quote J1AA from 9 to 12, G.M.T., as on either 7880 kc. or 9870 kc. alternately.



PIONEERS

Official RADIO NEWS Listening Post Observers

LISTED below by countries are the Official RADIO NEWS Short-Wave Listening Post Observers who are serving conscientiously in logging stations for the DX Corner:

Australia, C. N. R. Richardson, C. Arthur Matthews.
Brazil, W. W. Enete.
British Guiana, E. S. Christiani, Jr.
British West Indies, E. G. Derrick.
Canada, Douglas Wood, Jack Bews, A. G. Taggart, W. H. Fraser, Robert Edkins, Charles Eugene Roy.
Cuba, Frank H. Kydd.
England, Kenneth Judd, C. L. Wright, John L. Maling, Alan Barber, Donald Burns, L. H. Plunkett-Checkemian, L. H. Colburn, Norman C. Smith and John Parkinson, Norman Nattall, L. C. Styles.
France, J. C. Meillon, Jr.
India, D. R. D. Wadia.
New Zealand, Dr. G. Campbell MacDiarmid, Kenneth H. Moffatt.
Philippine Islands, Victorino Leonen.
South Africa, C. McCormick, Mike Kruger.
Switzerland, E. J. de Lopez, Dr. Max Hausdorff
Venezuela, Francisco Fossa Anderson.

Applications for Official Observers in the remaining countries should be sent in immediately to the DX Corner. Listeners outside of the United States who feel that they would like to serve in this capacity are here requested to file their applications as soon as possible before final appointments are made.

KNRA of the Seth Parker Expedition has been reported as heard at 10 p.m., C.S.T., 6160 kc.; on 13 megacycles at 8 a.m., C.S.T., as well as the remaining frequencies and wavelengths to follow: 8840 kc., 12345 kc., 12240 kc., 660 kc., 6423 kc. and also on 45 meters.

Some Listening Posts report XETE as announcing "XEAL," at times. This is probably the relay of the chain broadcast and the long wavelength call gets through once in a while.

Station PSK can be heard announcing "PRA3" often. (Probably the same goes as the foregoing.)

KKH has been reported on 7520 kc. at 9:45 p.m., C.S.T.

Who has heard PRA8 on 49.1 meters? It is reported as Pernambuco and has been heard at 9 p.m., E.S.T.

XENT reported on 69 meters, from 7 to 11 p.m., C.S.T., as Neuvo Laredo, Mexico.

CJRX is the new call of VE9JR, heard after 8 p.m., E.S.T.

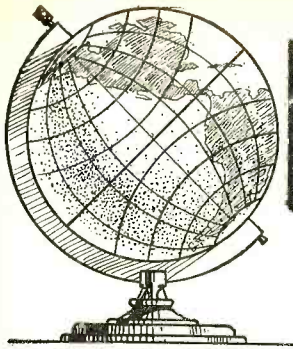
XQAJ, Shanghai, China, has been variously reported as on 51.7 meters, 52.7 meters and 52.9 meters. Who knows its exact wavelength and schedule?

Singapore has been reported on 49.9 meters, from 6 to 8 a.m., M.S.T. Who knows the call letters?

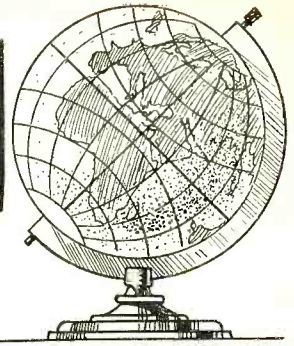
VUB, Bombay, India, has been reported on 49.5 meters, 7 to 9 a.m.

RFN, Khabarovsk, U. S. S. R., reported

(*Continued on page* 18)



WORLD SHORT WAVE TIME-TABLE



The schedule of short-wave broadcasting stations listed below includes only those that are received best in RADIO NEWS LISTENING POSTS. This new schedule is from 9 G. M. T. up to 06 G. M. T. Both wavelength and frequency are noted for each station. Station locations are found on page 18.

International Short-Wave "Best Bets"

Wavelengths in Meters	*Call Letters*	*Frequency in k.c.*
9 G. M. T. 4 A. M. E. S. T.		
28.1	CEC	10670
30.5 Irregular	J1AA	9870
31.5 Wed., Sat.	VK3ME	9510
38.?	JOBK	7800
49.9+ Ex. Tu., Th., Sat.	RV59	6000
70.2 Except Sun.	RV15	4273
10 G. M. T. 5 A. M. E. S. T.		
19.8+ Except Sun.	HVJ	15123
30.5	J1AA	9870
31.2+ Sun.	VK2ME	9590
31.3 Except Sun.	VK3LR	9585
31.5 Wed., Sat.	VK3ME	9510
38.?	JOBK	7890?
42.9+ Irregular	LCL	6990
50.2 Sun.	HVJ	5969
52.9+	XQAJ	5660
70.2 Except Sun.	RV15	4273
11 G. M. T. 6 A. M. E. S. T.		
13.9+	LSN	21540
13.9+	GSH	21450
19.7	DJB	15200
19.8	GSF	15140
25.1+ Sun.	RNE	11924
30.5	J1AA	9870
31.2+ Sun.	VK2ME	9590
31.3 Except Sun.	VK3LR	9579
31.3+	DJA	9560
31.5 Wed., Sat.	VK3ME	9510
38.?	JOBK	7890?
42.9+ Irregular	LCL	6990
49.4+ Except Sun.	W8XAL	6060
52.9+	XQAJ	5660
70.2 Except Sun.	RV15	4273
12 G. M. T. 7 A. M. E. S. T.		
13.9+	LSN	21540
13.9+	W8XK	21540
13.9+	GSH	21450
16.9+ Ex. Tues., Wed.	PHI	17740
19.6+	FYA	15243
19.7	DJB	15200
19.8	GSF	15140
23.3+ Sun.	CNR	12830
24.5+ Sun.	CT1CT	12229
26.0	XGR	11530
31.2+ Sun.	VK2ME	9590
31.3 Except Sun.	VK3LR	9579
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.8	PLV	9415
49.0+ Except Sat., Sun.	VE9HX	6110
49.2 Fri., Sat.	VE9GW	6095
49.4+	W8XAL	6060
49.5 Tues., Thurs.	OER2	6060
49.6	W1XAL	6040
16 G. M. T. 11 A. M. E. S. T.		
13.9+	LSN	21540
13.9+	W8XK	21540
16.8+	W3XAL	17780
17.3+ Fri.	W3XL	17300
19.6+	W2XE	15270
19.7	W8XK	15210
25.2	FYA	11900
46.5	HJ1ABB	6450
25.3	GSE	11865
25.4	I2RO	11810
26.8 Sun.	CT3AQ	11180
31.2+ Sun.	VK2ME	9590
31.3+	W1XAZ	9570
31.5+	GSB	9510
36.2+	CM6XJ	8265
40.5 Except Sun.	HJ3ABD	7402
42.9+	LCL	6990
47.8 Tues., Fri.	HI1A	6272
49.0+ Sun.	VV1BC	6112
49.0+ Except Sat., Sun.	VE9HX	6110
49.2 Fri., Sat., Sun.	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.4+	VQ7LO	6060
49.4+	W8XAL	6060
49.5 Tues., Thurs.	OER2	6060
49.6 Sun.	W1XAL	6040
50.2	HJ2ABC	5973
17 G. M. T. 12 Noon E. S. T.		
13.9+	LSN	21540
13.9+	W8XK	21540
16.8+	W3XAL	17780
17.3+ Fri.	W3XL	17300
19.6+	W2XE	15270
19.7	W8XK	15210
25.2	FYA	11900
25.3	GSE	11865
25.4	I2RO	11810
25.5	DJD	11760
25.6 Irregular	FYA	11720
26 Irregular	XAM	11530
30.6+ Irregular	GCW	9790
31.2+	W3XAU	9590
31.2+ Sun.	VK2ME	9590
31.3+	W1XAZ	9570
31.5+	GSB	9510
40.5 Except Sun.	HJ3ABD	7402
42.9+	LCL	6990
45.3+	RV72	6611
46.5	HJ1ABB	6450
47.5 Sun.	HIZ	6315
47.8 Tues., Fri.	HI1A	6272
25.4	I2RO	11810
25.5	DJD	11760
25.5	GSD	11750
28.9+	LSX	10350
29.0+	ORK	10330
30.5+ Irregular	IRM	9820
30.6+ Irregular	GCW	9790
31.2+	W3XAU	9590
31.3+	W1XAZ	9570
31.5	GSB	9510
37.3 Sun	CNR	8035
42.9+	LCL	6990
43.8+	HAS	6840
47.8 Sun.	HI1A	6272
49.0+ Sun.	YV1BC	6112
49.0+ Except Sat., Sun.	VE9HX	6110
49.2	VE9GW	6095
49.3+ Sun.	VE9CS	6070
49.3+ Irregular	W9XAA	6080
49.3+ Sun.	VE9CS	6070
49.4+	VQ7LO	6060
49.4+	W8XAL	6060
49.5 Tues., Thurs.	OER2	6060
49.5 Temporary	OXY	6600
49.8+	DJC	6020
49.8+ Irregular	COC	6010
49.9+	RV59	6000
21 G. M. T. 4 P. M. E. S. T.		
17.3+ Fri.	W3XL	17300
19.5 Tues., Fri. Temp.	CT1AA	15380
19.7	W8XK	15210
24.5 Thurs.	CT1CT	12229
25.2	FYA	11900
25.2	W8XK	11870
25.3 Temporary	W1XAL	11850
25.3+	W2XE	11830
25.4	I2RO	11810
25.5	DJD	11760
25.5	GSD	11750
29.0+	ORK	10330
30.5+ Irregular	IRM	9820
30.6+ Irregular	GCW	9790
31.2+	W3XAU	9590
31.5	GSB	9510
37.3 Sun.	CNR	8035
42.9+	LCL	6990
43.8+ Irregular	HAS	6840
47.5	HIZ	6315
47.8 Sun.	HI1A	6272
48.8+	W8XK	6140
49.0+ Sun.	YV1BC	6112
49.0+	VE9HX	6110
49.1 Except Sat.	W9XF	6100
49.2 Except Fri., Sat.	VE9GW	6095
49.3+	VE9CS	6070
49.3+ Irregular	W9XAA	6080
49.3+ Sun.	VE9CS	6070
49.4+	W8XAL	6060
49.3+	VE9CS	6070
49.3+	W9XAA	6080
49.3+	VE9CS	6070
49.3+ Temporary	YV5BMO	6070
49.4+	W8XAL	6060
49.5 Temporary	OXY	6060
49.6 Irregular	W1XAL	6040
49.8+	DJC	6020
49.8+ Sun.	COC	6010
50.6 Tues., Thurs., Sat.	HJ4ABE	5860
69.4 Irregular	G6RX	4320
00 G. M. T. 7 P. M. E. S. T.		
15.9+ Except Sat., Sun.	PLE	18860
25.2	W8XK	11870
25.5	GSD	11750
25.6	FYA	11720
28.9+	LSX	10350
30.4	EAQ	9860
30.5+ Irregular	IRM	9820
31.2+	XETE	9600
31.3	HBL	9580
31.3	GSC	9585
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.4+	W2XAF	9530
32.8+	CP5	9120
36.6+	PSK	8185
38.4+ Sat., Irregular	HBP	7790
40.5	HJ3ABD	7402
45.0+ Sun.	HC2RL	6668
46.1	HJ5ABD	6504
46.5	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
47.8	HI1A	6272
48.5	TGW	6180
48.7+	YV3BC	6150
48.8+	W8XK	6140
49.0	W2XE	6120
49.0+	YV1BC	6112
49.0+	VE9HX	6110
49.1+ Sat.	W3XAL	6100
49.2 Except Fri., Sat.	VE9GW	6095
49.3+	W9XAA	6080
49.3+	VE9CS	6070
49.3+ Temporary	YV5BMO	6070
49.4+	W8XAL	6060
49.6	W4XB	6040
49.6 Irregular	W1XAL	6040
49.5+ Sun.	COC	6010
49.8+	DJC	6020
50.1	TGX	5984
50.2	HJ2ABC	5973
50.4 Irregular	HJ2ABA	5880
50.6 Except Wed., Sun.	HJ4ABE	5860
69.4 Irregular	G6RX	4320
01 G. M. T. 8 P. M. E. S. T.		
25.2	W8XK	11870

THE WORLD SHORT

WAVE TIME TABLE

38.? JOBK 7890?
42.9+ Irregular LCL 6990
49.2 Fri., Sat. VE9GW 6095
49.4+ W8XAL 6060
52.9+ XQAJ 5660
70.2 Except Sun. RV15 4273

13 G. M. T. 8 A. M. E. S. T.

13.9+ LSN 21540
13.9+ W8XK 21540
16.8+ W3XAL 17780
13.9+ GSH 21450
16.9+ Ex. Tues., Wed. PHI 17740
17.2 J1AA 17380
19.6+ FYA 15243
19.7 DJB 15200
19.8 GSF 15140
23.3+ Sun. CNR 12830
24.5+ Sun. CT1CT 12229
25.1+ Sun. RNE 11924
25.3 GSE 11865
26.0 XGR 11530
31.2+ Sun. VK2ME 9590
31.3 Except Sun. VK3LR 9579
31.3+ W1XAZ 9570
31.3+ DJA 9560
31.8 PLV 9415
42.9+ Irregular LCL 6990
49.2 Fri., Sat. VE9GW 6095
49.4+ W8XAL 6060
49.5 Tues., Thurs. OER2 6060
49.5 Sun. OXY 6060
52.9+ XQAJ 5660
70.2 RV15 4273

14 G. M. T. 9 A. M. E. S. T.

13.9+ LSN 21540
13.9+ W8XK 21540
16.8+ W3XAL 17780
16.9+ Ex. Tues., Wed. PHI 17740
19.6+ FYA 15243
19.7 DJB 15200
19.8 GSF 15140
25.3 GSE 11865
26.0 XGR 11530
31.2+ Sun. VK2ME 9590
31.3 Except Sun. VK3LR 9579
31.3+ W1XAZ 9570
31.3+ DJA 9560
31.8 Except Sat., Sun. PLV 9415
42.9+ Irregular LCL 6990
49.1+ Sun. VV1BC 6112
49.0 VE9HX 6110
49.2 Fri., Sat. VE9GW 6095
49.4+ Irregular W8XAL 6060
49.5 Tues., Thurs. OER2 6060
49.6 W1XAL 6040
70.2 RV15 4273
80 Sun. CT1CT 3750

15 G. M. T. 10 A. M. E. S. T.

13.9+ LSN 21540
13.9+ W8XK 21540
15.2+ IRW 19700
16.8+ W3XAL 17780
16.9+ Ex. Tues., Wed. PHI 17740
19.6+ FYA 15243
19.7 W8XK 15210
19.7 DJB 15200
19.8 GSF 15140
19.8 VE9DN 15130
19.8+ Irregular HVJ 15123
25.3 GSE 11865
25.4 Sun. 12RO 11810
26.8 Sun. CT3AQ 11180
30.0 KAZ 9994
31.2+ Sun. VK2ME 9590
31.3+ W1XAZ 9570
31.3+ DJA 9560
31.8 Irregular PLV 9415
42.9+ Irregular LCL 6990
49.0+ Sun. VV1BC 6112
49.0+ Ex. Sat., Sun. VE9HX 6110
49.2 Fri., Sat., Sun. VE9GW 6095
49.3+ Irregular W9XAA 6080
49.4+ VQ7LO 6060
49.4+ W8XAL 6060
49.5 Tues., Thurs. OER2 6060
49.6 Irregular W1XAL 6040
49.8+ DJC 6020

18 G. M. T. 1 P. M. E. S. T.

13.9+ LSN 21540
13.9+ W8XK 21540
16.8+ W3XAL 17780
17.3+ Fri. W3XL 17300
19.7 W8XK 15210
25.2 FYA 11900
25.4 12RO 11810
25.5 DJD 11760
25.5 GSD 11750
30.4 Sat. EAQ 9860
30.6+ Irregular GCW 9790
31.2+ W3XAU 9590
31.3+ W1XAZ 9570
31.5 GSB 9510
42.9+ LCL 6990
47.5 Sun. HIZ 6315
47.8 Sun. HI1A 6272
49.0+ Except Sat., Sun. VE9HX 6110
49.2 Fri., Sat., Sun. VE9GW 6095
49.3+ Irregular W9XAA 6080
49.3+ Sun. VE9CS 6070
49.4+ VQ7LO 6060
49.4+ W8XAL 6060
49.5 Tues., Thurs. OER2 6060
49.5 Temporary OXY 6060
49.6 Irregular W1XAL 6040
49.8+ DJC 6020
73.0+ Except Mon. HCJB 4107

19 G. M. T. 2 P. M. E. S. T.

17.3+ Fri. W3XL 17300
19.5 Ex. Tu., Th., Sat. W2XAD 15330
19.7 W8XK 15210
25.2 FYA 11900
25.4 12RO 11810
25.5 DJD 11760
25.5 GSD 11750
30.4 Sat. EAQ 9860
30.5+ Irregular IRM 9820
30.6 Irregular GCW 9790
31.2+ W3XAU 9590
31.3+ W1XAZ 9570
31.5 GSB 9510
36.2+ CM6XJ 8265
37.3+ Sun. CNR 8035
42.9+ LCL 6990
43.8+ Irregular HAS 6840
47.5 Sun. HIZ 6315
47.8 HI1A 6272
48.9+ ZTJ 6122
49.0+ Sun. VV1BC 6112
49.0+ Except Sat., Sun. VE9HX 6110
49.2 Except Thurs. VE9GW 6095
49.3+ Irregular W9XAA 6080
49.3+ Sun VE9CS 6070
49.4+ VQ7LO 6060
49.4+ W8XAL 6060
49.5 Tues., Thurs. OER2 6060
49.5 Temporary OXY 6060
49.8+ DJC 6020
49.9+ RV59 6000
50.2+ HVJ 5969
73.0+ Except Mon. HCJB 4107

20 G. M. T. 3 P. M. E. S. T.

17.3+ Fri. W3XL 17300
19.5+ Ex. Tu., Th., Sat. W2XAD 15330
19.7 W8XK 15210
25.1+ Sun. RNE 11924
25.2 FYA 11900
25.3+ W2XE 11830
49.5 Temporary OXY 6060
49.8+ DJC 6020
49.8+ COC 6010
49.9+ HIX 6000
49.9 RV59 6000

22 G. M. T. 5 P. M. E. S. T.

19.5 Tues., Fri. Temp. CT1AA 15380
24.5 Thurs. CT1CT 12229
25.2 FYA 11900
25.2 W8XK 11870
25.3 Temporary W1XAL 11850
25.4 12RO 11810
25.5 DJD 11760
25.5 GSD 11750
26.8 CT3AQ 11180
30.4 EAQ 9860
30.5+ Irregular IRM 9820
31.2+ W3XAU 9590
31.3 HBL 9580
31.3+ W1XAZ 9570
31.3+ DJA 9560
31.5 GSB 9510
38.4+ Sat. HBP 7790
43.8+ Irregular HAS 6840
45.0+ Sun. HC2RL 6668
46.1 HJ5ABD 6504
46.5 Sun. HJ1ABB 6450
46.6+ Fri. W3XL 6425
47.8 HI1A 6272
48.5+ TGW 6180
48.7+ YV3BC 6150
48.8+ W8XK 6140
48.9 ZTJ 6122
49.0 W2XE 6120
49.0+ VV1BC 6112
49.0+ VE9HX 6110
49.1+ Sat. W3XAL 6100
49.1+ Except Sat. W9XF 6100
49.2 Except Fri., Sat. VE9GW 6095
49.3+ W9XAA 6080
49.3+ Sun. VE9CS 6070
49.3+ Temporary YV5BMO 6070
49.4+ W8XAL 6060
49.4+ W3XAU 6060
49.6 Sun. W1XAL 6040
49.6 W4XB 6040
49.8 DJC 6020
49.8+ COC 6010
49.9+ HIX 6000
50.1 Irregular YV4BSG 5984
50.1 TGX 5984
50.2 HJ2ABC 5973
50.4 Irregular HJ2ABA 5880
50.6 Mon., Wed., Fri. HJ4ABE 5860
69.4 Irregular G6RX 4320
73.0+ Except Mon. HCJB 4107

02 G. M. T. 9 P. M. E. S. T.

25.2 W8XK 11870
25.5 DJD 11760
25.6 CJRX 11720
28.1 CEC 10670
31.2+ XETE 9600
31.3+ W1XAZ 9570
31.4+ W2XAF 9530
32.8+ CP5 9120
36.6+ Irregular PSK 8185
40.5+ Except Sun. HJ3ABD 7402
45.0+ Tues. HC2RL 6668
45.3 Thurs. PRADO 6618
46.1 HJ5ABD 6504
46.5 HJ1ABB 6450
46.6+ Fri. W3XL 6425
47.5 Sat. HIZ 6315
47.8 HI1A 6272
48.5+ TGW 6180
48.7+ YV3BC 6150
48.8+ W8XK 6140
48.9+ ZTJ 6122
49.0 W2XE 6120
49.0+ VV1BC 6112
49.0+ VE9HX 6110
49.1+ Sat. W3XAL 6100
49.1+ Except Sat. W9XF 6100
49.2 Except Sun. VE9GW 6095
49.3+ W9XAA 6080
49.3+ Sun. VE9CS 6070
49.3+ Temporary YV5BMO 6070
49.4+ W8XAL 6060
49.4+ W3XAU 6060
49.6 W1XAL 6040
49.6 W4XB 6004
49.8 DJC 6020
49.8+ Sun. COC 6010

(*Continued on next page*)

49.9+	HIX	6000
50.1 Irregular	YV4BSG	5984
50.1	TGX	5984
50.2	HJ2ABC	5973
50.4 Irregular	HJ2ABA	5880
50.6 Mon., Wed., Fri.	HJ4ABE	5860
69.4+	G6RX	4320
73.0+ Except Mon.	HCJB	4107

03 G. M. T. 10 P. M. E. S. T.

25.1+	RNE	11924
25.2 Sun.	W8XK	11870
25.5 Irregular	DJD	11760
25.6	FYA	11720
25.6	CJRX	11720
31.3+	W1XAZ	9570
31.4+	W2XAF	9530
32.8+ Irregular	CP5	9120
40.5+ Except Sun.	HJ3ABD	7402
44.8	YNLF	6692
45.0+ Tues.	HC2RL	6668
45.3 Thurs.	PRADO	6618
46.5	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
47.5 Sat.	HIZ	6315
47.8	HI1A	6272
48.5	TGW	6180
48.7+	YV3BC	6150
48.8+	W8XK	6140
48.9+	ZTJ	6122
49.0	W2XE	6120
49.0+	YV1BC	6112
49.0+	VE9HX	6110
49.1+ Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.2 Except Sun.	VE9GW	6095
49.3+	W9XAA	6080
49.3+ Sun.	VE9CS	6070
49.3+	YV5BMO	6070
49.4+	W8XAL	6060
49.4+	W3XAU	6060
49.8 Irregular	DJC	6020
49.9+ Sat.	HIX	6000
50.1 Irregular	YV4BSG	5984
50.1	TGX	5984
50.6 Mon., Wed., Fri.	HJ4ABE	5860
6.94+ Irregular	G6RX	4320
73.0+ Except Mon.	HCJB	4107

04 G. M. T. 11 P. M. E. S. T.

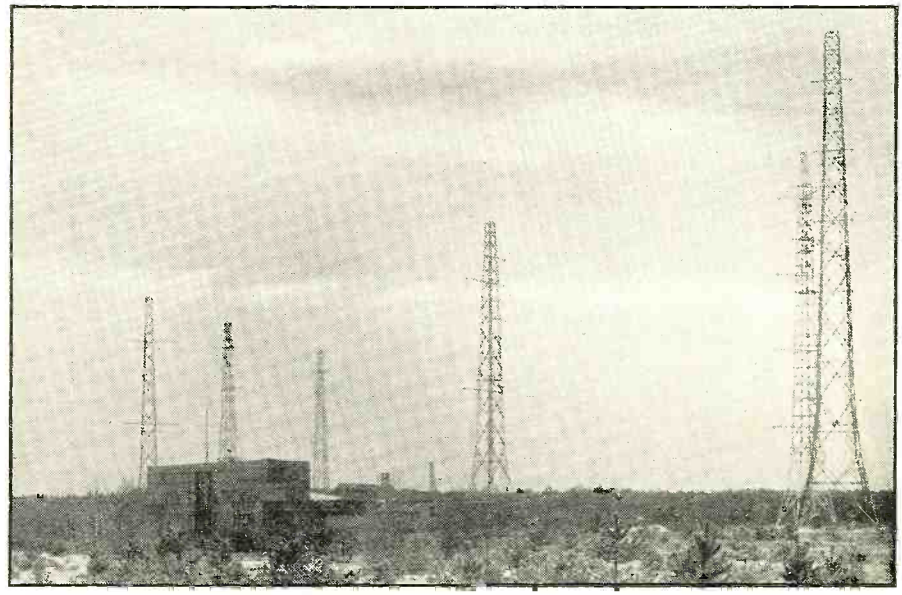
25.1+	RNE	11924
25.2 Sun.	W8XK	11870
25.5	DJD	11760
25.5	GSD	11750
25.6	FYA	11720
25.6	CJRX	11720
31.3+	W1XAZ	9570
31.5	GSB	9510
45.0 Fri.	TGW	6180
45.0+ Tues.	HC2RL	6668
46.6+ Fri.	W3XL	6425
47.5	HIZ	6315
47.8	HI1A	6272
48.8 Sat.	VE9CL	6150
48.8+	W8XK	6140
49.0	W2XE	6120
49.0+	VE9HX	6110
49.1+ Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.2 Thurs., Fri., Sat.	VE9GW	6095
49.3+ Tues., Sun.	VE9CS	6070
49.4+	W8XAL	6060
49.4+	W3XAU	6060
49.8	DJC	6020
49.9+ Sat.	VE9DN	6005
49.9+ Sat.	HIX	6000
50.1	TGX	5984
73.0+ Except Mon.	HCJB	4107

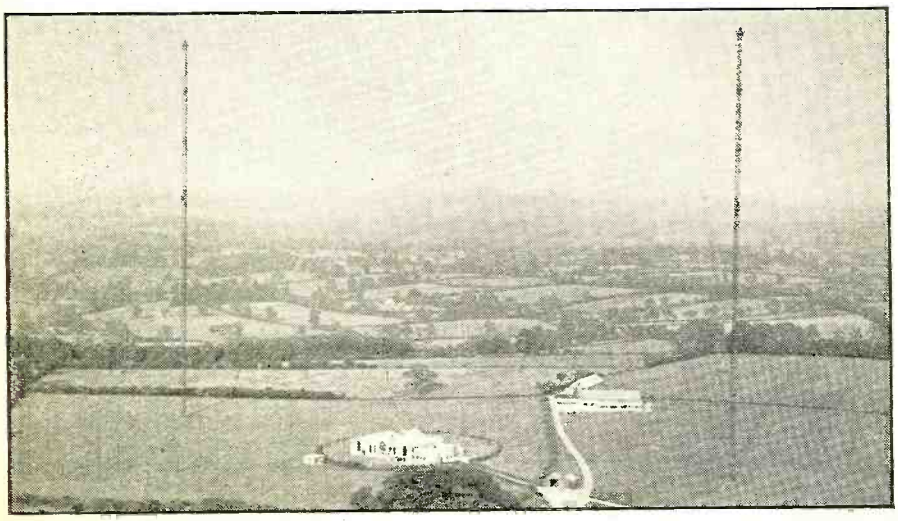
05 G. M. T. 12 Midnight E. S. T.

19.7	DJB	15200
25.2 Sun.	W8XK	11870
25.5	GSD	11750
31.3+	W1XAZ	9570
31.5	GSB	9510
47.8	HI1A	6272
48.8+	W8XK	6140
49.0+	WE9HX	6110
49.1+ Except Sat.	W9XF	6100
49.3 Tues., Sun.	VE9CS	6070
49.4+	W3XAU	6060
49.4+	W8XAL	6060
49.8+	DJC	6020
49.8 Sat.	COC	6010

Station Locations

13.9+	LSN	21540	Buenos Aires, Argen.
13.9+	W8XK	21540	Pittsburgh, Pa.
15.2+	IRW	19700	Rome, Italy
15.9+	PLE	18860	Bandoeng, Java
16.8+	W3XAL	17780	Bound Brook, N. J.
16.8+	GSG	17790	Daventry, England
17.2+	J1AA	17380	Kemikawa-Cho., Jap
17.3+	W3XL	17300	Bound Brook, N. J.
19.5	CT1AA	15380	Lisbon, Portugal
19.5	W2XAD	15330	Schenectady, N. Y.
19.6	FYA	15243	Pontoise, France
19.6+	W2XE	15270	New York, N. Y.
19.7	W8XK	15210	Pittsburgh, Pa.
19.7	DJB	15200	Zeesen, Germany
19.8	GSF	15140	Daventry, England
19.8	HVJ	15123	Vatican City
23.3	CNR	12830	Rabat, Morocco
23.3	HJ1ABB	12800	Bogota, Colombia
24.5+	CT1CT	12229	Lisbon, Portugal
25.1+	RNE	11924	Moscow, U. S. S. R.
25.2	FYA	11900	Pontoise, France
25.2	W8XK	11870	Pittsburgh, Pa.
25.3	GSE	11865	Daventry, England
25.3+	W2XE	11830	New York, N. Y.
25.4	I2RO	11810	Rome, Italy
25.5	GSD	11750	Daventry, England
25.5	DJD	11760	Zeesen, Germany
25.5+	PHI	11730	Huizen, Holland
25.6	FYA	11720	Pontoise, France
25.6	CJRX	11720	Winnipeg, Canada
26.0	XGR	11530	Shanghai, China
26.8	CT3AQ	11180	Funchal, Madeira
28.1	CEC	10670	Santiago, Chile
28.9+	LSX	10350	Buenos Aires, Argen.
29.0+	ORK	10330	Brussels, Belgium
30.0	KAZ	9994	Manila, P. I.
30.4	EAQ	9860	Madrid, Spain
30.5	J1AA	9870	Kemikawa-Cho. Jap.
30.5+	IRM	9820	Rome, Italy
30.6+	GCW	9790	Rugby, England
31.2+	XETE	9600	Mexico City, Mexico
31.2+	W3XAU	9590	Philadelphia, Pa.
31.2+	VK2ME	9590	Sydney, Australia
31.2+	CT1AA	9590	Lisbon, Portugal
31.3	HBL	9580	Geneva, Switzerland
31.3	VK3LR	9579	Melbourne, Australia
31.3	GSC	9575	Daventry, England
31.3+	W1XAZ	9570	Springfield, Mass.
31.3+	DJA	9560	Zeesen, Germany
31.4+	W2XAF	9530	Schenectady, N. Y.
31.5	VK3ME	9510	Melbourne, Australia
31.5	GSB	9510	Daventry, England
31.8	PLV	9415	Bandoeng, Java
32.8+	CP5	9120	La Paz, Bolivia
36.2+	CM6XJ	8265	Tuinucu, Cuba
36.6+	PSK	8185	Rio de Janeiro, Braz.
37.3	CNR	8035	Rabat, Morocco
37.5	HC2JSB	8000	Guayaquil, Ecuador
38.?	JOBK	7800?	Tokio, Japan
38.4+	HBP	7790	Geneva, Switzerland
40.5+	HJ3ABD	7402	Bogota, Colombia
42.9+	LCL	6984	Jeloy, Norway
43.8+	HAS	6840	Budapest, Hungary
44.8	YNLF	6692	Managua, Nicaragua
45.0+	HC2RL	6668	Guayaquil, Ecuador
45.3	PRADO	6618	Riobamba, Ecuador
45.3+	RV72	6611	Moscow, U. S. S. R.
46.1	HJ5ABD	6504	Cali, Colombia
46.5	HJ1ABB	6450	Barranquilla, Col.
46.6	W3XL	6425	Bound Brook, N. J.
47.5	HIZ	6315	San Domingo, D. R.
47.8	HI1A	6272	San Domingo, D. R.
48.5	TGW	6180	Guatemala City
48.7	YV3BC	6150	Caracas, Venezuela
48.8	VE9CL	6150	Winnipeg, Man.
48.8+	W8XK	6140	Pittsburgh, Pa.
48.9+	ZTJ	6122	Johannesburg, Africa
49.9	W2XE	6120	New York, N. Y.
49.1+	YV1BC	6150	Caracas, Venezuela
49.0+	VE9HX	6110	Halifax, N. S.
49.1+	W3XAL	6100	Bound Brook, N. J.
49.1+	W9XF	6100	Chicago, Ill.
49.2	VE9GW	6095	Bowmanville, Can.
49.3+	W9XAA	6008	Chicago, Ill.
49.3+	VE9CS	6070	Vancouver, B. C.
49.3+	YV5BMO	6070	Maracaibo, Venez.
49.4+	W8XAL	6060	Cincinnati, Ohio
49.4+	W3XAU	6060	Philadelphia, Pa.
49.5	OER2	6060	Vienna, Austria
49.5	OXY	6060	Skamlebaek, Den.
49.5	GSA	6050	Daventry, England
49.6+	W4XB	6040	Miami, Fla.
49.6+	W1XAL	6040	Boston, Mass.
49.8	DJC	6020	Zeesen, Germany
49.8+	COC	6010	Havana, Cuba
49.9+	VE9DN	6005	Montreal, Quebec
49.9+	HIX	6000	San Domingo, D. R.
49.9+	RV59	6000	Moscow, U. S. S. R.
50.1	YV4BSG	5984	Caracas, Venezuela
50.1	TGX	5984	El Liberal, Guatemala
50.2	HJ2ABC	5973	Cu Cuta, Colombia
50.2+	HVJ	5969	Vatican City
50.4	HJ4ABA	5880	Tunja, Colombia
50.6+	HJ4ABE	5860	Medellin, Colombia
52.7	XQAJ	5660	Shanghai, China
69.4	G6RX	4320	Rugby, England
70.2	RV15	4273	Khabarovsk, Siberia
73.0	HCJB	4107	Quito, Ecuador
80.0	CT1CT	3750	Lisbon, Portugal





TWO FAMOUS STATIONS

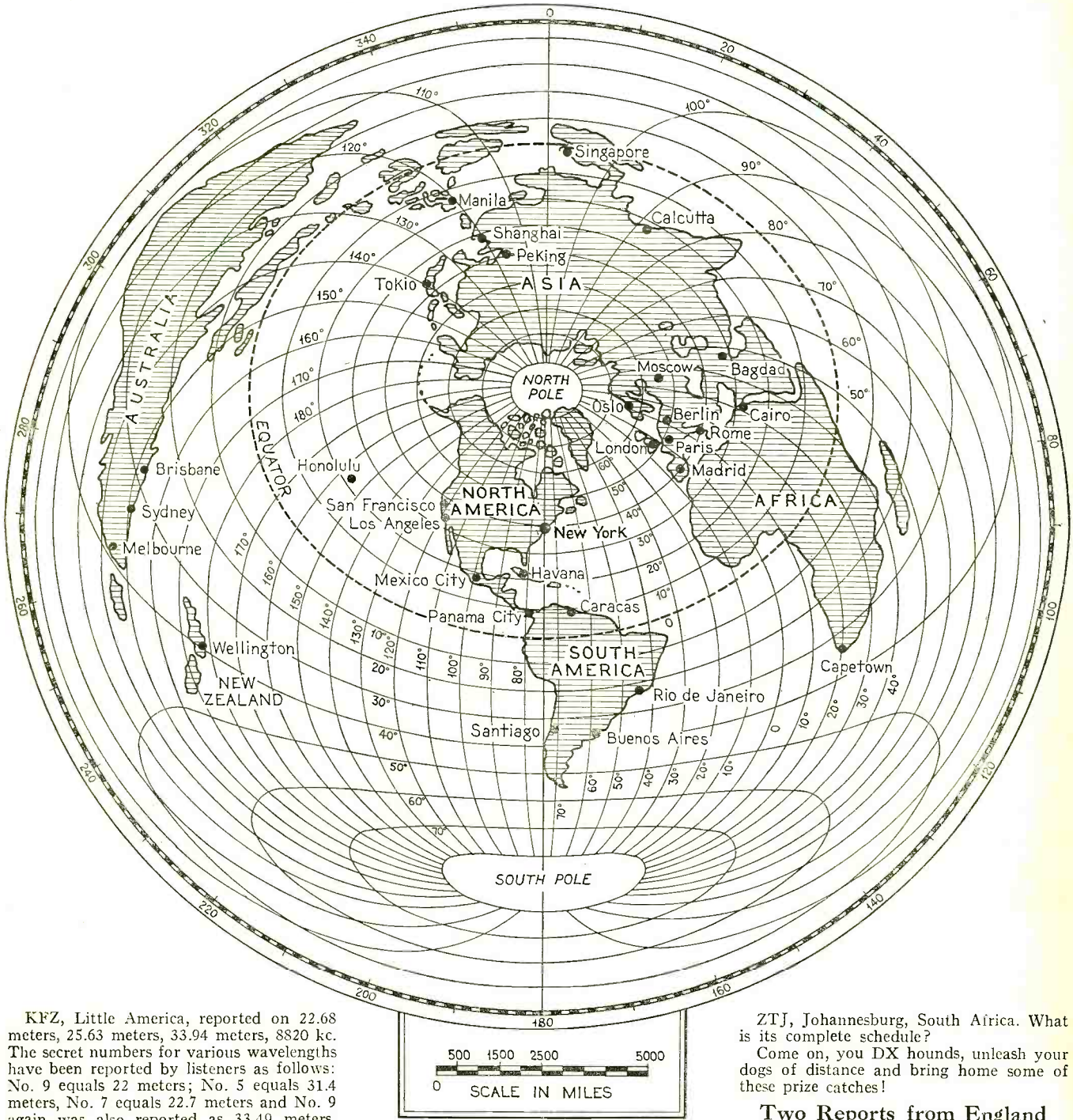
At left is a view of the Daventry location for the British Broadcasting Company's short-wave transmitters. Above, the location of the German short-wave transmitters at Zeesen

The DX Corner

(*Continued from page 15*)

on 4685 kc. RFM, also Khabarovsk, reported on 4271 kc.

WORLD DISTANCE CHART No. 1



KFZ, Little America, reported on 22.68 meters, 25.63 meters, 33.94 meters, 8820 kc. The secret numbers for various wavelengths have been reported by listeners as follows: No. 9 equals 22 meters; No. 5 equals 31.4 meters, No. 7 equals 22.7 meters and No. 9 again was also reported as 33.49 meters. Something wrong here. Other frequencies reported were 15270 kc., 11830 kc., 9520 kc.

WEF and WEM on 9590 kc. and 7400 kc. have been reported as talking to and rebroadcasting Little America.

KAZ, Manila, reported on 9990 kc., 10 to 10:45 a.m., E.S.T.

Who knows the complete time schedule of VQ7LO, Nairobi, Africa, transmitting on 6060 kc.?

YVQ reported on 45 meters, 8 p.m.

YNCRG, Granada, Nicaragua, reported on 44.7 meters.

The Naval dirigible "Macon" reported on 47 meters.

FM8KR, Constantine, Algeria, reported on 45 meters.

EA8AB, Tenerife, Canary Islands, reported on 40.5 meters from 6 to 7 p.m. amidst bad amateur interference.

JOBK heard at about 38 meters, Tokio.

HOW TO USE THE WORLD DISTANCE CHART

To use the map first find the distance in inches between New York and the desired point, multiply this by the miles per inch shown on the scale on the chart and the answer will be a close approximation to the air line distance between the two points. This chart is reproduced from the March, 1933, isue of RADIO NEWS *for the benefit of our new short-wave readers. Chart Number Two will be published next month*

YNLF on 44.8 meters reported.

CEC, Santiago, Chile, on 10670 kc.

Frank Jones' new short-wave station, CM6XJ, at Tuinucu, Cuba, on 36.28 meters.

XGR, Shanghai, China, heard on 26 meters.

ZTJ, Johannesburg, South Africa. What is its complete schedule?

Come on, you DX hounds, unleash your dogs of distance and bring home some of these prize catches!

Two Reports from England

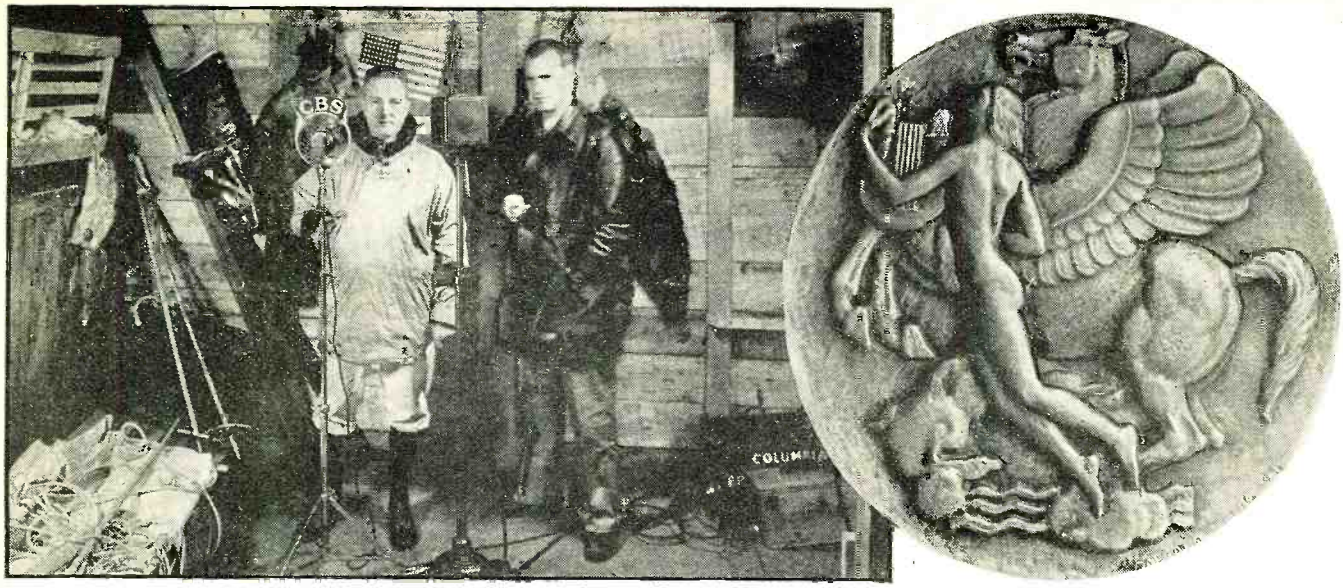
Mr. R. Stevens reports the following Best Bets on two short-wave sets, one operating on 5 volts and the other on 2 volts, from his location in Romford, Essex, England: DJA, LCL, EAQ, W1XAZ, RV59, W1XAL, OXY, W2XE, W8XK, VE9GW, YV5BMO, as well as all the British Empire stations.

Mr. L. C. Styles reports the following Best Bets from Ingatestone, Essex, England: W3XAL, W2XAD, W2XE, FYA, W8XK, DJB, HVJ, CNR, RNE, I2RO, EAQ, VK2ME, CT1AA, W3XAU, W1XAZ, DJA, W2XAF, RV72, W8XK, VE9GW, VQ7LO, DJC and a number of 80-meter amateurs, W3BMS, W1BES, W2KI, W2MV, W2MG and all the British short-wave stations.

Best Bets in Australia

Mr. H. A. Matthews of Culgoa, Victoria,

(*Continued on page* 54)



ADMIRAL BYRD AND HIS ANTARCTIC ANNOUNCER

On the broadcasts from Little America on the short waves, standard microphone equipment is used and the programs are supervised by Announcer Murphy. The two circular illustrations on this page are both sides of the medal recently presented to the Admiral for distinguished contributions to the radio art

LISTEN *to* BYRD

Samuel Kaufman

WITH complete studio and transmitter facilities set up on the icy terrain of Little America, programs from Admiral Byrd's base near the South Pole are now supplying countless thrills to listeners throughout the world. In addition to the regular Wednesday night broadcasts emanating from the short-wave directional antenna of Station KFZ—the most remote outlet of the Columbia Broadcasting System—actually on the ground with the exposition—there are numerous other Antarctic features available to short-wave listeners.

There is one weekly program *from* Little America which is relayed to the CBS for rebroadcasting over its stations from coast to coast. Also, there is a bi-weekly series of NBC programs *to* the Byrd Antarctic base. Thus, in addition to having the programs available on local broadcast-band outlets, short-wave enthusiasts have the advantage of tuning-in the features, direct, from the high-frequency channel employed by the transmitter at the program's point of origin.

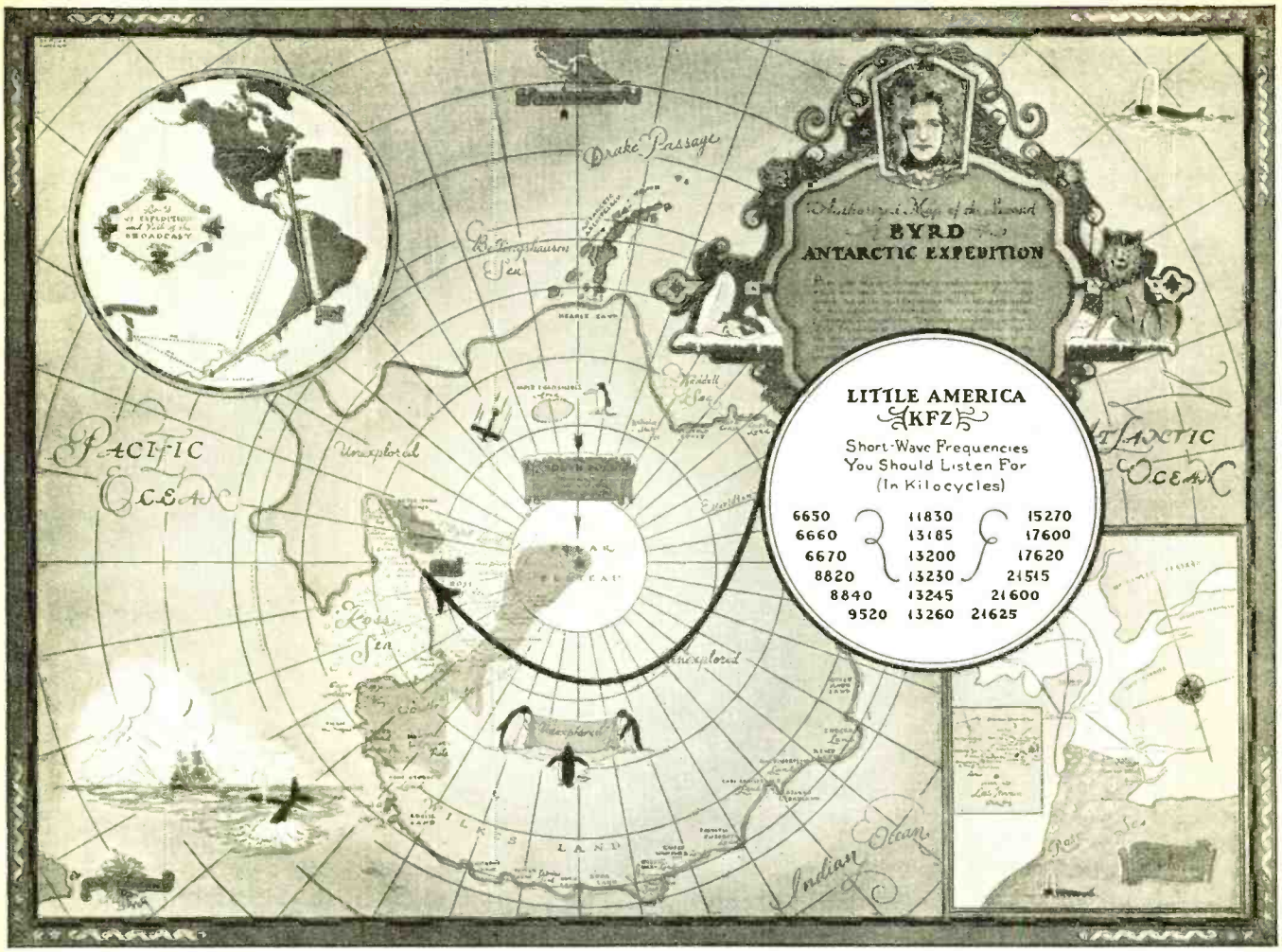
But, besides the network relay programs, short-wave fans have also easily picked-up various additional transmissions to and from the Antarctic each week since the beginning of the series.

Broadcasts from the expedition are heard in the U.S.A. regularly since the S.S. "Jacob Ruppert" passed through the Panama Canal en route to New Zealand last Fall. A 1,000-watt Collins transmitter designated as Station KJTY was on board and the first Saturday night broadcast took place on it from an improvised cabin studio. At Wellington, New Zealand, the facilities of a local broadcasting station were turned over to the Byrd party. Here programs were presented from a well-equipped land studio linked by telephone wires with the transmitter on ship-board. The "Jacob Ruppert" then set out on the perilous trip to the Ross Ice Barrier at Little America. The expedition, according to their news flashes, came near disaster on many occasions and listeners were thrilled with the accounts of the unexpected breaking-up of ice and the perils of the journey.

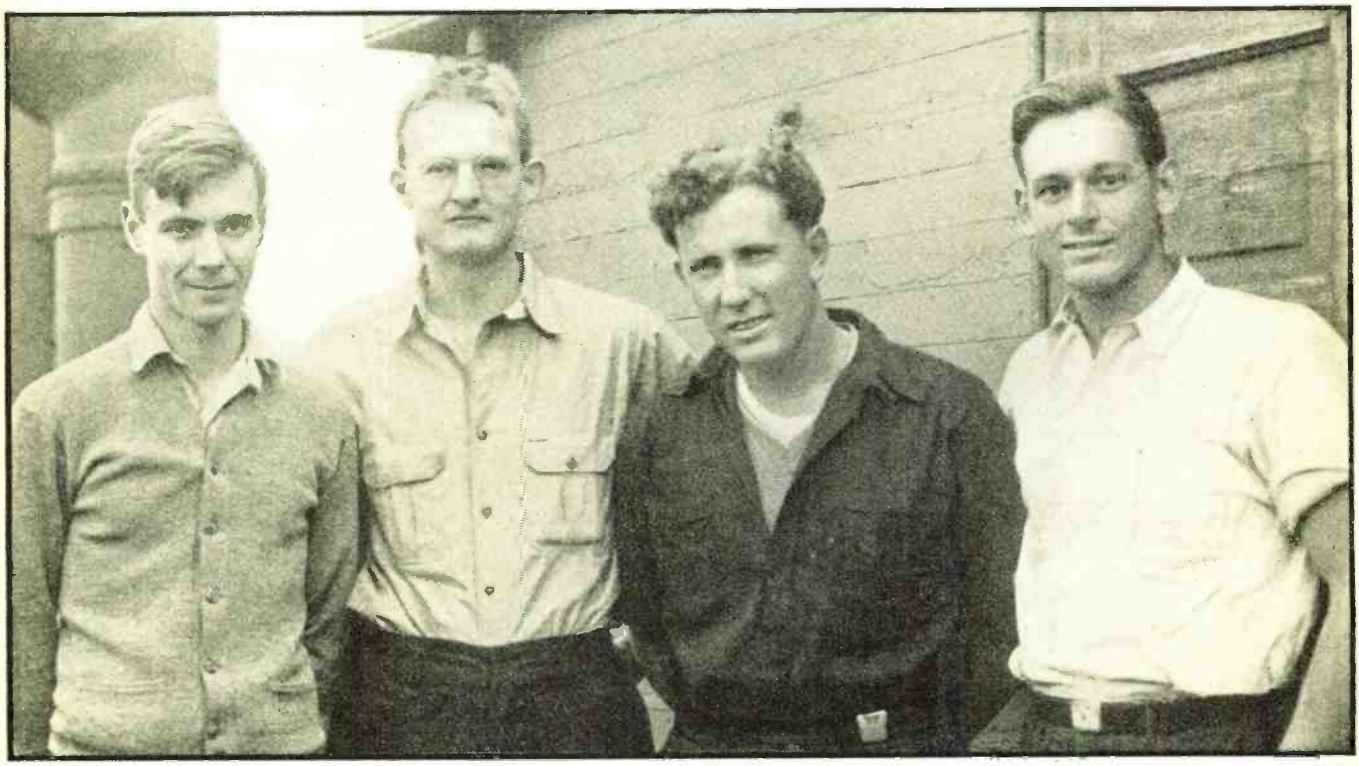
(*Continued on page 22*)

AT THE NEW YORK PROGRAM END

This is Edwin K. Cohan, technical director, as he cuts-in the short-wave program from Little America to the broadcast wavelengths, all the while talking direct to the technicians at Little America via short waves and the desk microphone

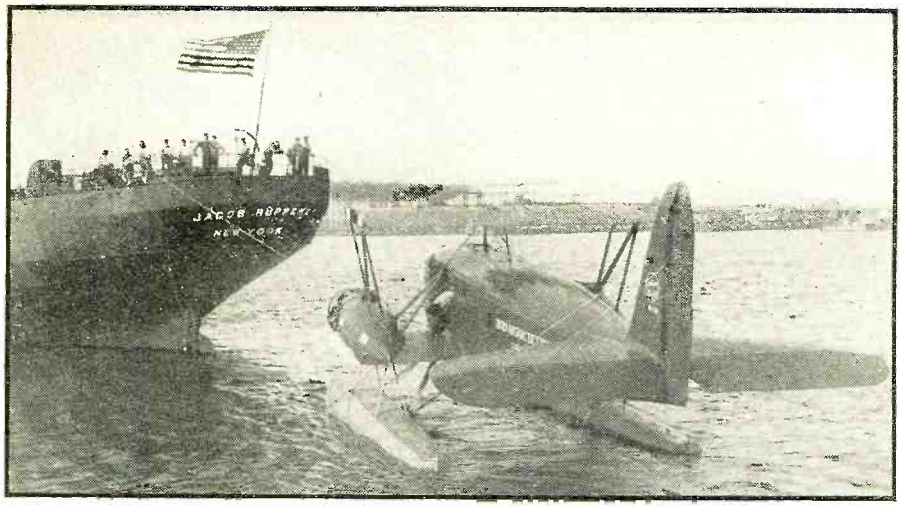


Courtesy General Foods Corp.



RADIO LORDS OF ANTARCTICA

Members of the Radio Division of the Byrd Antarctic Expedition, left to right, are: John M. Dyer (Columbia), radio engineer for communication; Stanley Pierce, electrical engineer and relief operator; Guy Hutcheson, radio operator "S. S. Jacob Ruppert," and Clay Bailey, chief radio operator. Above, official map of the Second Byrd Antarctic Expedition. Insert shows frequencies used by the short-wave radio transmitter of the expedition; arrow points to location of little America



THE BYRD RADIO-EQUIPPED PLANE

This twin-motored airplane was carried to Little America on the "Jacob Ruppert" and unloaded on the ice for use by the expedition

Once at their destination, the 1,000-watt transmitter was moved off the ship and set up on the ice, the call letters being changed to KFZ. The studio and transmitter "building" is a wooden shack only fifteen by thirty feet in size. It also serves as living quarters for the operating staff. The walls are "decorated" with fur parkas, windproof overalls and sled harnesses.

John N. Dyer, engineer in charge of all Byrd communications, presides over the KFZ facilities. Charles J. V. Murphy, announcer and production man, is also quartered in the radio shack.

KFZ's power is supplied by a 7 kw. gasoline generator mounted on the ice.

Although tall radio towers were left at the Little America base by the first Byrd party, an entirely new antenna system was erected for the Byrd Antarctic Expedition II.

The aerial is of a horizontal, diamond-shaped type and is known as a Bruce antenna. The wires are stretched between four 60-foot telegraph poles. A slight tilting of the antenna aims the signals toward Station LSX at Buenos Aires, Argentina, from which point the programs are relayed to Riverhead, Long Island, New York.

Relaying of the program is handled by RCA Communications, Inc. The nerve center for each Antarctic relay is in an office building on Broad Street in the heart of New York's financial district. Here, the programs from Little America are received over land lines from the receiving station at Riverhead and sent over wires to the New York studios for redistribution to the entire network. Also, messages to the Byrd expedition are sent through the same Broad Street nerve center. For outgoing programs, the impulses are conveyed to the huge transmitting base at Rocky Point, L. I.

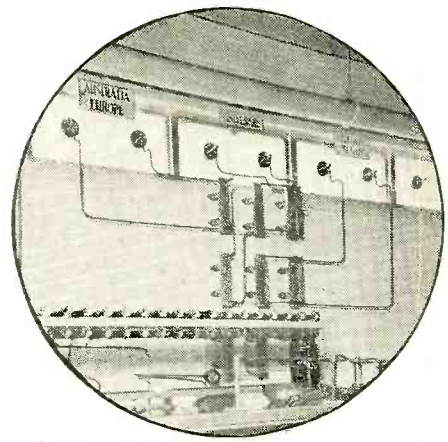
Two-way short-wave communication is maintained through this method on Friday and Saturday evenings from stations WCG and WEF about 9 p.m. Eastern Daylight Saving Time. These talks, however, are not rebroadcast over the network. The network feature occurs between 10 and 10:30 p.m., Eastern Daylight Saving Time, Wednesdays.

The network programs during the first few months were presented with 15 to 90 percent intelligibility, according to E. K. Cohan, technical director of CBS. He told the writer that the average reception was about 60 percent perfect, which, considering such various technical obstacles as magnetic storms and seasonal atmospheric disturbances, may be termed highly satisfactory.

The KFZ programs are broadcast on selected frequencies between 15 and 100 meters. Various frequencies are chosen to meet specific conditions. For example, when the long Antarctic night set in last April, it was found essential to utilize lower frequencies than in daylight. At a remote outpost—the last base before the contemplated flight over the South Pole—was erected Station KFY. KFY and KFZ are utilizing the same assortment of wavelengths originally assigned to the shipboard transmitter KJTY. He explained that during the Antarctic daylight season, which is the Northern Hemisphere's winter season, the channel of 13,200 kc. was chiefly used. (*Continued on page* 62)

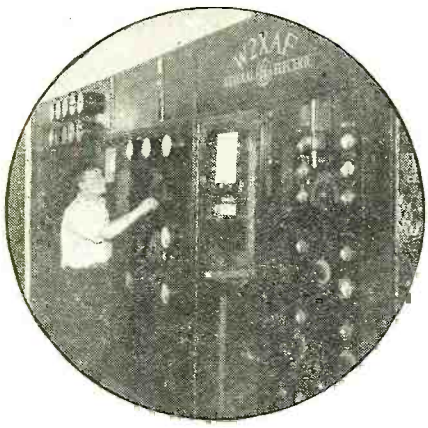
HELLO, ANTARCTICA!

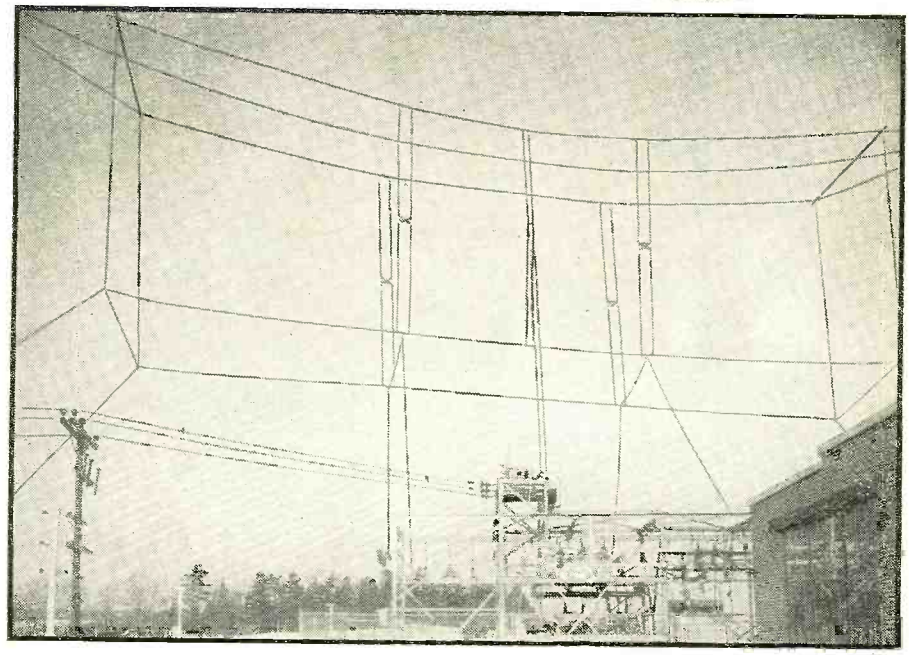
The antenna-switching arrangement for direct short-wave transmission from Schenectady to Little America. The middle switch throws the transmitter circuits onto the Little America antenna



SHORT-WAVE CONTACT

The short-wave transmitter W2XAF sends programs and messages to the members of the Byrd party weekly via the transmitter shown below and the directional antenna at the right





How to Build A TWO-TUBE S. W. SET*

The author obtains three-tube performance with only two tubes, using a duo-triode for the detector and first audio

Harry D. Hooten

WITH the advent of the new type 53 and 19 "twin" tubes, a new field of design has been opened to the short wave experimenter. Each of these tubes contains two separate triode class B tube-elements enclosed in a single envelope, making them ideal for small and portable apparatus. Furthermore, since the amplification factor and the power output is rather high, as compared with the ordinary run of triodes, a receiver using a combination of either a 53 or a 19 as a detector and first audio amplifier, and a 47 or a 33 as an output tube, will operate a speaker at a good level of volume on most short wave stations.

The receiver described here utilizes one type 19 as a regenerative detector and first audio amplifier, and one type 33 as an output tube. The detector portion is conventional in every respect, standard parts being used throughout. The first audio-frequency stage is transformer coupled, using a 3-to-1 ratio audio transformer. The output stage is resistance coupled. With this type of coupling plenty of amplification is obtained for operation of a speaker and at the same time the avoidance of a second audio transformer reduces cost and saves space. The set is built up on an aluminum chassis and panel and is designed to fit a wood or metal cabinet 6 inches high, 6 inches deep, and 10 inches long, inside dimensions.

Practically all of the insulation in the radio-frequency portion is of isolantite or other ceramic material. The tuning condenser shown in the photographs has been changed for one with isolantite insulation, the Hammarlund type MC-140M. Contrary to the usual procedure, the detector and coil sockets are not mounted directly on the chassis but are supported above it by small brass bushings, thus improving efficiency. As shown in the photographs, nearly all of the wiring is underneath the chassis. With the exception of the antenna resistance network and the coupling condenser, *all r.f. wiring is above the chassis; all low frequency and battery wiring is under the chassis.* This type of construction not only improves the general appearance of the receiver, but actually helps to prevent body capacity, instability and other undesirable effects by keeping the r.f. currents from the audio-frequency amplifier.

The reader is advised to study the drawing of the detector socket until the connections are thoroughly understood. Use plate No. 1 (P1) and the grid No. 1 (G1) of the 19 tube for the detector portion of the tube; plate No. 2 (P2) and grid No. 2 (G2) for the audio-frequency portion. It may be necessary to shield grid No. 2 to prevent r.f. from entering this portion of the tube; this is easily done by simply running the grid lead through a short piece of copper tubing and then grounding this tubing to the chassis.

The chassis and panel are not depended upon for a common return conductor. Instead all negative wiring is soldered to machine screws which protrude through the chassis and these screws are then "bonded" together by a common bus wire under the chassis.

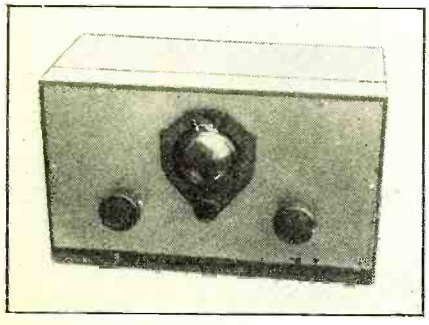
The coils for this receiver may be any of the standard types or they may be wound by the experimenter himself. The writer used ordinary 5 prong tube bases for the coils shown. Their efficiency can be improved considerably by using isolantite forms and spaced windings.

The following data is correct for coils wound on either tube bases or standard 1½ inch forms when used with a .00014 mfd. tuning condenser:

Wavelength Range	*Grid Coil*	*Tickler Coil*
15- 30 meters	3½ turns	5 turns
30- 50 meters	7½ turns	6 turns
50-100 meters	18½ turns	10 turns
100-200 meters	44½ turns	16 turns

Both grid and tickler coils are wound in the same direction on the tube base or coil form and with the exception of the 15-30 meter coil, all the grid windings are made with No. 24 d.c.c. magnet wire and all the ticklers are wound with No. 28 enameled copper wire. The grid coil of the 15-30 meter coil is wound with No. 18 d.c.c., spaced one diameter, and the tickler is wound with No. 24 enamelled wire, close wound. All ticklers are spaced 1/16 inch from grid coils. Coils (*Continued on page* 56)

* Amateur Radio Station W8KPX.



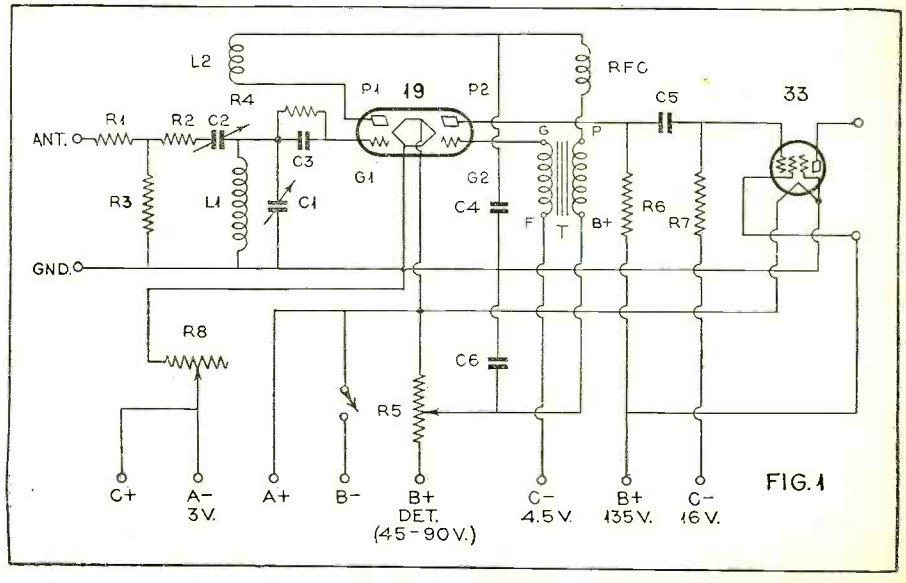


FIG. 1

GETTING ACQUAINTED *with* SHORT WAVES

(Some Commercial Set Types)

James Millen

SO far, in this series of articles dedicated to the short-wave neophyte, we have considered only home-made equipment—in progressive stages of elaborateness. While this apparatus has been designed so as to facilitate home construction, there exist many enthusiasts who lack either the time or inclination to build their own sets, and who have been educated by broadcast precedents to prefer commercial equipment—factory made receivers.

The market is prepared to supply this demand with a reasonable variety of good receivers and converters—adapted to the requirements of both the beginner and the more experienced fan. The equipment illustrated and described in this article provides a few examples of such receiver types. The short-wave fan who is interested in reception results rather than the engineering technique that contributes to them, may gloss over the more complicated details and still determine which bit of apparatus best effects the inevitable compromise between his requirements and his pocket-book. The reader who has followed through with us in the preceding articles, will encounter no difficulty in assimilating the technical discussion.

Factory-made short-wave equipment may be tabulated in the following order of elaborateness and complication: 1- to 2-tube sets; 3-, 4- and 5-tube, tuned-radio-frequency receivers; converters; superheterodynes (which includes all-wave sets). Price and efficiency may follow in the same order—though some converters are cheaper than tuned r.f. sets, and occasionally a single receiver will give better results than a converter combination. In the short-wave field, as on the more conventional broadcast bands, the superheterodyne carries off the laurels.

Most of the 1-tube and 2-tube receivers are similar in design and construction to the simple home-made sets we have previously described, and we shall therefore not consider them here. However, an exception to this general similarity is shown in the photograph A, which illustrates a super-regenerative receiver. While three tubes may be observed in

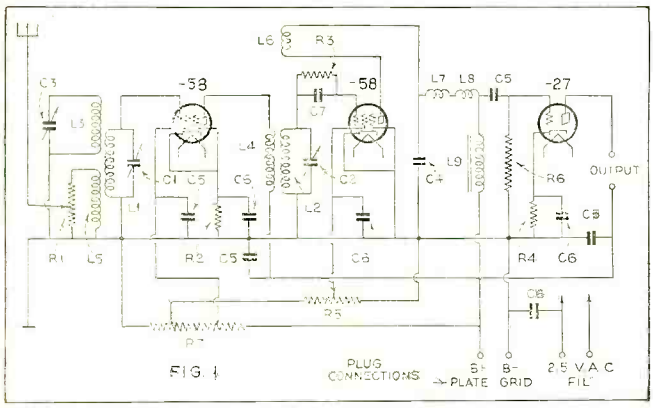
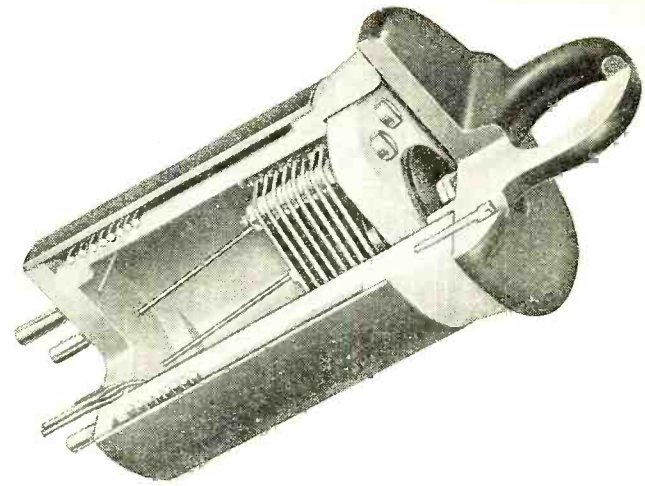


FIG. 1

A SIMPLE SHORT-WAVE CIRCUIT

Figure 1, above, shows one stage of radio with a regenerative detector and one stage of audio amplification. Figure 2, at right, shows a cross-section of a modern air-tuned plug-in coil



the photo, only two tubes are used when the receiver is operated as a conventional short-wave set operating between 10 and 200 meters. Plug-in coils cover the various bands. When the third tube is employed, the circuit becomes a super-regenerator, and the receiver may be used for reception on the 5-meter ultra-short-wave band.

A super-regenerative receiver is one in which it is possible to carry the advantages of regeneration beyond the usual limits made impossible by oscillation. In such a receiver, the regeneration control is turned considerably above the point where oscillations would ordinarily be present causing a beat-note whistle on 'phone stations and rendering reception unsatisfactory. However, by means of an extra tube, functioning as an "interruption frequency oscillator," the grid charge of the detector tube is varied periodically (at a frequency above audibility) in such a manner that the detector circuit cannot fall into oscillation. The lack of selectivity of the super-regenerator, which mitigates against its use on longer waves, contributes to ease of operation on the ultra-high frequencies. At the present writing, the ultra-short waves hold little of interest to the beginner. But as time goes on, and the fascination of the high-frequency game gets him, he will look lower for new worlds to conquer; and this combination receiver may be recommended as effectively laying two birds hors de combat with a single stone. This receiver employs a pentode output tube, and will operate a loudspeaker, whether operated with two or three tubes. It is designed for battery or line-power operation.

A typical circuit of a 3-tube receiver tuned r.f. is shown in Figure 1. A simple analysis, along our lines of study with the home-construction sets, will teach us the manner in which the set operates.

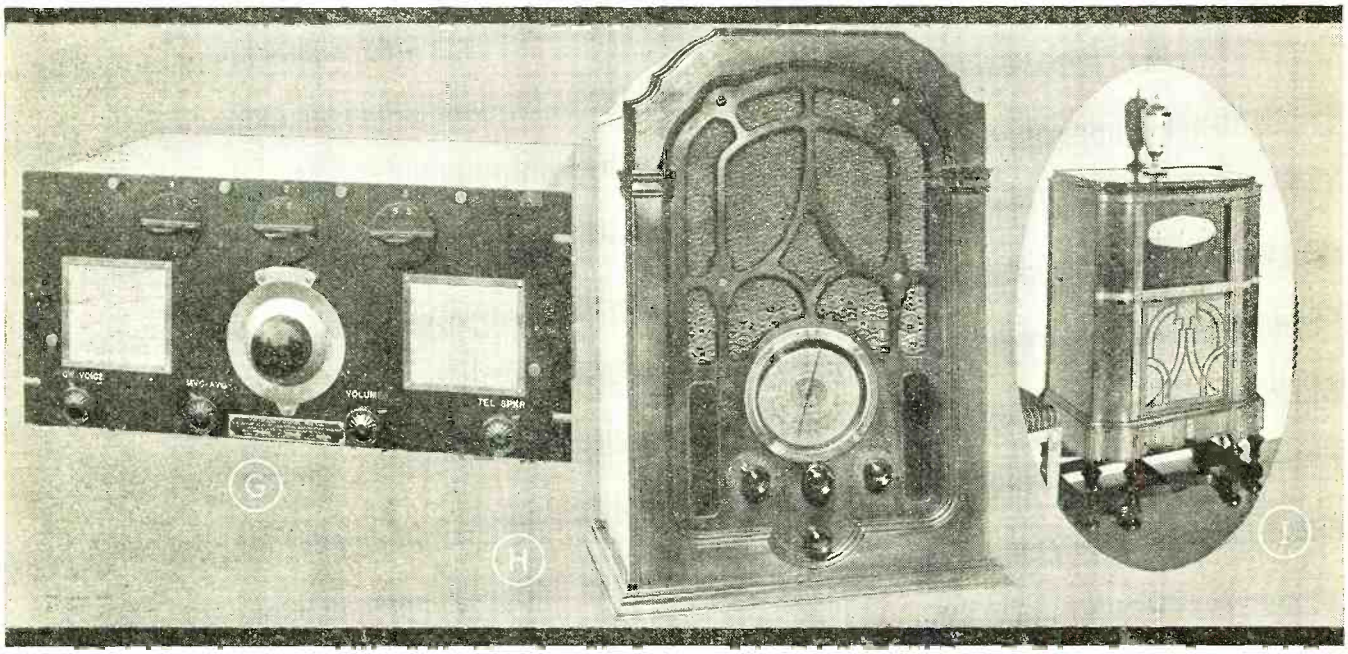
Coils L1, L3 and L5, condenser C1, along with the first –58 tube, constitute the principal components in the tuned radio-frequency stage. The three coils are wound on a single plug-in form, which can be seen at B—a view of the receiver with the top open. Different coils are plugged in to cover the various short-wave bands, six sets of coils (one in the r.f. and one, L2, L4 and L6, in the detector circuit) tuning from 9 to 200 meters.

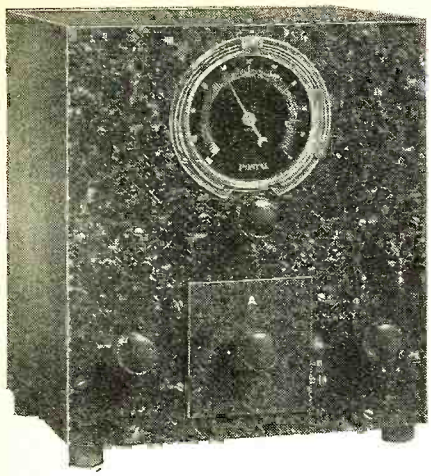
Winding L5 is the antenna primary, the amount of antenna input being adjustable by resistance R1, which functions as volume or gain control, independently of the regeneration control in the detector circuit.

Coil L3, tuned by condenser C3, functions as a trimmer for both the antenna and tuned r.f. circuits. It is a secondary control and rarely used—the set being a single control receiver.

The radio-frequency circuit is tuned by C1. The –58 tube is a very efficient r.f. pentode, the output of which—a highly amplified duplication of the antenna input—is transferred to the detector circuit through L4. The detector circuit is tuned by C2, which is ganged to C1 and rotates at the same time. Condenser C7, and resistor R3, are the grid condenser and gridleak. Regeneration is effected through the familiar "tickler" coil, L6, and controlled by the variable resistor R5.

The –58 detector tube again amplifies the signal, at the same time separating the audio-frequency component—the part to which one listens—from the radio-frequency carrier. The audio-frequency is passed on to the audio amplifying tube—a –27—through the choke coil L9 and condenser C6, for further amplification. While the (*Continued on page* 57)





TWO-STAGE T.R.F. PRE-SELECTOR

(For Use with S.W. or All-Wave Sets)

B. J. Montyn

ANYONE who uses a short-wave receiver is familiar with the experiences of receiving a far-distant station without being able to get it clear enough to understand the announcement. This may be due to the signal being below the noise level or to interference from another station whose image coincides with the desired signal. Here is where the preselector comes in.

The preselector or "booster" shown here consists of two tuned radio-frequency amplier stages and provides the following advantages: 1. Amplification at radio frequency resulting in a better ratio between signal and noise. 2. Elimination of interference caused by "repeat points." 3. May be connected to any short-wave receiver without any changes in the wiring of the receiver. 4. Has its own a.c.-d.c. power supply. 5. Antenna can be switched from the preselector to the receiver without disturbing wiring.

The average short-wave superheterodyne now in use has sufficient "adjacent-channel selectivity"; that is, it can separate two stations operating 10 or 20 kc. apart, but most of them have insufficient selection ahead of the first detector to entirely eliminate image interference. When well-designed additional r.f. stages are added, as is the case when this Postal Preselector is used, they should do away with this evil. Moreover, amplification at the original signal frequency reduces the noise level.

The preselector tuning is not highly critical. Anyway, in order to do away with the extra dial while searching for a station, the unit can be cut out.

The schematic diagram is shown in Figure 1 while the mechanical construction is illustrated in the photograph. The unit is available either in kit form or built up ready for use. Two –78 type tubes are employed in a conventional amplifier circuit employing the well-known Postal drawers instead of plug-in coils. These drawers consists of two copper shield compartments, one for each r.f. transformer. All connections are made automatically when the drawer is inserted. The shielding provided by the drawers and the metal compartment into which they slide is unusually complete, which accounts for the stability of the unit.

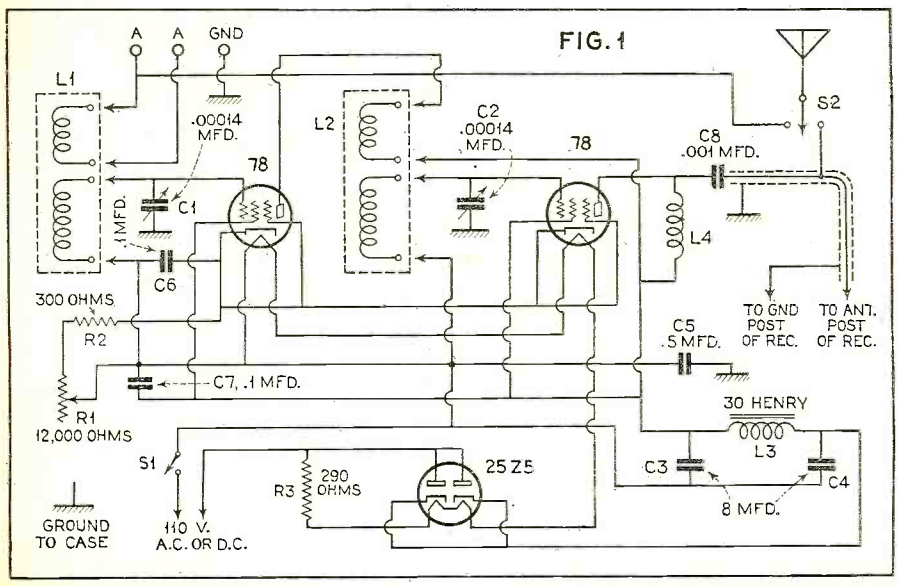
The output is through a shielded wire which should be connected to the antenna and ground posts of the short-wave receiver—preferably directly without adding any unshielded wires. The input binding posts at the back of the case provide for a double lead-in. If an L antenna is used, one "Ant." post should be connected to the ground terminal. The switch permits the aerial to be connected either to the set or the preselector. Thus an all-wave set can work on the broadcast band (or the short-wave bands) with the preselector cut out and the power on the preselector turned "off." The power supply employs a 25Z5 tube in a half-wave rectifier circuit. A resistance cord is employed in series with the filaments in order to keep the heat outside of the chassis.

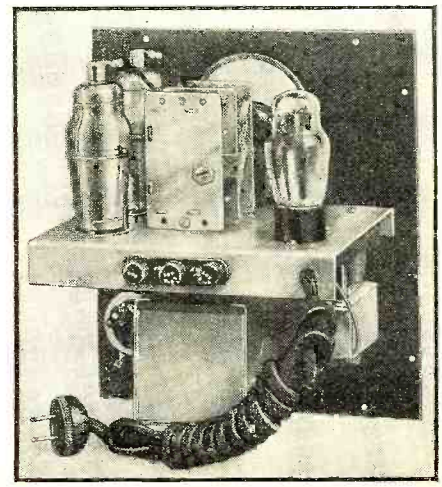
The shielded output lead should be connected to the antenna and ground posts of the short-wave receiver. The antenna connects to the input terminals at the back of the preselector case. Plug the line cord into a receptacle and turn on the switch. The lower right-hand knob is a combined on-off switch and sensitivity control. The left-hand knob is the antenna change-over switch. With this switch turned to the left (unit cut out), tune in a station on the original set, preferably one that is noisy or hard to get. Then cut in the unit and tune the dial on the preselector for best results. Throwing the switch back and forth gives an idea of the effectiveness of these two r.f. stages. The best results are obtained by turning the volume control on the unit nearly full on and that of the receiver part way down. This gives less noisy reception.

This unit was tested at the RADIO NEWS laboratory on two receivers of different makes. One receiver was a superheterodyne with no preselection. Although this is an excellent receiver, reception is often marred by repeat points, especially of powerful code stations. So, for instance, when listening to GSA one will often hear an interfering code station. By all ordinary means it is impossible to get rid of this interference. The preselector, however, removed all trace of it. It is the same with much of the other interference on this band. Certain signals which were "buried in the noise" at the time of test could be made understandable when the preselector was employed.

The second (*Continued on page* 39)

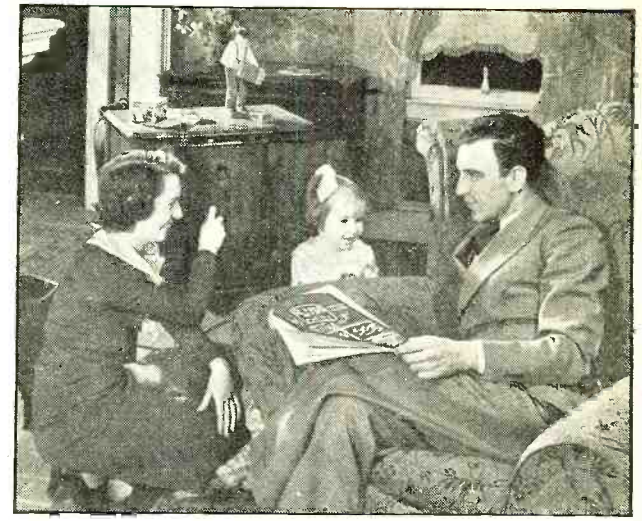
FIG. 1





Latest ALL-WAVE *and* SHORT-WAVE RECEIVERS

William C. Dorf

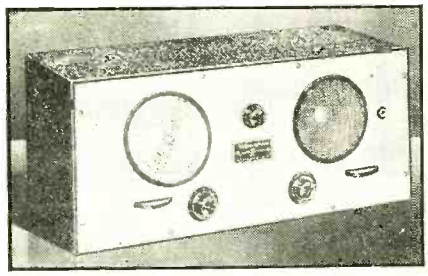


INVALUABLE SHORT WAVE AID

Short-wave receivers are valueless if one does not know when and where to tune to receive distant stations. But even the women of the family find that with RADIO NEWS WORLD SHORT-WAVE TIME TABLE, *tuning in London or China, Australia or South America is easy and a great thrill*

Compact Short-Wave Set

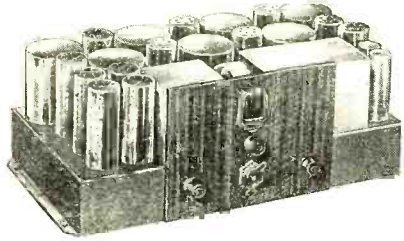
Description—The new Hallicrafters Skyrider short-wave receiver has a tuning range from 12 to 200 meters. The receiver, chassis, speaker and power unit are enclosed in the one metal case. The set incorporates such modern refinements as a low-loss wave-change switch, new anti-backlash



worm and gear reduction tuning drive with a 20-to-1 tuning ratio and modified band-spread. The Skyrider is available in two models, the standard set for the general short-wave fan and the communication receiver especially designed for the use of the amateur.

Latest Custom-Built Receiver

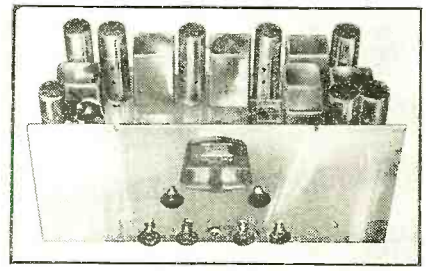
Description—The new Scott 15 tube all-wave superheterodyne receiver is an unusual one in a number of respects. The manufacturer calls special attention to the sturdy mechanical coil changing device employed to simplify the selection of the different wave bands covered. The receiver makes use of a pre-selector stage employing



the –58 type tube. Accurate calibrations on all wave bands is featured, as is a short-wave station locater employing a button-controlled beat-frequency oscillator. The set has visual tuning, static control and true single dial control without resorting to external trimmers or auxiliaries of any nature, even for antenna tuning which is automatically accomplished in changing wave bands. The parts employed in this set are protected to withstand unusual climatic conditions. Several striking new console cabinets have been developed for the receiver, combining artistic cabinet work and scientific acoustic quality.

All-Wave Set with 17 Watts Output

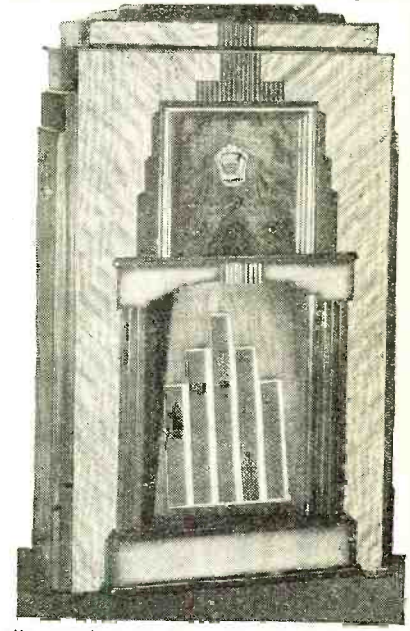
Description—The illustration below shows the new McMurdo Silver Masterpiece II all-wave laboratory-built superheterodyne receiver. It is constructed in three units; the tuner chassis, power amplifier and speaker. All three units are attractively finished in chromium. The tuner is shown in the illustration with the cover shield removed to show the placement of parts. The circuit comprises a tuned r.f. stage used on all wave bands, with the 58 type tube; an electron-coupled oscillator with a 2A7 type tube, three air-tuned i.f. stages with type 58 tubes, a 56 for the second detector, and the same type tube for the automatic



volume control, an electron-coupled beat oscillator with a 58 and an audio driver stage with the type 53 tube. The 2B6 is used in a dual push pull second audio stage and the third or power output stage is designed to deliver 17 watts. The 5Z3 is used for rectification. The wavelength range is from 10 to 570 meters. A band spread tuning dial is provided to simplify tuning in the congested short-wave bands.

Sixteen-Tube All-Wave Receiver

Description—Short-wave and broadcast listeners will be interested in the new Midwest model D, 16-tube all-wave receiver which covers a wavelength range from 9 to 2000 meters. The dial on the receiver is calibrated for the five wave bands covered. Band E has a tuning range from 850 to 2000 meters; band A covers the broadcast band from 565 to 200 meters; band L, 200 to 75 meters, includes police, amateur, television and commercial signals; band M, 75 to 25 meters brings in the short wave stations of the world, amateurs and commercial signals; band H, 25 to 9 meters includes the European broadcasts, amateur and commercial stations. The set is equipped with such refinements as automatic tone compensation, and an automatic tone blender. The top of the sturdy, attractive console cabinet enclosing the receiver is of four-way matched, striped walnut veneer. The front panels are of American walnut-stump veneer, two-way matched. The inclined speaker grille and lower front panel are American ply-wood. The instrument panel is inclined at the same angle as the grille. The side panels are of blister-maple and stump walnut veneer overlay. A thin silver stripe around the instrument panel as well as parallel



silver stripes on the grille front emphasize the modernistic effect.

Communication Type Short-Wave Receiver

Description—The National Company introduces the AGS-X crystal filter, communication type short-wave receiver. The feature of this new set is in the use of a single signal (mechanical quartz filter) circuit preceding the i.f. amplifier. With this device selectivity can be measured in cycles rather than kilocycles, which means an almost complete elimination of unwanted signals and a reduction in static. There are nine tubes employed in the set which include seven –36's, one –37 and one –89 type tube. The set is available for either a.c. or battery operation. It is equipped with

(*Continued on page* 52)

PRACTICAL AERIAL

The one big job for an from the transmitter and possible into space. An and should be properly

A. H. Lynch
(W2DKS)

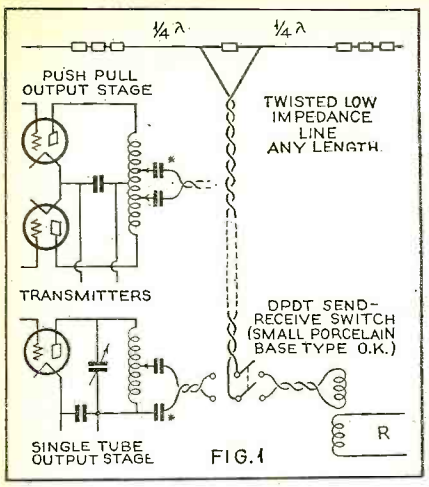


FIG. 1

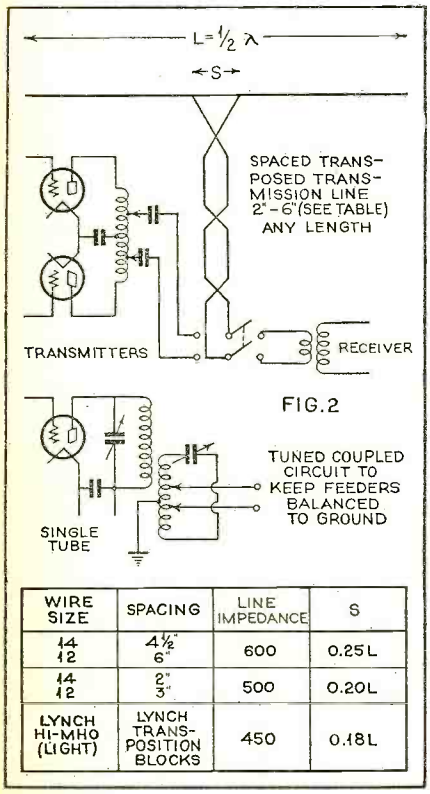


FIG. 2

WIRE SIZE	SPACING	LINE IMPEDANCE	S
14 12	4½" 6"	600	0.25L
14 12	2" 3"	500	0.20L
LYNCH HI-MHO (LIGHT)	LYNCH TRANSPOSITION BLOCKS	450	0.18L

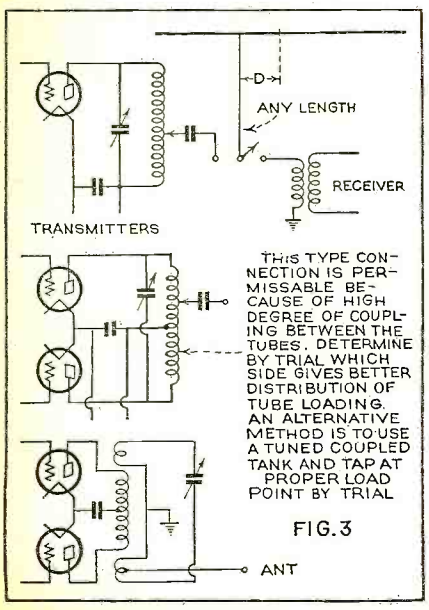


FIG. 3

THE type of antenna system to be used for amateur short-wave work is of secondary importance and depends largely upon the individual location and the frequency bands to be covered in regular operation. Some types are easily adapted for multi-band work while others are suited to only a single frequency band. In general, the latter types are somewhat more efficient but not obviously so. The object of this article is to bring together some practical information to help in choosing the most suitable antenna system for particular cases.

Better efficiency usually results in using a Hertz antenna (½-wave wire in free space) than when using the ¼-wave Marconi type which must have a good ground system or a large counterpoise. (In this latter type every inch of wire in the system radiates energy, so that a rather small percentage is radiated by the uppermost parts of the antenna which do the business.) The horizontal Hertz, on the other hand, is entirely *up-in-the-air* so it becomes obvious why the efficiency is better. And, of course, this applies equally well to signals coming in. Antenna systems for single-waveband operation will be first considered.

This simple half-wave antenna diagrammed in Figure 1 is a split doublet, each side being one quarter wavelength long. The length of each half equals 0.78 times the wavelength or $\frac{468}{2 \times \text{freq. (mc.)}}$. It is ideal for portable work at any frequency and does a first class job for both transmitting and receiving. The transmission line used to couple this doublet to the transmitter or receiver need not be tuned and can be of any length provided its impedance is correct. Forms of rubber-covered, twisted lampcord provide a suitable impedance match.

"Giant Killer" feeder wire is intended especially for this purpose. Its impedance is slightly higher than that at the center of the antenna (about 75 ohms) so that it should be fanned somewhat when connecting to either side of the center insulator to be theoretically correct. This type of antenna is suited only to the waveband (fundamental) for which it is cut or any *odd* harmonic thereof. On *even* harmonics a voltage (and impedance) maximum appears at the center and cannot be matched to (is virtually short-circuited by) a 75-ohm line. When used for receiving, the line will have no pickup and, therefore, a maximum signal-to-noise ratio will result. The line is magnetically coupled to the receiver by means of a small primary coil; to the transmitter across a few turns of the last plate-tank coil or coupled same as receiver. Bear in mind the necessity for sufficient insulation in the twisted line when used for transmitting.

Another method of feeding a half-wave Hertz is to use a spaced transmission line fanned at the antenna so that the impedance of the line equals that of a part of the antenna across which the line is connected. See Figure 2. The length of this antenna and the distance between the wires are quite critical. The length equals $\frac{463}{\text{freq. (mc.)}}$ feet. The distance (S) equals one-quarter the antenna length for a 600-ohm line, and decreases as the line impedance goes down. See table in Figure 2. A transposed line may be used and is particularly desirable for reception. The line should be perpendicular to the antenna for at least ¼ wavelength and should be terminated in such a manner at the transmitter so that it is balanced to ground. Transposition blocks make an easy and efficient job of the feeder. In putting up this type of antenna, the wire should be several percent too long and should be cut about one percent at a time, observing the performance after each cut. Fixed coupling to the transmitter (or an oscillator) should be used so that the loading effect of the antenna might be seen on the plate (or grid) milliammeter. When the doublet length is correct, it will have a maximum load effect.

A third type of antenna for single-band operation is the single-wire feeder affair shown in Figure 3. The length of the antenna is roughly the same as the previous type but had better be determined by experiment, as previously explained. The feeder should be connected one-seventh the length off the center and must run at right angles for proper operation. There must be no sharp bends in this feeder or there will be reflection losses and line radiation. This type is less suitable for reception than either of the foregoing systems because the line is not so free from pick-up.

In the foregoing antennas, properly designed and constructed, there should be no radiation or pick-up on the feeder and any length at all may be used. If no radiation or pick-up takes place in the feeder, the half-wave antenna is doing all the work, which is exactly what we want. And in this case there is a marked directionality, best transmission or reception being at right angles to the line of the antenna. In adjusting these antennas to the transmitter, the plate meter must be used as the antenna current in the feeders is very low and is not necessarily a true indicator of power taken by the antenna proper. Start with a minimum of coupling and gradually bring it up, always retuning the plate-tank condenser, until the tube is properly loaded. It is possible to use

AMATEUR DESIGN

antenna is to "soak up juice" radiate as much energy as antenna must be resonant coupled to the power source

E. Glaser
(W2BRB)

any of these types as a Marconi antenna for lower frequencies, tying the two feeders together. In a pinch this means may also be used on odd harmonics of the Marconi quarter-wave fundamental but, at best, is a makeshift job.

The single-wire-feed antenna of Figure 3 may be used for all amateur frequencies but does not perform as well on harmonics as on the fundamental frequency. This is because there is a mis-match between antenna and feeder on harmonics. It is possible to compromise and improve harmonic operation but usually at the expense of fundamental efficiency. The feeder is usually moved further from the center of the antenna. The feeder radiates, standing waves appear and there are losses all around. Nevertheless, many hams like this method because of its utter simplicity and obtain good results with it. It should be cut for the lowest frequency band to be used or, if this demands too great a stretch, Marconi operation may be used on the highest wavelength, the antenna being cut for one band lower.

A second all-band antenna may be procured by simply cutting any single wire (plus lead) into a half-wavelength for the lowest frequency band to be used. Operation with a ground may also be used as above. This is really a voltage-feed type with a feeder of zero length. The end of the antenna is plenty "hot" and should therefore be hung close to the plate on the tank coil. A separate tank of low capacity (to reduce losses) may be coupled to the plate tank and the antenna hung on to that. A ground is sometimes used at the other end of this coupled circuit. However, some losses are bound to appear as the antenna comes into the shack and into the vicinity of other apparatus. Not only that but there is a strong field around the antenna which may be a nuisance—affecting neutralizing, paralizing the receiver, etc. Of course, the entire length of wire radiates so that a lot of energy may be wasted before it gets to the high part of the system. The length should be adjusted experimentally as with previous systems because the antenna proper, coming into the shack, is subject to all kinds of influences which might affect the fundamental, or natural frequency. This antenna is equally good on *all* harmonics because the ends of an antenna are always maximum voltage points (Figure 4).

A third type, permitting many-band operation is the old, reliable "Zepp," (Zeppelin) which is about the easiest antenna to resonate because a certain amount of tuning may be done right at the transmitter or receiver. See Figure 5. A half-wave antenna is used with quarter-wave feeders. This might be considered a full-wave affair with half a wavelength "folded," so that a point of maximum current comes right at the feeder end. This is a true current-fed antenna, the losses appearing in the previous voltage-fed system being entirely absent here. Although the feeders must be a quarter-wavelength long, electrically, much leeway is possible by loading or cutting with parallel or series-tuning condensers. When multi-band operation is desired, a compromise in length must be made to accommodate tuning to the various harmonics, the most reasonable length being a little under three-eights wavelength. This is not at all critical, compared to the chopping of the flat tops for this family of antennas, but should be quite close. This limitation of feeder length which appears here for the first time in this series of antenna systems, might be worse were it not for the fact that the feeders may be bent or folded to add length. Again, the half-wave flat-top might well be cut too long and chopped although this is less important with the Zepp than with most of the other types. Most hams do not get a proper balance of feeder currents so the feeders do some radiating. Even so, the results obtained usually justify this old favorite. It is because some leeway is possible that they don't take the necessary pains to do a perfect job. This is really an unbalanced system, but it does a lot toward improving the signal-to-noise ratio, especially when transposed feeders are used. However, in our opinion, the following antenna is really the ace of all wave receiving aerials.

Figure 6 shows another very flexible system, this time a balanced "split" arrangement that resembles the first shown doublet, but which is really a one-and-a-half-wave antenna with two half-wave parts, folded as feeders. Since a current maximum exists in the center of the antenna we need half-wave feeders this time, to get back to another current maximum for current feed. Again, compromising in feeder length for the sake of the harmonic family, the feeders should be the same length as in the Zepp. This will allow tuning to all bands in a similar manner. In both this type and the Zepp, the full voltage of the antenna appears on the feeders, so that the spacers must be first-class insulators and of low dielectric constant. When a transposed line is used this antenna is excellent for reception, although tuning *must be used!* This is the most versatile aerial of the whole bunch for multi-band use and will cover a large part of the short-wave spectrum.

To correct a common fallacy, solid wire has not the lowest high-frequency resistance but, rather, a sort of cable made of insulated wires, tightly twisted together, presents a much lower resistance than the equivalent solid wire.

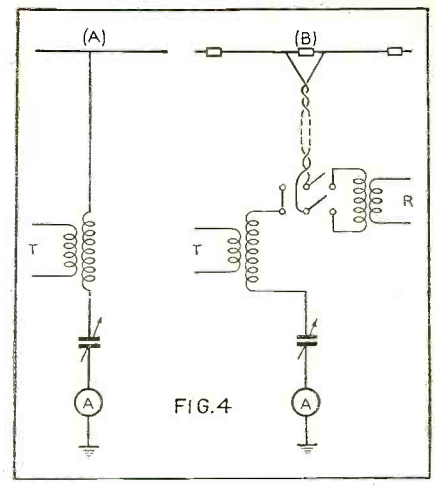


FIG. 4

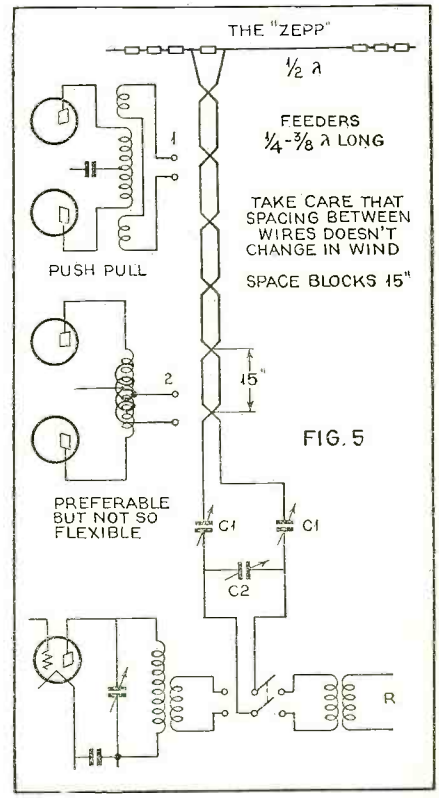


FIG. 5

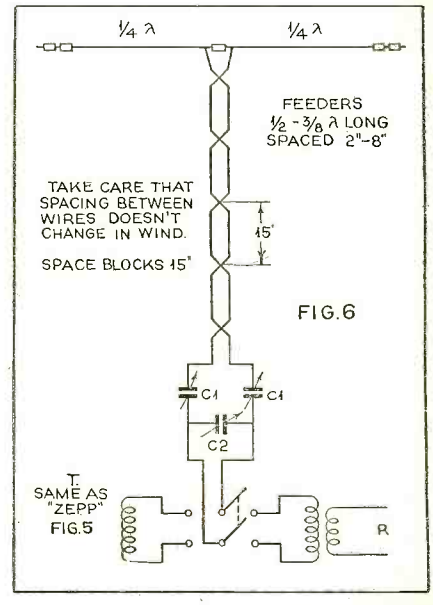


FIG. 6

PHENOMENA UNDERLYING RADIO

(Piezo-Electric Applications)

E. B. Kirk

Part Eight

PIEZO-ELECTRIC crystals have also been adapted to use in phonograph pick-ups and in microphones and loudspeakers. The acoustical actions give promise of becoming very valuable. Piezo-crystal oscillators and resonators have furnished a most convenient form of wavemeter and are an excellent means for maintaining frequency standards. Little more than mention of the work in this field can be made here, but frequency determinations and control are of the utmost importance to aural broadcasting and to television.

Marrison (of the Bell Laboratories) has by means of a series of circuits reduced the frequency of a circuit controlled by a crystal from 100,000 kilocycles per second to 10 cycles per second and at this low frequency has driven a clock. By such an arrangement it is possible to maintain a frequency constant over a period of days to within an accuracy of 1 in 10,000,000. So far this is, to my knowledge, the most accurate timekeeper devised.

One method of calibrating wavemeters makes use of a peculiar luminous property of a vibrating crystal first observed by Giebe and Scheibe. They invented (in 1925) what is called a luminous resonator. This consists of a crystal plate resting on one electrode, but with the upper electrode separated from the crystal by a small air-gap and the whole affair mounted in a partial vacuum (10 to 15 mm. of mercury). When one of the resonance frequencies of the plate is approached, by tuning the driving circuit, the interaction of the direct and the converse effects causes luminous bands to appear on the upper surface of the crystal. The number and the arrangement of the bands depends on the manner in which the plate is vibrating; that is, which fundamental or overtone is acting. This gives a convenient visual indicator and has been used for the comparison of the international standards of frequency.

Piezo-Electric Materials

Quartz has been used almost exclusively for piezo-electric crystals, although mica, Rochelle salts, tourmaline, boracite, sugar, d-tartaric acid and many other substances of the same crystallographic form can be used. For frequencies below 25 kilocycles, quartz crystals of sufficient size are difficult and expensive to obtain (magneto-strictive methods which we shall discuss later are useful below 25 kc.). Recently Rochelle salt crystals have been "grown" very successfully and are being used to advantage particularly for phonograph pick-ups and microphones.

We have not discussed the results of twisting a crystal; this action, although it can be analyzed into a combination of compression and tension applied in a complex way, is too complicated to be approached in a non-mathematical manner.

The Pyro-Electric Effect

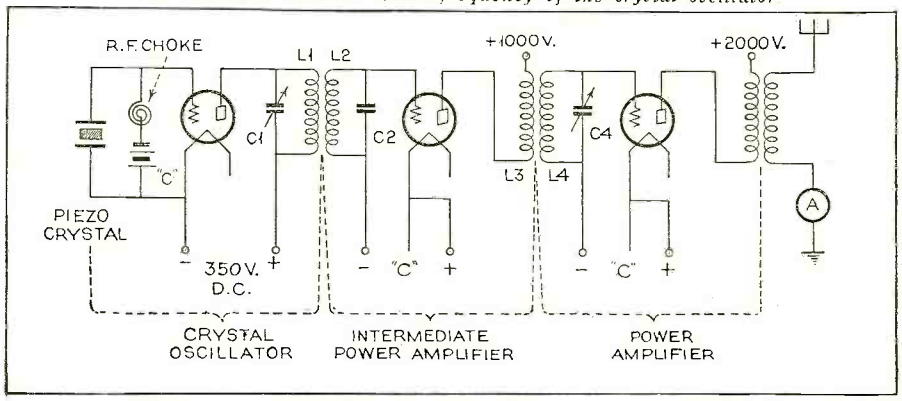
It was mentioned previously that Dutch travelers returning from Ceylon about 1703, with tourmaline crystals, discovered the piezo-electric effect. Although there may be doubt that they recognized the pressure action as such, it seems clear that they did observe definitely the pyro-electric effect by noticing that the tourmaline crystals which had become heated in an open fire strongly attracted the hot ashes. This unusual action is exhibited by a limited class of crystals (all crystals having one or more axes with dissimilar ends and which constitute the class of hemihedric crystals with inclined faces). The Curies, after trying a number of substances, concluded that all crystals which showed pyro-electric action showed also piezo-electric response. Some of the substances tested were sodium chlorate, tourmaline, quartz, topaz, Rochelle salts and sugar.

A pyro-electric crystal when heated or cooled develops charges on the extremities of its hemihedral axes. If a crystal, tourmaline, for example, be heated and then broken, the parts will show the same polarity as the unbroken piece, and if it be powdered and spread on a glass plate and its temperature changed, the particles of the crystal will arrange themselves in lines similar to iron filings in a magnetic field. This shows that there is a polarity developed even in the smallest pieces. This action is explained in a manner somewhat similar to the explanation of the piezo-electric action. The heat causes changes within the crystal which are unequal along the various axes and, since the electrons are bound. in the rearrangement of the molecules. There is a shift or polarization.

Pyro-electricity has not been put to any startling use, but it is evident that since mechanical change always involves heat, an application of mechanical force, compression, tension, bending, twisting, etc. would, by causing inequalities of temperature, give rise to electric charges on crystals submitted to these forces. A series of compressions and rarefactions (such as sound waves) would cause a corresponding variation in the electrical condition which in turn could be detected or amplified. Further the converse, as in the case of the piezo-electric effect, is possible: changes in potential difference applied to the appropriate faces of a crystal cause changes in temperature within the crystal. However, we see at once (*Continued on page* 63)

A CRYSTAL-CONTROLLED OSCILLATOR

Figure 1. This shows a typical crystal-controlled oscillator circuit. For ultra-short waves (in the neighborhood of 1 to 5 meters or a little above) tourmaline has proven more suitable than quartz for fundamental control, since it produces more uniform oscillation with less tendency toward side-tone oscillation. It also allows a frequency gain of about 35%, for quartz, for the same size plate. Tourmaline has a constant of approximately 80 m. per mm. when cut as a disc. The mounting of such a crystal is very important. It should rest on an electrode having a carefully lapped plane surface. Even slight unevenness will cause irregular operation and crystal damage by overheating, fusion or cracking. Silvering or sputtering can be used with large crystals, but it affects the period of small plates. In any case, the upper electrode, although making uniform contact, must not exert excessive pressure and is therefore best held in place by a spring. One commercial type of mounting carries the crystal within an evacuated bulb. The crystal and its mounting should, at least, be hermetically sealed and some thermostatic means provided for keeping it at constant temperature. The values of L and C in the circuit are chosen for resonance at the desired wavelength and the crystal dimensions are determined so that either one of its fundamentals drives the circuit at the desired frequency. The constants of the intermediate and final power stage are chosen to resonate to the frequency of the crystal oscillator



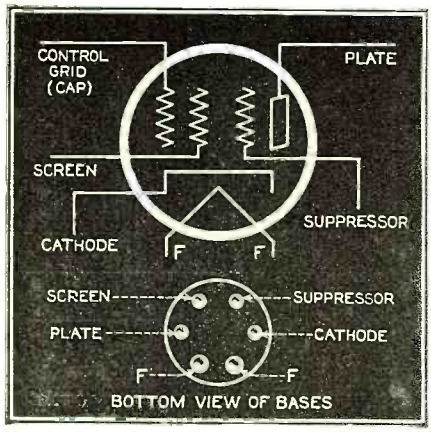


TABLE 1

	6C6	6D6	
Ef	6.3	6.3	VOLTS, A.C. OR D.C.
If	0.3	0.3	AMP.
LENGTH	4 11/16" - 4 15/16"	4 11/16" - 4 15/16"	INCH
DIAM.	1 9/16"	1 9/16"	"
BULB	ST-12	ST-12	
BASE	SMALL 6-PIN	SMALL 6-PIN	
INTERELECTRODE CAPACITIES			
G-F (WITH SHIELD CAN)	0.010 MAX.	0.010 MAX.	MMFD.
INPUT	5.0	4.7	"
OUTPUT	6.5	6.5	"
CLASS A AMPLIFIER			
Ep	250 MAX.	250 MAX.	VOLTS
Esg	100 MAX.	100 MAX.	"
Eg (CUT OFF)	-7 APPROX.		"
Eg	-3	-3 MIN.	"
Ip	2.0	8.2	MA.
Isg	0.5	2.0	"
μ	1500 MIN.	1280	
Rp	1.5	.8	MEGOHM
Gm	1225	1600	μMHOS
Eg FOR Gm = 10 μMHOS		-40	VOLTS
Gm = 2 "		-50	"

BIASED DETECTOR								MIXER IN SUPER		
PLATE SUPPLY	250	250	250	250	100	100	100	250	100	VOLTS
Esg	50	33	100	100	25	30	12	100	100	"
Eg	-1.95	-1.7	-3.85	-4.3	-1.52	-1.83	-1.16	-10 †	-10 †	"
BIAS RESISTOR	3000	8000	4000	10,000	13,700	10,000	18,000			OHMS
CATH. CURRENT*	0.65	0.21	0.97	0.43	0.110	0.183	0.063			MA.
PLATE RESISTOR	0.25	0.50	0.25	0.50	0.50	0.25	1.0			MEGOHM
GRID RESISTOR **	0.25	0.25	0.25	0.25	1.0	0.5	1.0			"
COUPLING CONDENSER	0.03	0.03	0.03	0.03	0.01	0.01	0.01			MFD.
R.F. SIGNAL	1.18	1.21	1.38	1.37	1.2	1.6	1.05			VOLTS R.M.S.

* WITH NO SIGNAL. ** OF THE NEXT STAGE † MINIMUM FOR OSCILLATOR PEAK OF 9 VOLTS.

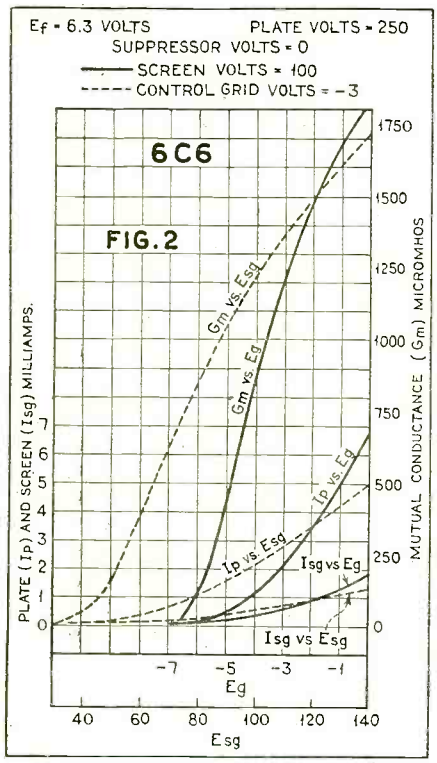
DATA ON THE 6C6 - 6D6 TUBES

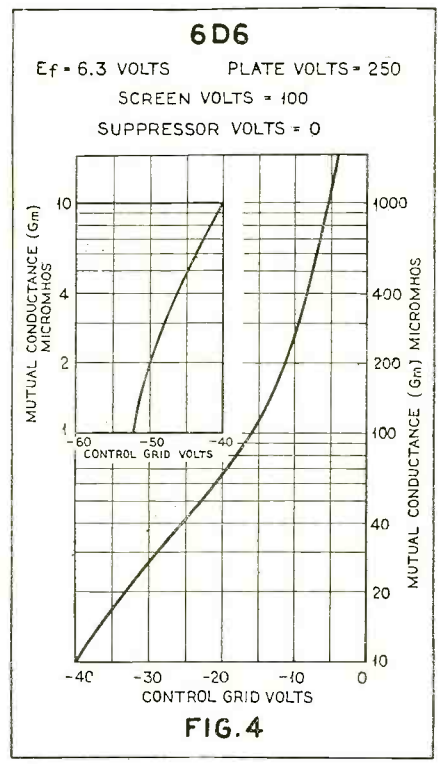
J. van Lienden

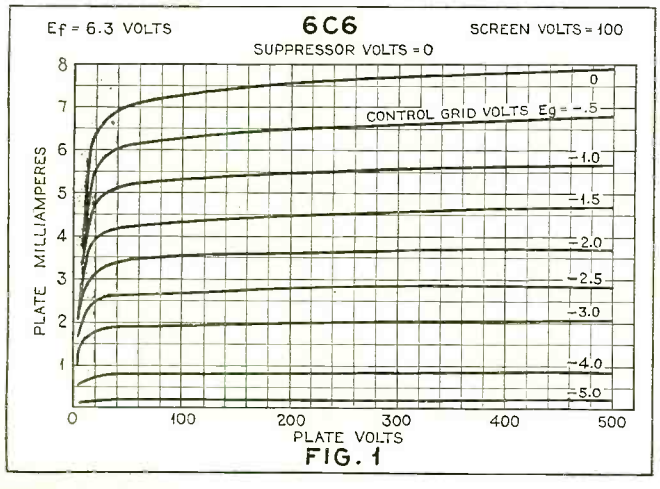
TUBE types 6C6 and 6D6 are similar in characteristics to the familiar −57 and −58 tubes, respectively, except for differences in heater voltage. Therefore, the curves and data given in this article are also applicable to these latter types. The 6C6 (corresponding to the −57) is a triple-grid detector and amplifier, and the 6D6 (similar to −58) is a triple-grid, super-control amplifier, having variable-mu characteristics. These tubes should not be confused with the type −77 and −78, for, although the differences (the difference is in the shield) are small, there are some circuits wherein a −77 or −78 could not be interchanged with a 6C6 or 6D6. The 6C6 and 6D6 have a special shield construction which is connected within the tube to the cathode. This construction permits of obtaining low input and output capacitances. The −77 and −78 have the older conventional screen-grid construction. In the case of the −77, the inner and outer sections of the screen are connected together, while in the −78 the outer screening section is tied to the cathode.

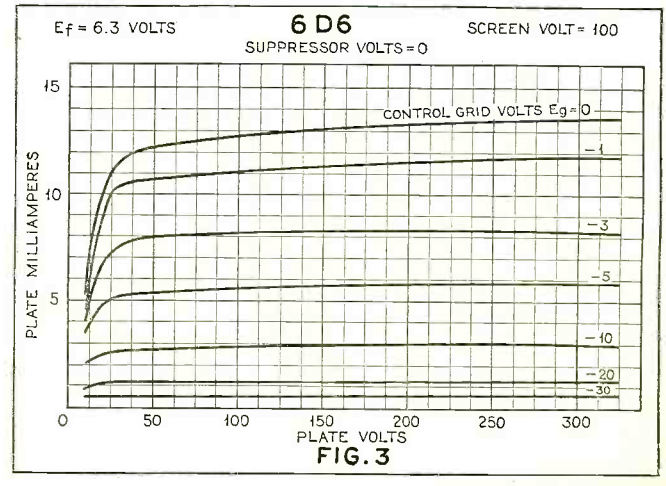
The 6C6 type is suitable as a radio-frequency amplifier, as a biased detector, or as a detector-oscillator in supers. It can also be used as a resistance-coupled audio amplifier or as a control tube in a.v.c. or noise-suppression systems, or for industrial purposes.

Characteristics of this tube for use as an amplifier or biased detector are shown in Table 1. A family of plate characteristics is found in Figure 1. Figure 2 illustrates the influence of variations in grid voltage and screen voltage on the plate current, screen current and mutual conductance. The filament current of the tube is such that it can be used in series with other 6.3-volt (*Continued on page* 51)

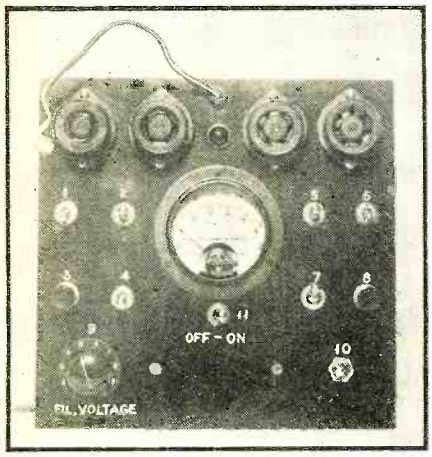








RADIO NEWS SERVICE INSTRUMENTS NO. 1



A PORTABLE TUBE CHECKER

John H. Potts

UNQUESTIONABLY the most essential part of a serviceman's equipment is a reliable instrument for testing tubes. When the set to be serviced is inoperative, immediate information as to the condition of the tubes is often required. In such cases a tube checker alone can supply this information and in all other cases it furnishes the quickest and most convenient means of determining a tube's condition.

Considering the large number of tube testers on the market, relatively little concerning their design and construction has been written. Often the serviceman or experimenter will want to build his own tester, either to form part of a test kit or as a separate unit. The instrument to be described is of the utmost simplicity in design and operation, yet is based on a fundamental test method which has been the standard for years in laboratories as a means of keeping an effective check on tube depreciation during life test runs. It does not, of course, provide an infallible indication as to a tube's capabilities. In the final analysis, the performance of any tube is dependent not only upon its electrical and mechanical condition, which this tester indicates, but also upon the specific portion of the circuit in the particular set in which it is to function, factors which no tube tester can precisely duplicate. Yet, in spite of its simplicity of design and low cost, it provides a highly accurate and complete analysis of the condition of any tube.

Most tube testers supposedly operate on some form of mutual conductance (control-grid-to-plate transconductance) measurement. The relationship between the method of test employed to measure this characteristic and any standard laboratory method is usually rather remote. In Figure 1A is shown a typical circuit used in low-priced testers. A small transformer, with its secondary tapped for various filament voltages alone, is used. With S1 in the position shown, the grid is at zero bias. Since the primary and secondary are joined, a shift in grid potential in the same direction as that of the plate potential is obtained when S1 is depressed, thereby connecting the grid to one of the higher filament voltage taps. Since the line voltage is fed directly to the tube elements, a short circuit in the tube may cause rather disastrous results. The control-grid cap is also "hot" when the ungrounded side of the line is at point "a," thereby giving the user an occasional unpleasant jolt. Since the grid swing occurs in positive regions when the plate is positive, the resemblance to any recognized mutual conductance test is indeed faint. With all its faults, however, it provides a fairly good indication of the condition of many types of tubes.

In Figure 1B we have a much better design. The transformer secondary is constructed in two sections, one of which is tapped for the various filament voltages. The cathode, or one side of the filament of the tube, is connected to the junction of the two windings. The high voltage secondary is tapped for plate voltages approximating those normal for the tube under test. Since alternating current is used, during one-half the cycle point B will become positive with respect to point C. At the same instant, tapped voltages between C and A will be negative with respect to point C. The grid, being joined to point A, thus momentarily assumes a negative potential. When S1 is depressed, the grid is returned to a lower voltage tap and therefore a lower negative potential. Since its control effect is thereby reduced, greater plate current flows during the positive plate swing. The relative difference between these two readings bears a closer relationship to a real mutual conductance measurement than that secured by the method shown in Figure 1A.

In Figure 1C, a circuit which closely approximates the requirements for true mutual conductance measurement is shown. Since a.c. is applied to the grid only, and all tube elements are energized with normal operating d.c. voltages, actual operating conditions are closely approached. The resistor, R1, must be negligibly low with respect to the plate resistance of the tube under test if true mutual conductance is to be measured. The rectifier meter measures the a.c. component of the plate current resulting from the impressed grid voltage. This apparatus is excellent but is expensive and complicated to build and therefore unsuited for average service work.

It is an open question as to whether a mutual conductance test is necessary, or even desirable, for service work in a customer's home. Laboratories for many years have used a simple emission test to check the condition of the tubes on life test and, in service work, we have in effect a series of life tests of a real dynamic type. The vast majority of tube failures are due to loss of emission

Features of This Tube Checker

1. Tests all types of tubes.
2. Tests for every possible type of short circuit in the tube.
3. Tests each element of duo-diode-triodes, rectifiers, etc., separately.
4. Tests cathode-heater leakage.
5. Simple to build.
6. Extremely low cost.
7. Designed for the serviceman.
8. Easily adapted to future tubes.
9. Single reading—no mental arithmetic.

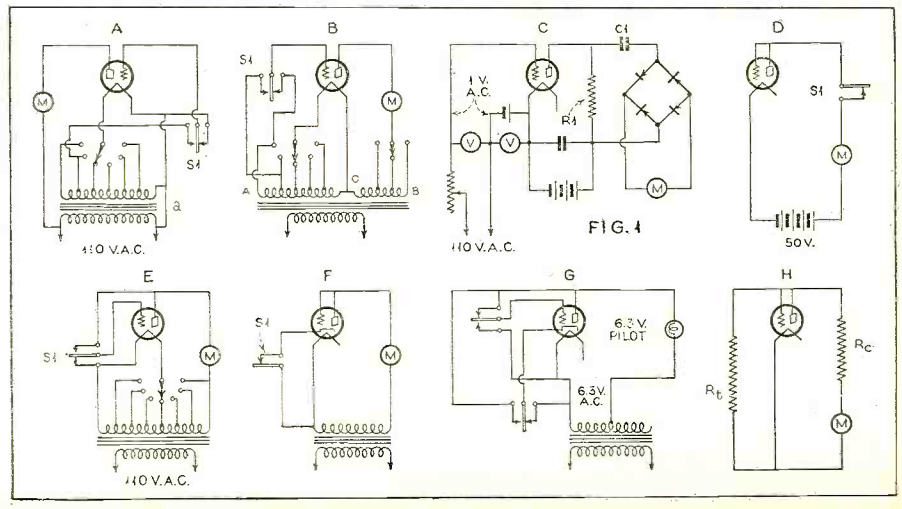


FIG. 1

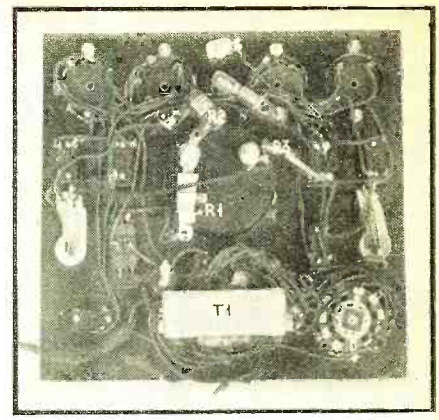
and it follows that, since this is the simplest and most useful fundamental test, it should be adopted. The application of this type of test requires careful consideration, as there are many pitfalls to be avoided. Figure 1D shows a typical laboratory set-up for emission test. When the switch S1 is closed, 50 volts d.c. is applied to the plate and grid and the resulting current read. Under these conditions, the high current may temporarily cause an increase in gas current which requires occasionally several minutes' operation to clear up. It was decided, therefore, to use a much lower voltage in the tester described in this article. This is quite conveniently available from the usual tube tester transformer, and accordingly, in our tester, the fundamental circuit of which is shown in Figure 1E, 30 volts a.c. is used. At this low voltage, no harmful results from the application of this test are evident and an extremely simple and effective test results.

Since we occasionally encounter cathode leakage, a simple test for this trouble is included, as shown in Figure 1F. When SW1 is opened, there is no return circuit for the test voltage other than the cathode-heater resistance. When this resistance is low, current will flow and will cause a meter deflection. This method is used in one of the better designed commercial testers and is therefore not original.

Figure 1G is a diagram of the method used in this tester for locating shorts. Since each element may be switched to any other element, every possibility of short-circuit is covered. The low-voltage pilot light used for the short-circuit indicator permits the tube to be tested for shorts while hot.

Figure 2 shows a complete schematic diagram of the completed tube tester. Switches 1, 2, 4, 5, 6 and 10 are single-pole-double-throw toggle switches. These switches have three terminals, two on one side and one on the other. The single terminal side corresponds to the moving arm of the usual type of switch. Each socket terminal, with the exception of the filaments or heaters, is wired to the moving-arm terminal of its switch. The other terminals at the same end of the switches are connected together and brought over to SW3, which closes the circuit to the filament and one side of the transformer secondary. The terminals at the opposite end on the switches mentioned are also joined together and brought over to R3, through which they connect to the other side of the transformer. Switch 10 is mounted in the lower right-hand corner and arranged to throw right and left rather than up and down. This switch should be wired as shown in the drawing, so the plate is connected to the meter circuit when the switch is thrown to the left. If we start to test, then, with switch 10 thrown to the left, we need only to throw the cathode switch to its upper position, with all other element control switches down, to obtain our quality test. If the tube to be tested is a multi-purpose affair, such as the duo-diode-triode, we may test each element separately by placing the cathode and all other element switches in the upper position and moving each element switch down and up in turn, noting each reading, while switch 10 is thrown to the right. It is thus possible to determine if the diode sections are accurately balanced. Many testers are designed to test only the triode sections of such tubes.

Since we are, in effect, measuring the internal resistance of the tube by this method, the resistance of the test circuit has been kept as low as is practical. The necessity for this may be seen by considering the diagram 1H, where R_t represents the tube resistance under such test conditions and R_c the test circuit resistance. Let us assume that the internal resistance of the tube under test should normally be 500 ohms under such test conditions, but as a result of loss of emission due to long-continued use, has increased to 1000 ohms. The measuring circuit should then indicate a 50% drop in current. If, however, our measuring circuit should have a resistance in itself of 1000 ohms, the percentage change in circuit resistance would be the ratio of 500 ohms to 2000 ohms or 25%. Thus the current change as indicated by the meter would be only 25%. This point has been analyzed in detail because the failure of certain tube tester designs to reject weak –80's is due to this cause. This may also account for the fact that relatively few –80's are replaced in the field until complete failure has occurred. The series resistors R1 and R3 have been included to protect the meter when measuring mercury-vapor tubes. For all other tubes the switch S8 short-circuits R3; R1 is just enough (*Continued on page* 58)



IN presenting this series of articles, RADIO NEWS is making an outstanding contribution to servicemen's literature. Constructional articles have been presented in the past, covering individual pieces of service equipment, but there has never been published a completely co-ordinated service kit which the serviceman can construct in his own shop.

The various units of this kit are being designed and constructed by the author, working in conjunction with the RADIO NEWS technical staff. The primary object is to provide equipment which is highly practical and effective. Features will not be sacrificed in order to make them cheap, but every effort will be made to hold the cost to the lowest figure consistent with adequate precision and dependability. The first articles will describe portable instruments for servicing in the field. Following will be non-portable and semi-portable equipment for the shop.

The author has had many years' experience in practical service work and for years was in charge of design of test equipment in one of the world's leading radio companies. With this background of experience, plus the facilities of the R. N. Laboratory and staff, the designs described in this series will recommend themselves to servicemen everywhere.

—The Editors.

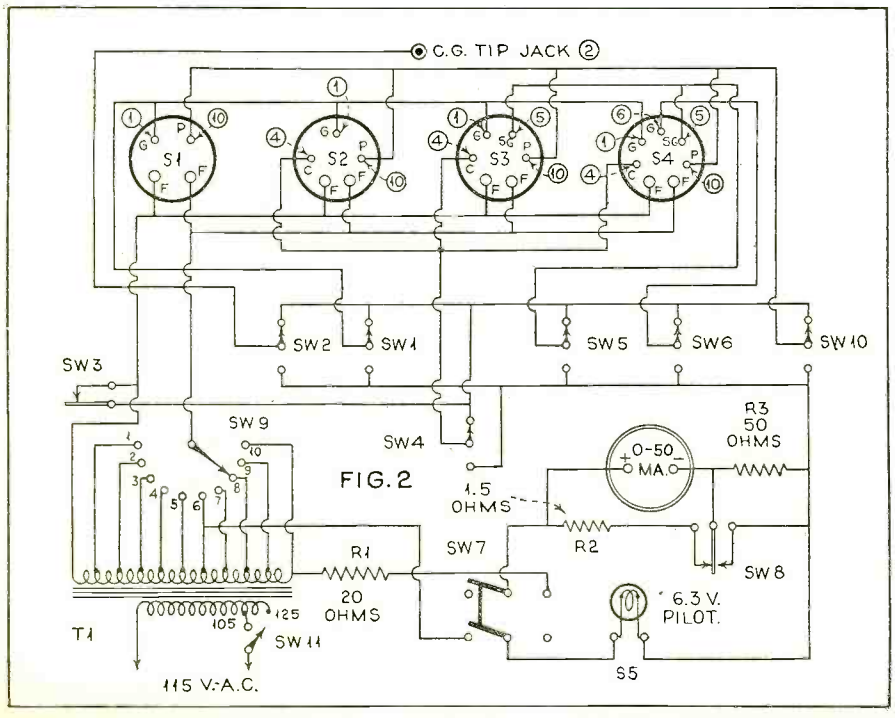
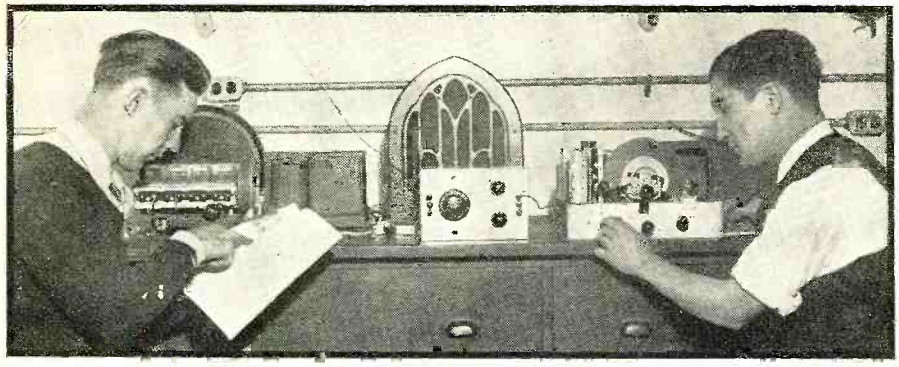


FIG. 2



THE DX CORNER

FOR BROADCAST WAVES

WITH the coming of warm weather the DX fan is likely to lose interest so far as broadcast-band DX reception is concerned. For the most part he will resort to one of two things. Either he will put his hobby away in moth balls for the summer—or he will take up short-wave reception. There seems to be a strong trend toward this latter alternative, particularly since all-wave receivers have grown so popular. Like the well known neighborhood landmark, the coal and ice dealer, the fan equipped with an all-wave receiver is provided with a year-'round commodity. During the colder months he can concentrate on the broadcast-band wavelengths, but when reception starts to fall off in spring he can fall back on the short waves where good DX reception not only continues right through the hot weather but is likely to be at its very best.

The broadcast-band DX fan who has not tried the short waves will find them mighty interesting—and he need not be equipped with an all-wave receiver. He can make a start with a simple 1-tube receiver and at a cost of only a few dollars he will, if he employs an efficient circuit design, be able to listen in on foreign stations to his heart's content. Or, he can construct or purchase a relatively inexpensive short-wave converter which, connected ahead of his regular broadcast-band receiver, will provide him with the equivalent of an all-wave set. Several pieces of equipment such as these have been dscribed in recent issues. Elsewhere in the present issue is a how-to-build article covering an excellent 2-tube receiver which makes 2 tubes do the work of 4 and provides loudspeaker operation, yet is extremely inexpensive to build and does not require any particular experience on the part of the constructor.

The Summer months also provide an excellent opportunity to overhaul the DX receiver installation and to make such changes or additions as may seem desirable to enable it to "bring home the bacon" next Winter. The antenna probably needs some attention, for instance; or perhaps a new one of different characteristics would be worth trying. Then, it would be worth while to provide a means for tuning the antenna in order to take advantage of the very considerable improvement in signal strength that can in most cases be obtained in this way. In case you have overlooked it, an interesting and instructive article on this subject appeared in the February issue this year, page 483. This article pointed out the improvement in signal strength gained through the use of an antenna tuning device and discribed the construction of this device—the "Radio News Tenatuner". Under actual measurement, signal voltage was shown to be increased from 1.8 to 7.5 times by this device—even when used with a receiver which was already highly efficient.

It is believed that during the next two or three months this department can serve the DX fan in no better way that in suggesting ways and means for improving his installation and with this idea in mind there are several worth while schemes suggested below. In the Fall months the publication of more DX news and notes will be resumed and at that time appointments of Official Listening Posts will be started. In the meantime applications for such appointments will be cordially welcomed. In submitting applications it will be helpful if information is provided upon the applicant's DX accomplishments during the past year, the type of receiver and antenna employed, and any other pertinent information which will assist the committee in making the appointments.

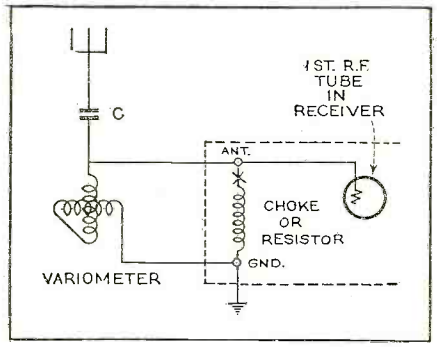
And—DX enthusiasts, don't forget that this is your department. Do your bit to make it what you would like it to be by sending in ideas, reports or suggestions.

—The DX (Broadcast Band) Editor

Tuning the Input Circuit

There are a number of receivers on the market in which the input circuit to the first tube is untuned. In this type the antenna terminal is usually connected direct to the grid of the first r.f. tube and either an r.f. choke or a resistor is connected between the antenna and ground terminals of the set.

The first tube in these receivers, because of this untuned input, provides relatively little gain and adds nothing to the selectivity of the circuit. Its primary purpose is to isolate the antenna from the gang-tuned circuits so that they will maintain their alignment regardless of the characteristics of the antenna employed. By the simple



change suggested herewith it is possible to obtain considerably greater signal strength and greatly improved selectivity in receivers of this type—and still not throw the ganged circuits out of alignment. The scheme suggested is not a new one but its advantages are not as well known as they might be. The circuit shown is one suggested by C. H. Long, Winston, Mo., in a recent letter to this department. Thereon Colegrove, Radio Operator on the tugboat H. C. Cadmus, Gainesville, Fla., also suggested a similar arrangement.

To make the change requires only a variometer and a fixed condenser. Variometers are no longer a common commodity but an excellent one for this purpose is the Type 269 made by the General Radio Company which may be obtained by addressing the company direct, at Cambridge, Mass. The size of the fixed condenser cannot be given precisely as the required capacity will depend somewhat on the size of the antenna employed. Different sizes should be tried until one is found which will permit the variometer to tune throughout the broadcast band. For the average antenna value of .0002 will probably be about right.

As shown in the accompanying circuit, the resistor or choke included in the receiver should be disconnected from the antenna terminal (at X) but the lead from this terminal to the grid of the tube should be left intact. The 2 terminals of the variometer should be connected to the antenna and ground terminals of the receiver. In the case of the G. R. variometer the mounting bracket is one terminal and this should be connected to the ground terminal of the receiver; the front screw-lug terminal being connected to the antenna post of receiver. The series condenser is then connected between the antenna lead-in and the variometer.

When these connections have been made the receiver may show a tendency to oscillate. If such is the case then the variometer and fixed condenser should be inclosed within a shield and the leads to the receiver made as short as possible. In rare instances it may even be desirable to shield the lead from the variometer to the antenna post of the receiver, or to twist the two leads together. This is not recommended, however, unless found necessary in order to obtain full stability.

When this tuning unit is connected to a receiver it constitutes an additional tuning control, of course. However, the tuning of the variometer is not highly critical and therefore does not complicate the operation of the receiver to any great extent. Due to the fact that the variometer and condenser tune the antenna circuit as well as the input grid circuit a distinct improvement in the sensitivity and selectivity of the receiver should result.

Signal Strength Meter

In the DX Corner last month the advantages of a good tuning meter to the DX listener were pointed out and suggestions were given for the installation of a simple yet highly effective device of this type on any receiver employing automatic volume control.

In the arrangement described a milliammeter, *having a range less than the current flowing in the plate circuit in which it was installed,* was connected in the plate lead (between the r.f. filter and B+ supply) of any tube controlled by the a.v.c. system. A low-range meter was employed in order that by means of a shunt resistor the range of the meter could be increased so that full scale deflection would just be obtained with no signal tuned in. Any signal tuned in would cause the meter indicator to back away from this full scale position, the stronger the signal the more the meter would retard.

Where a fixed shunt is used across the meter there are certain disadvantages in the case of a.v.c. receivers which have some means for manually reducing sensitivity. When adjusted for relatively low sensi-

tivity the plate current usually drops and the tuning meter no longer reaches full-scale deflection (with no signal tuned in). As a result the retardation caused by a received signal is relatively less. Moreover, for every different adjustment of the manual sensitivity control the "no signal" meter deflection will be different.

A simple way to overcome this difficulty and to obtain full scale deflection with a resulting maximum indication for each station tuned in, is to employ a suitable rheostat as a shunt, in place of the fixed resistor. Then every time the manual sensitivity control is varied the meter rheostat may be likewise readjusted to maintain full scale deflection of the meter. This arrangement also has the advantage that the meter can be recalibrated to read relative signal strengths direct by making the right hand end of the scale zero and numbering the divisions 1, 2, 3, etc., from right to left. Thus on a 20 division meter scale a strong signal which retards the meter half way would show a signal strength of 10, one which retards it only quarter way would be read as a signal strength of 5, and so on.

Where the manual sensitivity control varies sensitivity by altering the bias of the amplifier tubes this system will work out to excellent vantage. Where there is no manual sensitivity control or where the sensitivity control does not vary the tube bias, then a fixed shunt across the tuning meter will be satisfactory.

There is nothing like a good tuning meter when one desires to try out different antennas or other changes in the installation. If with the regular antenna a given station causes the tuning meter to retard say 5 degrees, for instance, and a new antenna is put up which causes a retardation of 6 or 7 degrees on the same station, it will be obvious that the new antenna offers a distinct and worth while improvement over the old. For such tests the signal from a local station may be employed—and in fact is recommended because the lack of fading on local stations will insure greater accuracy in the tests. In effect the tuning meter functions exactly like a highly sensitive vacuum-tube r.f. meter and will detect changes in signal strength which would be entirely imperceptible to the ear. Another advantage is that it does not "jiggle" with modulation as does an output meter and therefore permits sharply defined and accurate readings. When connected in the plate circuit of an amplifier tube which is controlled by the a.v.c. system, the tuning meter provides an accurate indicator when realigning the tuned circuits or making other adjustments. For this purpose it is more convenient to use than an output meter because the signal from a local broadcast station may be used for the test signal whereas with an output meter used as an indicator it is necessary to use a modulated r.f. oscillator in order to obtain constant modulation and avoid flickering of the output meter pointer.

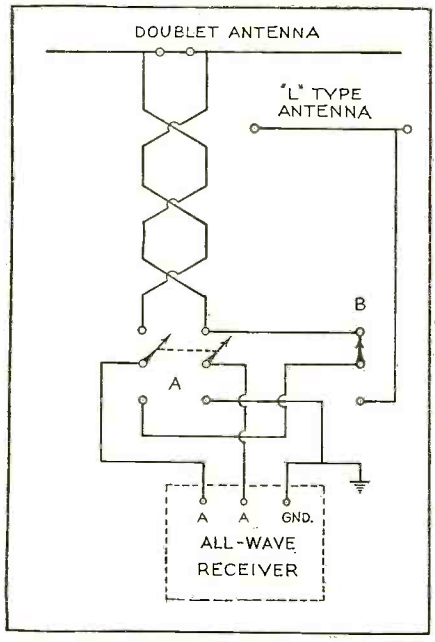
KNX Increases Power

Under authority from the Federal Radio Commission, station KNX, Hollywood, Calif., 1050 kc., increased its power on April 27, to 50,000 watts. On its lower power KNX has been one of the California stations best received along the Atlantic seaboard. It will be interesting to note what improvement results from the higher power now being employed.

Antenna Switching

Many owners of all-wave receivers employ doublet antennas, with transposed or parallel leads but find that better pick-up from distant broadcast-band stations is obtained with a long antenna of the "inverted L" type. This was found to be true at one of the R. N. listening posts and for convenience a simple switching arrangement was installed which provided an instant choice of three antenna combinations. The receiver employed had its antenna coil primary insulated from ground and the switching system was therefore made to include the ground so that one end of this coil could be grounded when using the "L" type antenna.

The switching circuit is shown herewith. It includes a d.p.d.t. knife switch and a s.p.s.t. knife switch. The doublet antenna consisted of a single span of wire, broken in the center by an insulator. The inner ends were connected to a transposed lead-in. The "L" type antenna was approximately 100 feet long. The switches made possible the following combinations: (1) Doublet direct to receiver with switch "A" up; (2) one side of doublet and ground with "A" down and "B" up; (3) "L" antenna and ground with "A" and "B" both down. Thus, in effect, there were two sizes of "L" antennas and a doublet available. The flexibility of this system was found highly advantageous because at times the long "L" antenna was found to be superior to the doublet, even on short waves. When selectivity was needed in receiving broadcast-band stations, it was obtained by using half the doublet, and so on.



For best results do not have the single lead from the "L" antenna run close to or parallel with the leads from the doublet, because of possible capacity coupling. However, do not have the two switches more than a few inches apart or the side of the doublet which goes to both switches may pick up undesirable noise and thus partly offset the advantage of the double lead-in.

DX Broadcast for African Listeners

Joseph Stokes of the KDKA DX Club requests that readers in East Africa be notified that Station KDKA, 980 kc., Pittsburgh, Pa., and its short-wave station W8XK, will broadcast a special DX program for African listeners, especially those in Mozambique, on Sunday night, July 15. Transmission will continue for 1 hour, beginning at 11:00 p.m., E.S.T., or 6:00 a. m. (Monday morning), South African Time.

An Effective Ground System

Edgar Weaver, Pittsfield, Ill., has been experimenting with ground systems and has evolved the following as a simple, yet highly effective one. He used 4 gas pipes, each 5 feet long and flattened one end of each to a wedge shape to facilitate driving and also to keep the earth out. Then he drilled a number of small holes in each and drove them into the earth in a row, spaced about 1½ feet apart. The four were then connected together by soldering a wire to each, then these 4 wires were soldered to the ground lead to the receiver. The tops of the pipes were left open and are regularly filled with water which seeps off into the surrounding earth through the small holes, keeping it moist at all times.

After completing this ground system reception from 2BL (Australia) was found to be considerably better than it had been when using an ordinary single pipe ground.

South Africa

The F. W. Anton Eveleigh Co., licensed radio dealers, of Port Elizabeth, South Africa, submit the following as an up-to-date list of the South African stations:

ZTC Cape Town, 600 kilocycles
ZTD Durban, 723.25 kilocycles
ZTJ Johannesburg, 645 kilocycles
Bloemfontein (relaying Johannesburg) 806 kilocycles
Pretoria (relaying Johannesburg) 962.38 kilocycles

"We are not sure what is the exact power of Johannesburg but think it will probably be 5 or 10 kw. Cape Town is definitely 10 kw. Durban, we believe, is 5 kw."

WLW Now 500 KW.

According to latest advice WLW, the Crosley station at Cincinnati, has been licensed to put the new 500 kw. transmitter in full time service beginning the evening of May 2, to replace the 50 kw. transmitter now in use. All tests of the new transmitter, which has been operating in the early morning hours for some months as the experimental station W8XO, indicate that the range with the new transmitter greatly exceeds that of the old one. By the time this reaches the eyes of readers it is likely that WLW will have established numerous records. This will be a good station for foreign listeners to shoot at when seasonal conditions are right again.

The Leading DX State?

Many readers undoubtedly wonder what part of the United States enjoys the best DX reception. This is probably a point that will never be definitely settled because there are too many variable factors involved. Geographical location is only one of these. The equipment used and the ability of the operator are the other important considerations. Reports published in this department during the past few months indicate that California ranks well up as a DX'ers Paradise, where numerous trans-Pacific stations are received with relative ease, particularly the Japanese stations. Missouri for no apparent reason seems to be very much in the running also. Being in the heart of the U. S. and several hundred miles from the nearest sizable body of water, the known advantage of an easy path over water is lacking to a large extent. Yet C. H. Long of Winston *has verifications* from 34 Australian stations, 16 Japanese, 6 New Zealand, 2 Chinese, 1 Philippine and 2 Hawaiian, not to mention numerous others from Europe and South America. Undoubtedly Mr. Long's success is due, in part at least, to the unusually fine DX receiver of his own design and construction which he employs. Those who have been following RADIO NEWS regularly will remember that this receiver was described, with full construction data, in a series of articles running continuously from March to July, 1933, inclusive.

It would be interesting to have reports from DX listeners in other states (and foreign countries as well) who have been successful in obtaining verifications from

(*Continued on page* 54)

EUROPEAN STATION LIST

AUSTRIA

Call	Location	Kc.	Kw.
....	Vienna (Experimental)	240	0.5
....	Innsbruck	519	0.5
....	Bisamberg (Vienna)	592	100.0
....	Graz	886	7·0
....	Klagenfurt	1294	0.5
....	Linz a.d. Donau	1294	0.5
....	Dornbirn	1294	0.15
....	Salzburg	1348	0.5

BELGIUM

....	Brussels I	620	15.0
....	Brussels II	932	15.0
....	Binche	1492	0.1
....	Chatelineau	1492	0.1
....	Antwerp	1492	0.1
....	Courtray	1492	0.1
....	Wallonia	1492	0.1
....	Nimes	1492	0.2
....	Liege	1500	0.1
....	Radio-Cointe	1500	0.1
....	Wallonia	1500	0.1
....	Seraing	1500	0.1
....	Verviers I	1500	0.1
....	Verviers II	1500	0.1

BULGARIA

....	Sofia	850	1.0

CZECHOSLOVAKIA

....	Prague I	638	120.0
....	Brno	922	32.0
....	Bratislava	1004	13.5
....	Kosice	1113	2.6
....	Moravska-Ostrava	1158	11.2
....	Prague	1204	5.6

DANZIG FREE CITY

....	Danzig	1303	0.5

DENMARK

OXP	Kalundborg	238	75.0
OXQ	Copenhagen	1176	10.0

ESTONIA

....	Tallinn	731	20.0
....	Tartu	1348	0.5

FINLAND

....	Lahti	166	40.0
....	Oulu	431	2.0
....	Viipuri	527	10.0
....	Pori	749	0.5
....	Helsinki	895	10.0
....	Tampere	1420	1.2
....	Turku	1492	.6
....	Pietarsaari	1500	.25

FRANCE

....	Radio-Paris	182	75.0
....	Eiffel Tower (Paris)	215	13.0
....	Lyons P.T.T.	648	15.0
....	Paris P.T.T.	695	7.0
....	Marseilles P.T.T.	749	5.0
....	Toulouse P.T.T.	776	2.0
LL	Paris	827	2.0
....	Strasbourg	859	15.0
....	Toulouse	895	10.0
....	Limoges P.T.T.	913	0.5
....	Poste Parisien (Paris)	959	100.0
....	Grenoble	968	20.0
....	Rennes P.T.T.	1040	2.5
....	Bordeaux P.T.T.	1077	12.0
....	Radio-Vitus	1110	2.0
....	Lille P.T.T.	1213	5.0
....	Juan-les-Pins (Nice)	1249	2.0
....	Montpellier	1339	5.0
....	Lyons	1393	5.0
....	Beziers	1429	2.0
....	Radio-Normandie	1456	0.2
....	Agen	1456	0.6
....	Bordeaux-Sud-Ouest	1492	1.0
....	Nimes	1492	0.2

GERMANY

....	Deutschlandsender (Konigswusterhausen)	191	60.0
....	Muehlacker (Stuttgart)	574	100.0
....	Langenberg	658	60.0
....	Munich	740	100.0
....	Leipzig	785	120.0
....	Berlin	841	100.0
....	Hamburg	904	100.0
....	Breslau	950	60.0
....	Heilsberg	1031	60.0
....	Cassel	1195	1.5
....	Frankfurt	1195	17.0
....	Freiburg-im-Breisgau	1195	5.0
....	Kaiserslautern	1195	1.5
....	Trier	1195	2.0
....	Gleiwitz	1231	5.0
....	Augsburg	1267	2.0
....	Nurnberg	1267	2.0
....	Bremen	1330	1.5
....	Flensburg	1330	1.5
....	Hanover	1330	1.5
....	Magdeburg	1330	1.5
....	Stettin	1330	1.5
....	Konigsberg	1348	0.5
....	Dresden	1465	1.5

GREAT BRITAIN

5XX	Daventry National	200	25.0
....	North Regional (Manchester)	668	50.0
....	Midland Regional) (Daventry)	767	25.0
....	Scottish Regional (Westerglen)	804	50.0
....	London Regional (London)	877	50.0
....	West Regional (Washford Cross)	977	50.0
....	North National (Moorside Edge)	1013	50.0
....	Scottish National (Westerglen)	1050	50.0
....	Belfast, Ireland	1122	1.0
....	London National	1149	50.0
....	West National (Washford Cross)	1149	50.0
....	Aberdeen	1285	1.0
....	Newcastle	1429	1.0
....	Bournemouth	1474	1.0
....	Plymouth	1474	0.3

GREECE

....	Saloniki	804	20.0

HUNGARY

HAH	Budapest II	359.5	0.75
HAL	Budapest I	545	120.0
HAE	Nyiregyhaza	1122	6.25
....	Budapest II	1321	0.8
HAE2	Magyarovar	1438	1.25
HAE3	Miskolc	1438	1.25
HAE4	Pecs	1465	1.25

IRISH FREE STATE

....	Athlone	565	60.0
....	Cork	1240	1.0
....	Dublin	1348	1.0

ITALY

....	Bolzano	536	1.0
....	Palermo	565	3.0
....	Florence	610	20.0
....	Rome I (S. Palomba)	713	50.0
....	Milan I (Siziano)	814	50.0
....	Genoa	986	10.0
....	Bari	1059	20.0
....	Naples	1104	1.5
....	Turin I	1140	7.0
....	Trieste	1222	10.0
....	Rome II	1258	1.0
....	Milan II (Vigentino)	1348	4.0
....	Turin II	1357	1.0

ICELAND

TFU	Reykjavik	183	17.0

LATVIA

....	Riga	583	15.0
....	Madona	1104	20.0
....	Riga	1510	10.0

LITHUANIA

LYT	Kaunas	155	7.0

LUXEMBURG

....	Luxemburg	230	150.0

NETHERLANDS

....	Huizen	160	7.0
....	Kootwijk	160	50.0
....	Hilversum	995	20.0
....	Bloemendaal	1220	0.05

NORWAY

LKO	Oslo	253	60.0
LKI	Finmark	355	1.0
LKH	Hamar	519	0.7
LKT	Trondheim	629	1.2
LKA	Aalesund	850	0.35
LKB	Bergen	850	1.0
LKP	Porsgrund	850	0.7
LKF	Frederikstad	868	0.7
LKD	Bodo	1276	0.5
LKS	Stavanger	1276	0.5
LKN	Notodden	1348	0.08
LKR	Rjukan	1348	0.15
LKK	Christiansand	1357	0.5
LKM	Tromso	1357	0.1

POLAND

....	Warsaw	214	120.0
....	Wilno	536	16.0
....	Katowice	758	12.0
....	Lwow	795	16.0
....	Poznan	868	16.0
....	Cracow	986	2.0
....	Lodz	1348	1.7

PORTUGAL

CT1GL	Lisbon	885	0.15
CT1BO	Lisbon	936	0.15
CT1DH	Lisbon	952	0.01
....	Parede	1031	5.0
CT1AA	Lisbon	1056	2.0
CT1AN	Lisbon	1056	0.01
CT1BM	Lisbon	1056	0.05
CT1EB	Lisbon	1056	0.05
CT1DS	Lisbon	1058	0.01
CT1GK	Lisbon	1063	2.0
PRP1	Oporto	1249	1.5
CT1BP	Lisbon	1275	0.05
....	Oliveira	1304	0.25
CS1RS	Oporto	1448	1.0

RUMANIA

....	Brasov	160	20.0
....	Bucharest	823	12.0

SPAIN

EAJ1	Barcelona	795	5.0
EAJ22	Salamanca	662	1.0
EAJ2	Madrid	731	3.0
EAJ5	Seville	731	1.5
EAJ3	Valencia	850	1.5
EAJ15	Barcelona	1022	3.0
EAJ19	Oviedo	1022	0.7
EAJ7	Madrid	1095	7.0
EAJ18	Logrona	1193	0.1
EAJ8	San Sebastian	1258	3.0
EAJ4	Santiago	1492	....
EAJ6	Pampeluna	1492	....
EAJ9	Malaga	1492	....
EAJ10	Saragossa	1492	....
EAJ12	Alcoy	1492	....
EAJ13	Palma (Majorca)	1492	....
EAJ16	Granada	1492	....
EAJ17	Morcia	1492	....
EAJ20	Sabadell	1492	....
EAJ21	Mellilla	1492	....
EAJ23	Gandia	1492	....
EAJ24	Cordoba	1492	....
EAJ27	Burgos	1492	....
EAJ28	Bilbao	1492	....
EAJ31	Alicante	1492	....
EAJ33	Tarragona	1492	....
EAJ34	Gijon	1492	....
EAJ39	Badalona	1492	....
EAJ41	La Corona	1492	....
EAJ42	Lleida	1492	....
EAJ43	Santa Cruz de Teneriffe	1492	....
EAJ44	Albaceta	1492	....
EAJ46	Ceuta	1492	....
EAJ47	Valladolid	1492	....
EAJ48	Pontevedra	1492	....
EAJ51	Manresa	1492	....
EAJ52	Badajos	1492	....
EAJ11	Tarragona	1500	....
EAJ14	Castillon	1500	....
EAJ25	Tarrassa	1500	....
EAJ26	Antequerra	1500	....
EAJ29	Alcala	1500	....
EAJ30	Onteniente	1500	....
EAJ32	Santander	1500	....
EAJ35	Villaneva	1500	....
EAJ36	Jatiba	1500	....
EAJ37	Linares	1500	....
EAJ38	Gerona	1500	....
EAJ40	Pontevedra	1500	....
EAJ45	Senia	1500	....
EAJ49	Toledo	1500	....
EAJ50	Las Palmas	1500	....

SWEDEN

SBG	Motala	216	30.0
SBE	Boden	392	0.6
SBF	Ostersund	413.5	0.6
SBD	Sundsvall	601	10.0
SCN	Malmberget	704	0.25
SBA	Stockholm	704	55.0
SBB	Goteborg	941	10.0
SCC	Falun	1086	2.0
SBH	Horby	1131	10.0
SCB	Eskilstuna	1240	0.2
SCP	Saffle	1240	0.4
SCU	Varberg	1240	0.3
SCL	Kiruna	1258	0.2
SCV	Orebro	1258	0.2
SBK	Karlstad	1312	0.25
SBC	Malmo	1312	1.25
SBI	Norrkoping	1312	0.25
SBJ	Trolhattan	1312	0.25
SCF	Hudiksvall	1375	0.15
SCG	Halsingborg	1384	0.2
SCR	Uddevalla	1393	0.05
SCS	Umea	1393	0.2
SCE	Halmstad	1402	0.2
SCW	Ornskoldsvik	1411	0.2
SCA	Boras	1447	0.15
SCI	Kalmar	1456	0.2
SCD	Gavle	1483	0.2
SCT	Upsala	1492	0.15
SCM	Kristineham	1500	0.25
SCH	Jonkoping	1515	0.25
SCJ	Karlskrona	1530	0.2

SWITZERLAND

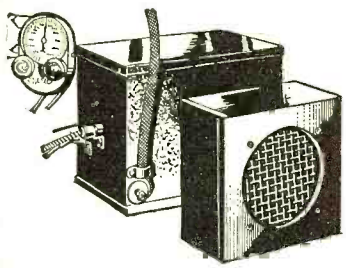
....	Geneva	401	1.3
....	Beromunster	556	60.0
....	Sottens	677	25.0
....	Monte Ceneri	1167	15.0
....	Basel	1375	0.5
....	Berne	1375	0.5

TURKEY			
....	Ankara	200	7.0
....	Istanbul	185	5.0
U. S. S. R.			
RW11	Moscow-Comintern	175	500.0
RW10	Minsk	208	100.0
RW4	Kharkov I	223	20.0
RW53	Leningrad I	245	100.0
RW58	Moscow II	271	100.0
RW12	Rostov-on-Don	353	20.0
RW24	Smolensk	364	2.0
RW2	Moscow III	401	100.0
RW25	Voronej	413.5	10.0
RW79	Murmansk	610	10.0
RW29	Petrozavodsk	648	10.0
RW9	Kiev	722	100.0
RW26	Stalino	776	10.0
RW39	Moscow IV	832	100.0
RW52	Simferopol	859	10.0
RW30	Dniepropetrovsk	913	4.0
RW40	Gomelj	959	1.2
RW13	Odessa	968	10.0
RW67	Oukhta	968	2.0
RW86	Chernigov	1013	10.0
RW70	Leningrad II	1040	10.0
RW33	Krasnodar	1050	1.0
RW57	Tiraspol	1068	10.0
RW75	Vinnitza	1095	10.0
RW20	Kharkov II	1185	10.0
YUGOSLAVIA			
....	Ljubljana	527	5.0
....	Belgrad	686	2.5
....	Zagreb	1086	0.7

Portable Sets

(*Continued from page* 11)

like occasions. The set is equipped with a chromium plated airplane type dial with spot-o-lite tuning, automatic volume control, and a built-in B eliminator. The following tube equipment is utilized: one 78



for the r.f. stage, one 36 as a combined first detector and oscillator, one 78 for the i.f. amplifier, one 85 for the second detector and automatic volume control, one 37 for the first audio stage, one 89 for the audio driver stage and one 79 in the power output stage. The receiver case measures 9¼ inches wide by 7⅝ inches high by 5¾ inches deep.

Self-Contained Motor Car Set

Announcement is made of the new Detrola model 6A single-unit superheterodyne automobile receiver, featuring the Elimo-Suppressor filter system which eliminates the necessity of spark-plug suppressors. A dust-proof dynamic type speaker is used and the remote-control unit is of the latest airplane style. The chassis measurements are 9 inches by 7¼ inches by 6½ inches. The tubes utilized are as follows: two –78's, one 6F7, one –75, one –42 and one –84 type rectifier. The current consumption is 6½ amperes.

Holiday Listeners

(*Continued from page* 9)

these, July and August stood above the twelve-month average of audience response. Audience mail is not referred to here as a yardstick of results—but its stability throughout the summer is perhaps the most scientific index of stability in the size of the audience." William C. Gittinger, Sales Manager, Columbia Broadcasting System.

RUTH ETTING

ALICE FAYE

BABE RUTH

JOHN CHARLES THOMAS

BACKSTAGE *in* BROADCASTING

Samuel Kaufman

JOHNNY GREEN, the 25-year-old musical director of the CBS Oldsmobile programs, recently reached new heights in his sensational career when he was named musical advisor of the network. Green, in his new capacity, acts as consultant on musical matters, program building and talent and idea development. His appointment still leaves him free to compose music for the stage and talkies. Green's composition for hit musical shows and talkies have made him an outstanding figure in the amusement world. Just recently, he returned from London where he composed music for a radio revue presented by the British Broadcasting Corporation. On the Oldsmobile series, heard Tuesdays and Fridays, he is co-featured with Ruth Etting, popular songstress of stage and screen.

EVER since the inception of talking pictures, there has been a considerable interchange of talent between radio and the films. It is true, though, that very few entertainers score with equal success in both fields. One of the recent Hollywood film finds was Alice Faye, a featured vocalist of Rudy Vallee's Orchestra. Alice hied to the talkie colony for a rôle with the crooner in "George White's Scandals." She clicked so well in the flickers that a long-term contract was immediately given her. To all appearances at the time of this writing, she will be lost to the microphone for a considerable time, with the possible exception of guest appearances. But while losing one vocalist to the talkies, radio reclaimed another of its former stars who had "gone Hollywood." Sylvia Froos is the girl who, after completing her rôle in the musical film "Stand Up and Cheer," came back to the CBS where she is heard Wednesdays.

THE mad comedy antics of Groucho and Chico Marx—two of the famed Four Marx Brothers—are once again coming over the airlanes. The new series is presented on CBS Sunday nights by the American Oil Company. Groucho and Chico established a huge radio following during their NBC series of a year ago and radio fans anxiously awaited their return to the microphone. At the start of the CBS series, the comic pair refused to broadcast before a visible audience, but the series was soon moved to the stage of the Columbia Radio Playhouse where the programs now take the air before several hundred invited guests. Freddy Martin's Orchestra supplies the musical background to the funsters' mad and fast capers.

WHEN John McCormack, noted Irish tenor, sailed for Africa early in the Spring, John Charles Thomas, distinguished American baritone, was chosen as the new star of the Vince program heard Wednesdays over NBC. Thomas was born in a small Pennsylvania town, the son of a Methodist minister. After winning a scholarship at a Baltimore conservatory, he launched his career in the field of light opera. Stardom came soon, but Thomas abandoned the Broadway stage for a concert and opera career. His popularity soared to new heights in the classical fields. He has sung in all important musical centers of the world and has been featured with the Royal Opera of Brussels, the Covent Garden Opera of London, and the San Francisco, Philadelphia, Chicago Civic and Metropolitan Opera Companies.

BABE RUTH, the Home Run King, is now in the ranks of regular radio entertainers. The idol of the younger generation is starred on NBC in a Monday, Wednesday and Friday series under the sponsorship of the Quaker Oats Company. On the series, Babe tells boys some of his batting pointers and participates in dramatization of his own career. Each broadcasting night, after Babe's workout with the New York Yankees is over, he hies to the studio of the local NBC station to prepare his program.

LANNY ROSS, popular vocal star of the Maxwell House Show Boat Hour, recently returned to the Radio City studios after a brief Hollywood talkie sojourn to find a new contract awaiting him. In addition to the Thursday night presentation, the General Foods Corporation decided to present a Wednesday "matinee" of the Show Boat feature. Both series are heard over extensive NBC hook-ups. It is our belief that there will be a growing trend towards presenting such daytime encores of popular evening features.

LILLIAN ROTH, erstwhile singing star of talking pictures, has heeded the call of the microphone and is co-starred with Edward Nell, Jr., baritone, on the new programs sponsored by the R. L. Watkins Company on CBS Monday nights. A high-

SYLVIA FROOS

RIGHT:
JOHNNY GREEN

CHICO MARX

LEFT:
LANNY ROSS

GROUCHO MARX

light of the new series is the presence of the Ohman and Arden Orchestra supplying the musical background. Ohman and Arden, long famous as an NBC piano team, have a splendid musical organization which, we believe, will greatly enhance their radio following.

Summer Radio

(*Continued from page 7*)

number of new types of automotive radio equipment that can be used both on land and sea, for mobile purposes. Another article gives the results of a remarkably complete survey, recently made, of summer radio conditions. Still another article points out the newest types of all-wave equipment. A careful perusal of this issue will bring to light many opportunities awaiting the alert serviceman and dealer during this holiday period. If there is any additional information you require regarding this equipment, drop us a letter and we will see to it that the information is furnished to you.

2-Stage Preselector

(*Continued from page 26*)

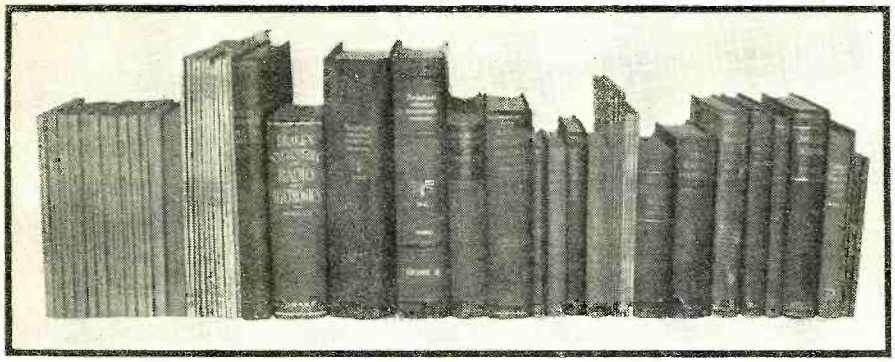
receiver was also a superheterodyne of high quality and it had one r.f. stage. In this receiver a tuning meter has been installed in such a way that it is possible to get some idea of the signal strength. The improvement obtained through the use of the preselector was definitely indicated by the meter.

There is no reason why this preselector could not be used with any short-wave receiver—or broadcast receiver. There are coils available for the broadcast band and DX hunters should derive considerable benefit from it. Actual tests have not been made of this feature, however, as the broadcast-band coils were not available at the time of the RADIO NEWS tests. The drawers available cover the following bands:

Drawer 1: 350 to 550 meters;
Drawer A: 90 to 200 meters;
Drawer C: 29-61 meters;
Drawer 2: 200 to 350 meters;
Drawer B: 60 to 90 meters;
Drawer D: 14 to 31 meters.

List of Parts

C1, C2—2-gang variable condenser, 140 mmfd.
C3, C4—double 8 mfd. electrolytic condenser, 200 volts
C5—.5 mfd. by-pass condenser, 200 volts
C6, C7—.1 mfd. by-pass condensers, 200 volts
C8—.001 mfd. mica condenser
L1, L2—set of Postal drawer-coils (14 to 200 meters)
L3—20-henry filter choke
L4—7 mh. r.f. choke
R1—volume control, 12,000 ohms, with switch
R2—300-ohm resistor, 1 watt
R3—290-ohm line resistance cord
S2—rotary switch
1 Postal drawer-coil socket
1 Postal front panel, engraved
1 drilled metal sub-base
1 crystal-finished cabinet with rubber feet, size 8½ inches by 10 inches by 6 inches
1 large knob
2 small knobs
3 6-prong sockets
Aerial and ground binding post
Two-foot shielded cable
Screws and hardware
Aeroplane dial



THE TECHNICAL REVIEW

JOSEPH CALCATERRA

Perpetual Trouble-Shooter's Manual, Volume IV, by John F. Rider. Published by John F. Rider, 1934. This manual hardly needs any introduction to the serviceman. For the benefit of the novice, let us say that this series of volumes is intended to give diagrams and service data on all broadcast receivers manufactured in the United States since the beginning of creation. The fourth volume includes those receivers which have appeared since the publication of Volume III. It contains over 1000 pages of diagrams of the latest radio receivers such as the all-wave sets, compacts, automobile sets with built-in eliminators and service instruments. The information is more complete than in the previous volume, since it now includes resistor and capacity data on all diagrams and voltages on most of them. Moreover, many diagrams include complete instruction for alignment and hints for installation.

The circuits shown are reproduced from the data supplied by manufacturers; they have not been redrawn in order to conform to a uniform standard. This has the advantage that errors in copying are avoided. The volume is accompanied by an index which lists all the diagrams in all four volumes and indicates on what pages they can be found. There is also a special section devoted to the explanation of the latest complicated circuits for a.v.c., delayed a.v.c., noise suppression, automatic tone control, the use of the pentagrid tube and reflex circuits. Diagrams of actual commercial apparatus are given to clarify the text. Whether you are looking for data on the International "Kadette" two-tuber, or on the Philco 16 all-wave receiver, the Trouble-Shooter's Manual contains it.

The Physics of Electron Tubes, by L. R. Koller; First Edition. McGraw-Hill Book Co., 1934. This is the latest volume of the International series in physics, edited by Mr. F. K. Richtmyer. It is intended to treat the fundamental physical phenomena involved in the operation of electron tubes. The text is devoted entirely to the insides of the tubes and does not discuss any of the circuits that are employed with it. A great part of the book deals with the theory of electron emission; the liberation of electrons by heat, light, impact, intense electric fields or X-rays. Thus the subject is not restricted to the so-called "vacuum tubes," but includes photoelectric cells of the emissive, conductive and voltaic type, gaseous discharge tubes, etc.

Although the text is written from the standpoint of the physicist, there is considerable information that will be useful to the average radio engineer or experimenter. For instance, formulas are given which show how much total emission can be expected from a filament of a given length, diameter and material at a given temperature. There are many useful tables showing the characteristics of various elements. Readers who are interested in learning something more regarding the construction and properties of vacuum tubes would do well to study carefully Dr. Koller's book.

Who's Who in Broadcasting; edited by Sydney A. Mosley; First Year. Sir Isaac Pitmans & Sons, 1933. A collection of short biographies of the leading personalities behind the microphone in Great Britain. It is an alphabetically arranged list of persons who have performed before the microphones of the B. B. C. and includes most of the well-known singers, musicians, actors, announcers, etc.

Auto-Radio Installation and Servicing; compiled and published by Hygrade Sylvania Corporation. Servicemen and engineers who are occupied with work on automobile radio sets will certainly appreciate the labor of Sylvania engineers in compiling the various tables. This book, which is available for free distribution to servicemen, contains valuable pointers on the installation of radio sets of automobiles. It includes a table of all makes of automobiles showing which terminal of the ignition system is grounded in their models for the last five years. There is another table which lists all makes of cars, giving data regarding built-in aerials in the top. There is another table of all automobile receivers, indicating the intermediate frequencies of the superheterodynes and the types of tubes employed in each. Then there are tables of characteristics of all tubes suitable for use in automobile sets. The text discusses the problems of suppressing ignition noise, installing antennas, etc., and also devotes several pages to typical troubles encountered in various makes of cars and radio sets.

Wide-Band, Open-wire System, by H. S. Hamilton; Electrical Engineering, April, 1934. This article contains a description of a new open wire circuit used for program transmission between San Francisco and Chicago. Various Circuits and test results are shown.

Review of Articles in the April, 1934, Issue of the Proceedings of the Institute of Radio Engineers

League of Nations Wireless Station, by G. F. Van Dissel. This paper outlines the plan of operation of the League of Nations Radio Station, gives a statement of its purpose, the procedure for its administrative control and a description of the equipment employed.

The Testing of Frequency Monitors for the Federal Radio Commission, by W. D. George. The Radio Commission has specified that frequency monitors for use in broadcast stations for checking their carrier frequencies be of a specifically approved type. This paper outlines the essential features which must be incorporated in such frequency monitors to meet the requirements of the Federal Radio Commission and gives a general description of the monitors tested and the test procedure.

High Frequency Models in Antenna Investigations, by G. H. Brown and Ronold King. This paper points out the feasibility of small scale analogy, by the use of models, to study radio transmission problems.

Propagation of High-Frequency Currents in Ground Return Circuits, by W. H. Wise. This paper shows how the electric field parallel to a ground circuit can be calculated without assuming that the frequency is so low that polarization currents in the ground circuit may be neglected.

Review of Contemporary Literature

Auditory Perspective, by W. B. Snow. Bell Laboratories Record, March 1934. This paper describes a series of experiments made to determine whether the effect of binaural reproduction could be obtained for a large audience without the costly features of individual earphones and wiring.

Auditorium Acoustics, by E. H. Bedell. Bell Laboratories Record, March 1934. The factors of auditorium acoustics and controls for volume, tone and signalling required to obtain most satisfactory results in auditory perspective systems are described in this paper.

Loudspeaker and Microphone, by A. L. Thuras. Bell Laboratories Record, March 1934. This paper describes the problems arising from the standpoint of equipment characteristics required to produce satisfactory auditory perspective reproduction and outlines the methods used in solving such problems in the design of satisfactory equipment and circuits.

Long Distance Transmission, by R. E. Crane. Bell Laboratories Record, March 1934. This article points out the severe requirements placed on transmission systems by auditory perspective systems and describes circuits and methods used to fill such requirements.

Noiseless Recording, by W. A. MacNair. Bell Laboratories Record, March 1934. This paper explains the methods used to produce Western Electric "noiseless" sound-on-film recording so that sounds ordinarily masked by background noise can be reproduced satisfactorily.

Gaseous Discharge Television Lamps, by H. J. Brown. Proceedings of the Radio Club of America, March 1934. As a result of the investigations described in this article, the author concludes that crater lamps of conventional design are entirely satisfactory for television systems employing 120 lines per frame and 25 pictures per second.

Resistance Attenuators for Radio-Frequency Use, by Malcolm Ferris. Proceedings of the Radio Club of America, March 1934. This paper describes the factors which must be considered in the design of resistance attenuators for use in signal generators and similar apparatus.

Some Applications of an A.C. Valve Bridge, by M. Reed. The Wireless Engineer and Experimental Wireless, April 1934. This article describes a method of using a valve bridge with a.c. supply for the solution of problems involving modulation, de-

tection of continuous wave signals and amplification and measurement of impulse signals.

Stability of Resistance-Coupled Amplifiers, by W. Baggally. The Wireless Engineer and Experimental Wireless, April, 1934. In this article, a method of determining the conditions for stability of a resistance-coupled amplifier are described so that simple decoupling methods involving the use of a condenser and resistance circuit in the plate circuit can be employed to eliminate instability.

Inductance of Solenoids in Cylindrical Screen Boxes, by W. G. Hayman. The Wireless Engineer and Experimental Wireless, April 1934. A formula is given in this paper for the direct determination of the number of turns required for a given solenoid, and simple corrections which enable it to be applied to the case of screened coils.

The Measurement of Small Inductance, by Robert F. Field. The General Radio Experimenter, March 1934. This article points out the effect of three sources of errors—sliding zero balance, variable inductance of the added resistor, and energy factors of the bridge arms due to parallel capacitance—in causing inaccuracies in the measurement of small inductances.

Constant-Inductance Resistors, by Robert F. Field. The General Radio Experimenter, March 1934. A variable decade resistor consisting of an arrangement of resistor and inductance sections so arranged that the inductance remains costant through the complete range of resistance values is described in this article.

Slow- Motion Movies with an Ordinary Motion-Picture Camera, by John D. Crawford. The General Radio Experimenter, March 1934. A method of taking slow motion pictures with an ordinary motion picture camera, by using a properly adjusted stroboscopic light is described in this article.

Twenty Years of Amateur Radio. QST, May 1934. A record of the history and achievements of the American Radio Relay League is contained in this article which traces the beginnings and development of the A. R. R. L.

Radio Legislation Before Congress. Electronics, April 1934. This article lists, and comments on, the various measures affecting radio which are up before Congress and their probable effects on radio transmission and reception.

How to Get Copies of Articles Abstracted in This Department

The abstracts of articles featured in this department are intended to serve as a guide to the most interesting and instructive material appearing in contemporary magazines and reports. These publications may be consulted at most of the larger public libraries or copies may be ordered direct from the publishers of the magazines mentioned.

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Review of Technical Booklets Available

2. *1934 R. F. Parts Catalog.* Specifications on the entire line of Hammarlund variable and adjustable condensers, r.f. transformers, sockets, shields and miscellaneous parts for broadcast and short-wave receivers, and transmitting variable condensers.

4. *A 15 to 200-Meter Superheterodyne.* Outstanding features of the Hammarlund-Roberts high-frequency Superheterodyne designed especially for commercial operators for laboratory, newspaper, police, airport and steamship use.

5. *A 1934 Volume Control, and Resistor Catalog.* Complete data on standard and replacement volume controls, adjustable resistors, vitreous wire-wound fixed resistors, voltage dividers, precision wire-wound non-inductive resistors, high-quality attenuators, center-tapped filament resistors, power (50-watt) rheostats and other Electrad resistor specialties.

6. *Line Voltage Control.* Characteristics and uses of a voltage regulator and chart showing the correct Amperite recommended by set manufactures for their receivers. Also tells how to improve your customers' sets and make a profit besides.

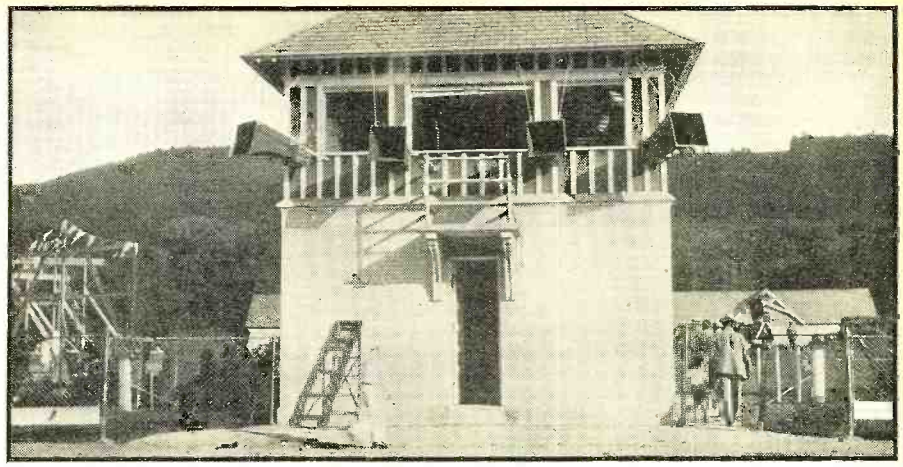
7. *Rich Rewards in Radio.* Interesting information on the growth of radio and the opportunities existing in the field of radio manufacturing, radio servicing, broadcasting, talking pictures, television, public-address systems and commercial station operation on land and sea, for men who are trained to fill the many jobs created by the radio and allied industries. The book also contains detailed information on the complete home-study courses in radio and allied subjects offered by the National Radio Institute.

9. *Resistor Catalogue.* Specifications of the International Resistance Co. 1934 line of metallized, wire-wound and precision wire-wound resistors, motor-radio suppressors, handy servicemen's kits, technical data on the building of servicemen's test equipment.

16. *RMA Standard Resistor Color-Code Chart and Meter Conversion Data.* A handy postcard-size color-code chart designed by the Lynch Mfg. Co. to simplify the job of identifying the resistance values of resistors used in most of the standard receivers.

25. *Noise-Reducing Antenna Systems.* Two types of noise-reducing systems perfected by the Lynch Mfg. Co. for both

(*Continued on page* 61)



THE SERVICE BENCH

ZEH BOUCK

THE REFRIGERATOR SIDE-LINE STEPS OUT!

THE *Service Bench* for January 1934 pointed out the increasing possibilities of refrigerators—sales and service—as a side-line to the radio service business. Our anticipation of a gala refrigerator year is corroborated in a recent statement by E. G. Biechler, President of Frigidaire, "The best information we can gather, based on investigations inside and outside of our industry, leads me to believe that 1934 will be an outstanding year in the history of electric refrigeration."

And the *time* of the year is propitious! Ice cubes in tall glasses are tinkling way up at the peak of the curve! Also it is now *easier than ever before* for the radio serviceman to contact a good refrigeration line through his radio associations, due to the fact that so many radio manufacturers have taken on the refrigerator business—General Motors, Majestic, Stewart-Warner, General Electric, Grunow—etc. The small-town or urban serviceman who has any sort of a representative franchise, on radios made by one of these companies, should experience little difficulty in effecting arrangements to peddle their refrigerators also. Displays and a genuine sales campaign will contribute much to the success of this side-line. As H. W. Newell, Vice President in Charge of Sales with Frigidaire, points out we are in a shopping era, and, "The public is reading advertisements, looking at displays and opening its doors to direct-selling men, in an effort to *learn the full facts and make the wisest choice.*"

In reference to—

Refrigerator Troubles

—Mr. W. O. Slaughter, of the Radio Service Company, Hammond, La., writes as follows:

"I operate a radio and refrigeration service shop and find that in the summer the old income can be revived by refrigeration service. I have had factory training with the Frigidaire and Kelvinator companies. The point is that their machines are the type which can be and usually are serviced on the spot—rather than returning the refrigerating units to the factory. Naturally, we are more interested in the refrigerators that offer genuine service jobs.

"Both Frigidaire and Kelvinator employ the same refrigerant, SO_2 (sulphur dioxide). The servicing of these machines therefore follows the same general lines. Other refrigerators—a few—use methyl chloride and iso butane. These have somewhat different characteristics, which can be discussed later if you are really interested. (We sure are!—*Service Editor.*)

"The radio serviceman should familiarize himself with the theoretical aspects of mechanical refrigeration. This is a specialized field, and haphazard attempts at servicing should be shunned. For example, I am somewhat dubious concerning the methods suggested by Arthur Crosley in the January *Service Bench* for reducing vibration by adding counter-weights to the compressor flywheel.

"This may work in isolated instances, but it is ten-to-one that this trouble developed after the machine had been in operation for a period of time—indicating that the real trouble is less obvious, because it was not present when the refrigerator was new. (We agree in part. But we know of cases when the trouble was undoubtedly inherent in the refrigerator, but was not originally apparent, due to general tightness. As the bearings loosened up with age and service, the vibration was permitted to build up until it developed into an annoying thump.—*Service Editor.*)

"The cause of excessive vibration is usually due to high head or back pressure, or lack of oil in the compressor body. The high head pressure is caused by air entering the system on the suction or low side; and lack of oil by the gradual working out of it into the freezing coil or boiler, and failing to return. This is particularly true in many of the small 'household' models, but occasionally happens in even the largest types.

"Where vibration and noise is caused by lack of oil, and if it is only the first or second time it has happened, the remedy for another year is merely the addition of about one-half pint of special, high-viscosity oil. This is introduced into the compressor body on the low or suction-valve side, care being taken not to permit the entering of air, which will cause high-head pressure, bad freezing, constant running, and maybe a stalled motor."

It will be observed that Mr. Slaughter reiterates the seasonal attractiveness of the refrigerator business. To take full advantage of this, a clientele should be circularized in pretty much the same manner of radio service letters pointing out the desirability of having the radio put into first class condition for the summer season or some special radio event. The following letter is typical, and may be readily

adapted to your own requirements in matter of approach, methods of charging, etc.:

My dear Mr. ——: Do you realize that your refrigerator has been working away for you day and night for a longer period of time than you would expect of almost any other modern convenience—from your radio to your auto. And with warm weather definitely upon us an even greater burden will be placed on the machine for months to come. Would it not be worth while to have your refrigerator checked over NOW—for a few cents—and prevent a failure when you need it most—and which might very well run into considerable money?

Perhaps you have noticed that, of late, it requires more frequent defrosting? Or is noisy? Or runs much more constantly than it did when first purchased? Has your cream soured, by any chance, for the first time since you have had the refrigerator? Are your electric light bills unusually high?

All these things are symptomatic of troubles which can be quickly and easily eliminated, without interruption of service, and the savings actually effected in lowered electrical consumption will probably more than cover the cost of servicing.

Our charges for inspection and adjustment are nominal; and where actual repairs are required the cost will be the lowest consistent with reliable work by refrigeration experts.

Yours Sincerely——

The Air Cell and the Rural Serviceman

We have a letter from Le Roy Schmidt, of the Schmidt Radio Service, Binford, N. Dak., anent the *Service Bench* for March 1934, in which we discussed the air-cell receiver and the serviceman. Mr. Schmidt admits the service possibilities—but as far as sales are concerned he feels that the rural or small town serviceman is out of luck. As he points out the mail-order house can undersell the individual serviceman any time.

Against this competition, the serviceman has only one argument. Buy from him—pay a little more perhaps—and at least you have *someone right on hand to come back at in case of trouble!*

Another way the rural serviceman can compete with the mail order house on air-cell receivers—and herein, we believe is his real gravy—is in the renovating of old-type battery sets. This may be done, either for the owners, or on sets that have been traded in. In the latter case they may be

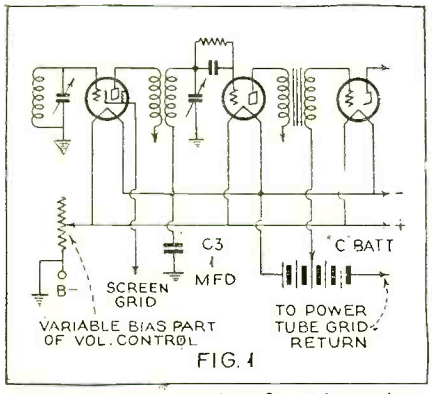


FIG. 1

resold, for a very good profit, at low prices.

In effecting such modernization, keep the following points in mind:

1. No adjustable rheostats should be used. Any rheostat on the set should be removed and mounted behind the panel. It is wired in a circuit common to all tubes. This should be adjusted, with a new aircell, so that the voltage across any socket is exactly 2.2 volts. At this adjustment, the maximum tube and battery life will be realized. Of course a fixed resistor (not of the ballast type) can be used, and the value calculated, by Ohm's law, as the resistance necessary to drop from 2.6 volts—the potential of a new air-cell battery—to the optimum operating voltage of 2.2. The tubes are operated in parallel, so it is merely necessary to add the filament currents of all tubes to determine the total current—or I. The voltage, E, is obviously .4 volts (2.6 volts—2.2 volts). Then R=E/I. However, as this may give a fractional ohmage, rather troublesome to obtain, the rheostat method, as outlined above, will usually be easier.

2. Eliminate the dial-light. This will often draw more current than all the tubes put together. (A .06 ampere pilot light is available if the customer insists and the tubes leave a sufficient margin of current.)

3. Be sure to replace with the correct type of 2 volt tubes. All triodes should be replaced with 30s (excepting power tubes). Screen-grid circuits employing 22s or 24s take a type 32. The variable-mu tube, 34, is substituted for similar tubes. Type 31 is a power amplifying tube for Class A circuits—singly or in push-pull. Type 19 is employed in Class B power amplifiers, and the 33 is a power amplifying pentode. Total I should not exceed 600 ma.

4. Remember that the tubes in the 2-volt series are of the filament-cathode type. There are no heaters (with the exception of type 15). All cathodes will therefore be common, and only one grid bias can be secured by the IR drop from ground to cathode. This will generally be a variable bias and part of the volume-control system. Any additional biases required must be supplied by a "C" battery connected between the negative leg of the filament and the grid return. One "C" battery of course, can be tapped to supply as many different biases to as many different tubes as desired. This idea is illustrated in the abbreviated circuit, Figure 1. Note that no grid return, unaffected by the common bias (usually part of the volume control system, as intimated) can be grounded—i.e., connected to a rotor of the tuning condenser, unless isolated rotors are used. Condenser C3, which completes the radio-frequency circuit L2-C2, must be relatively large, so that the two circuits, L1-C1 and L2-C2, will gang—in other words, tune as if the lower side of L2 were grounded.

5. Make sure that the resistor network is altered if necessary, to eliminate any shunt or "bleeder" resistors across any portion of the plate voltage.

6. In case of antiquated receivers, it will be desirable to modernize the audio-frequency system by arranging for push-pull with good transformers.

Air-Cell Conversion

The following contributions from the field supplement the general points on re-

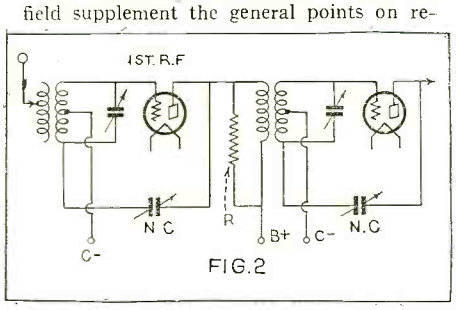


FIG. 2

building sets for air-cell operation: "There are hundreds of the early battery type Atwater Kent receivers still going strong especially in the rural sections of the country. I have changed many of these receivers over to air-cell operation and have

(*Continued on page* 64)

RADIO PHYSICS COURSE

ALFRED A. GHIRARDI*

Lesson 31

Mutual Induction

THE electromagnetic induction due to two independent electric circuits reacting upon each other, is called *mutual-induction* (see Figure 1). The previous examples of the induction of voltage in the secondary winding of a transformer due to the current flowing through the primary is an excellent illustration of mutual-induction. Parallel conductors carrying independent alternating currents react upon each other by reason of the mutual inductive influence between them. Mutual induction between wires in radio transmitters, and in radio receivers, is often the cause of howling, hum, etc., and certain steps may be taken to prevent this.

It is not necessary to again go into a detailed study of the actions taking place during mutual-induction, as this has already been covered during our study of the transformer. It should be remembered that induced voltage is produced in the secondary circuit whenever current in the primary starts fo flow, ceases to flow, changes its rate of flow, or changes its direction of flow. The intensity of the induced voltage depends upon, and is proportional to, the rate at which current changes take place in the primary. The higher the frequency, the more rapid is the change of current, and so the greater will be the induced voltage. The greater the amplitude, or rise and fall, of current in the primary with a given frequency, the greater is its rate of change, and the higher will be its induced voltage. The primary and secondary circuits may be simply straight wires near each other, solenoid coils, etc.

From the point of view of the electron theory, the effects of mutual-induction may be explained simply. Electrons are flowing around the primary winding when current is sent through. While this stream of electrons is increasing, it causes electrons in the secondary to flow around in the direction opposite to those in the primary. The secondary electron streams by their movement, produce magnetic forces which exert a backward push on those in the primary, and try to stop their flow. If the primary circuit is opened, the stream of electrons in the primary comes to rest, and those in the secondary reverse their direction of flow and tend to make the electrons in the secondary keep on moving. Whatever change takes place in the stream of electrons in the primary, the electrons in the secondary oppose the change by means of the magnetic forces set up by their motion. The student should check up these forces by applying the right-hand rule to find the directions of the fields in each case, remembering that the right-hand rule refers to the direction of the current flow—which is opposite to the direction of the electron flow.

Self-induction can be easily understood by comparing it with the case of mutual-induction explained above. If a coil is connected to a source of alternating current a stream of electrons flows along from one turn to the next. The action between any two turns is the same as if they were two separate coils. As the stream of electrons flow through say the top turn of the coil, they set up a magnetic force which tends to push all the electrons along in the other portion of the coil, that is, tend to increase the current.

Two coils may be placed with reference to each other so that a part of the electromagnetic field of one coil passes or cuts through the conductors forming the other coil. Then there is a mutual inductive effect between the coils and they are said to be *coupled*. The closer together the coils are, the greater are the number of lines of force due to the primary current that link with the turns of the secondary, and the *closer* or *tighter* the coupling is said to be. Also the better the permeability of the magnetic circuit, the better is the coupling.

The induced voltage across the secondary of such a two-coil arrangement depends upon the sizes of both coils, their relative positions and distance apart, the permeability of the magnetic circuit, and the rate of change of the primary current. All of these *physical* factors, except the rate of change of the primary current, are collectively called the *mutual inductance* (M) of the circuit. The larger the coils are, the closer they are to each other, and the more nearly their axes coincide, the greater is their mutual inductance M. Since the mutual inductance possible between two coils is affected by so many variable things, and since the design of radio apparatus is almost entirely tied up with mutual inductances and variations thereof, it is important that we study this subject in detail.

In many applications, inductors are connected in series, and are also placed near each other so that magnetic coupling exists between them. The inductance of a coil depends, among other factors, upon the square of the number of turns of wire of which it is composed. Doubling the number of turns makes the inductance 4 times as large, etc. Suppose we have two coils, built exactly alike, as shown in (A) of Figure 1, and having the same inductance. If they are connected together in series but kept apart to prevent magnetic interaction, the total inductance will simply be equal to the sum of the two. However, if they

(*Continued on page 60*)

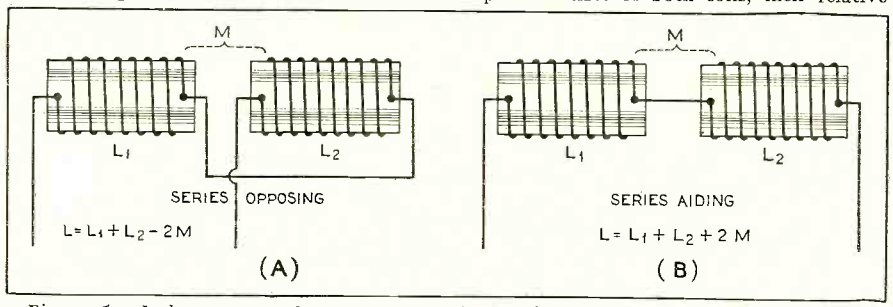


Figure 1. Inductors may be connected and placed so their magnetic fields either buck each other or aid each other. The total inductance depends upon the connections and the spacing and placing of the coils

*Radio Technical Pub. Co. Publishers, Radio Physics Course.

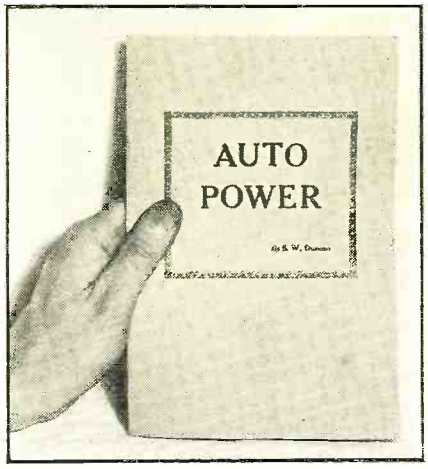
WITH THE EXPERIMENTERS

S. GORDON TAYLOR

Auto Radio Power

Radio experimenters have developed all sorts of uses for old Ford spark coils and generators. Thus far nobody has developed them to a point where they will put the cat out at night and wind the clock—but they have been made to do almost everything else under the sun.

Now comes a book which gives detailed instructions for converting the ordinary Ford generator, both Model A and Model



T, into a 110-volt a.c. generator, a 32- or 110-volt d.c. generator, or a 110-volt d.c., 32-volt d.c. or 110-volt a.c. motor. As generators, these revamped units, when driven from the fan belt pulley of an automobile engine, will provide between 100 and 200 watts at 110 volts a.c., or 100 watts at 110 volts d.c. If desired, these generators can be driven from any other source such as a separate small gas engine rated at ½ horse power.

The book, "Auto Power," by S. W. Duncan, provides complete instructions for the revamping process and states that the complete job of changing the standard Ford generator to one providing 110 volts a.c. costs not more than $1.00. The book also provides instructions for rebuilding the Dodge and Delco generators and gives practical test information which enables the constructor to check his work to avoid broken-down insulation, shorted turns or other defects during the revamping process.

In view of the fact that generators of these types can be obtained for almost nothing from any automobile junk yard and, when rewound in accordance with the instructions given, will provide plenty of power for operation of standard a.c. receivers or sound systems in an automobile, there is no question but that many experimenters will be interested in this book. The editor of this department will be glad to provide the publisher's name.

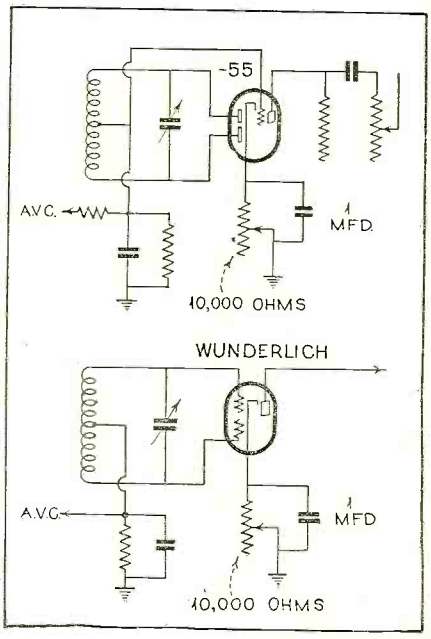
Installing an Interstation Noise Suppressor System

Radio receivers equipped with interstation noise suppression generally employ a separate tube and the grid bias action of this tube is controlled by the automatic volume control circuit of the receiver in such a way as to block the audio amplifier when the signal strength fades to a predetermined minimum.

This system, of course, is successful but the circuit is complex and not easily installed in a receiver. Also, it requires an extra tube with the necessary additional operating voltages.

The system as used by the writer is simple and easy to install. It can be used in all Wunderlich and -55 type tube circuits in which the triode section is diode biased and where the manual volume control is installed in the audio amplifier. As can be seen in the diagram, a variable resistor is connected in the cathode lead of the detector circuit and it is by-passed by the 1 mfd. condenser. The plate current of the detector tube causes a voltage drop through this resistor which results in a negative bias being placed on the diode plates or the dual grids as the case may be.

The receiver is tuned to a point between stations, where the noise is loudest and the rheostat is turned until the bias on the diode plates is greater than the voltage



generated by the noise. This stops rectification and therefore detection and the set will be silent.

As soon as the receiver is tuned to a station which provides a signal input to the diode which is greater than the diode bias, then rectification takes place. This results in an increased bias on the grid of the triode and a decrease in the current flowing through the cathode resistor.

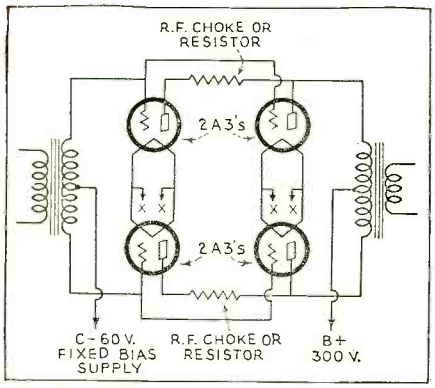
If the receiver is tuned to a station that fades in and out of the noise level, reception will be choppy, due to the set going silent as the signal enters the noise level. This is common to all interstation noise suppression systems.

The distortion introduced by operating the tube in this fashion is very small at normal inputs. It increases near the cut-off point but is no worse than in other systems in which the grid of the audio tube may be driven negative enough to operate the tube as a bias detector instead of as a distortionless amplifier.

MORRIS LANDAU,
Wilkes-Barre, Pa.

Stabilizing a Push-Pull Parallel Amplifier

In a 30-watt Class A prime amplifier that I have constructed and in a similar high-power amplifier built here at the college, there was considerable difficulty with motorboating. The output power stage of both amplifiers used 2A3 type tubes in parallel push-pull. The trouble persisted when the input tubes were removed from their sockets and even when the grids of



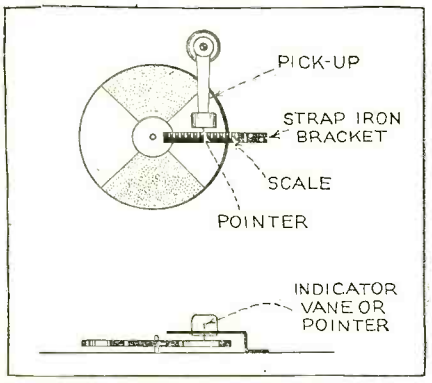
all the 2A3's were connected to an external 62 volt C bias battery.

The remedy for this condition is very simple. Put a small radio-frequency choke or a resistor of about 5 ohms between the plates of the tubes in parallel. This totally eliminates any instability. Using a resistor of less than 5 ohms, the amplifier would pop on loud signals.

GORDON ROGERS,
Clemson College, S. C.

Home-Made Record Gauge

In broadcast and public-address recorded programs it is often necessary to play only a part of the phonograph record or tran-



scription, as, for instance, in dramatic sketches where music is superimposed on the broadcast program. This is a tricky

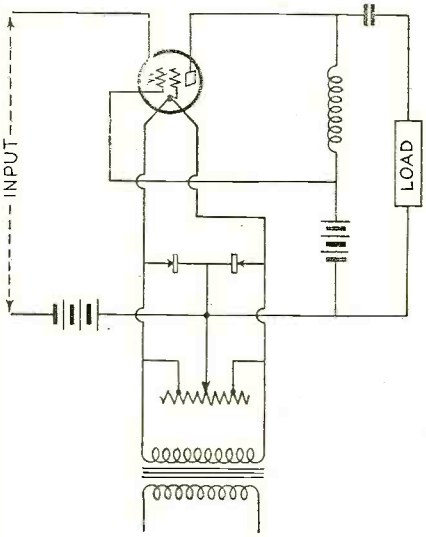
(*Continued on page 63*)

LATEST RADIO PATENTS

BEN J. CHROMY*

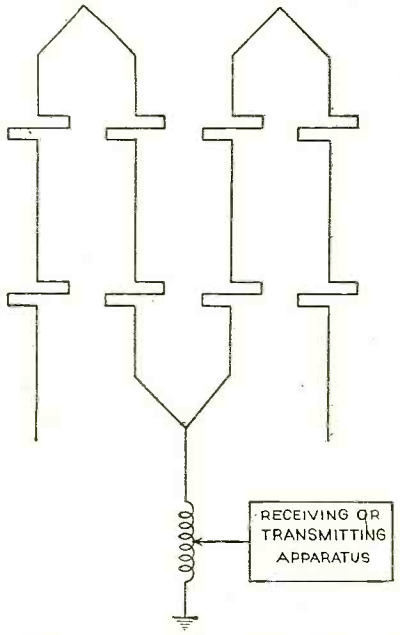
1,912,755. HUM REDUCTION IN ALTERNATING CURRENT RECEIVERS. RENE A. BRADEN, Merchantville, N. J., assignor to Radio Corporation of America, a Corporation of Delaware. Filed Feb. 19, 1930. Serial No. 429,483. 20 Claims.

1. An electric system comprising an electron discharge device having a thermionic cathode, an input circuit and an output



circuit, a source of alternating current connected to the cathode for supplying heating current thereto, a path of adjustable impedance in shunt to the source, a connection from said circuits to a predetermined electrical point on said path and a second path of variable impedance connected to said point for controlling the electrical value of said point.

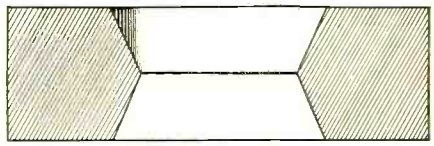
1,914,887. WIRELESS TELEGRAPH AND TELEPHONE AERIAL. CHARLES SAMUEL FRANKLIN, London, England,



assignor to Radio Corporation of America, a Corporation of Delaware. Original application filed Sept. 22, 1926, Serial No. 136,908, and in Great Britain Oct. 7, 1925. Divided and this application filed Dec. 14, 1932. Serial No. 647,108. 7 Claims.

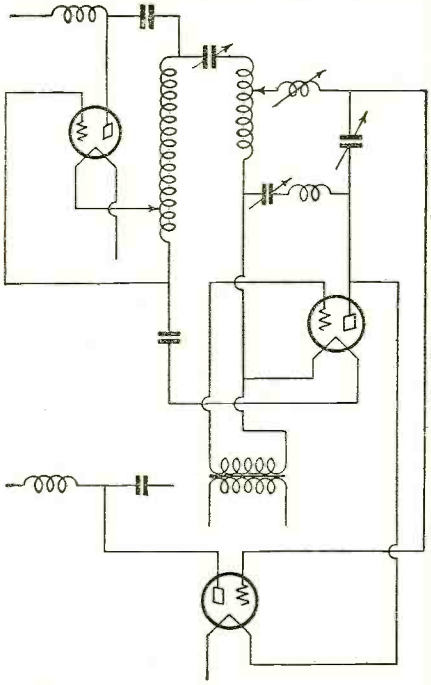
1. A directional aerial system comprising a plurality of aerials wherein radiation is suppressed from every alternate half wavelength, whereby each aerial has alternate radiating and substantially non-radiating sections, and means for serially connecting the aerials together in pairs at their extreme radiating sections.

1,907,425. PIEZO-ELECTRIC RESONATOR. WARREN A. MARRISON, Maplewood, N. J., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a Corporation of New York. Filed Dec. 19, 1928. Serial No. 327,017. 11 Claims.



3. A quartz crystal piezo-electric resonator cut parallel to its electrical and optical axes and having its dimensions so related that it has a very small temperature coefficient.

1,916,843. HIGH FREQUENCY TRANSMITTER. WILHELM LANGEWIESCHE, Berlin-Tempelhof, Germany, assignor of

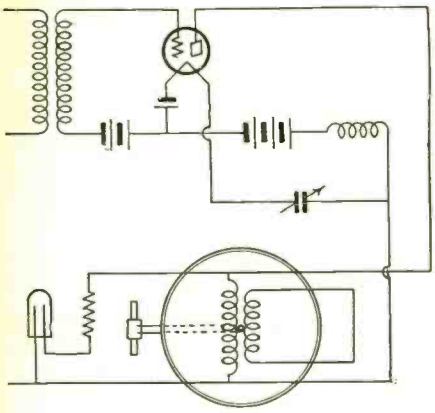


fifty per cent to Radio Patents Corporation, New York, N. Y. Filed Sept. 20, 1930, Serial No. 483,241, and in Germany Sept. 21, 1929. 9 Claims.

1. In combination with a telephone transmitter, a master oscillator generating high frequency currents, a power amplifying tube controlled by said master oscillator, a modulating tube having its filament inserted in the output circuit of said master oscillator to be heated by said high frequency current and having its anode connected to the cathode of said power amplifying tube and a high frequency shunt between the cathode and anode of said modulating tube.

*Patent Attorney, Washington, D. C.

1,918,977. SYNCHRONOUS MOTOR. WARREN A. MARRISON, Maplewood, N. J., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a Corporation of New York. Filed June 6,



1930. Serial No. 459,580. 7 Claims.

3. In combination, a space discharge device, an output circuit therefor, a synchronous motor and a condenser connected in the output circuit of said device, and a direct current meter connected in shunt to said condenser.

1,916,586. ELECTROLYTIC DEVICE. PRESTON ROBINSON and JOSEPH L. COLLINS, North Adams, Mass., assignors to Sprague Specialties Co., North Adams, Mass., a Corporation of Massachusetts. Filed May 8, 1931. Serial No. 536,072. 21 Claims.

9. In the manufacture of electrolytic devices with aluminum electrodes and having an electrolyte with a pH between 4 and 8, the process which comprises forming the electrode in an electrolyte, maintaining the electrolyte at a substantially constant pH during the whole formation process and assembling the electrode into a condenser having an electrolyte of lower pH than the forming electrolyte.

15th Anniversary

(*Continued from page* 13)

With the publication of the March, 1931, issue of RADIO NEWS, editorship was assigned to Laurence M. Cockaday, formerly technical editor of the New York *Herald Tribune* and one of the founders and editors of *Popular Radio* magazine, as well as *The Wireless Age* (founded in 1912). In 1932 RADIO NEWS acquired a leading contemporary, *Radio Call Book Magazine* and the *Technical Review*, and merged the two publications in the December issue. In October 1933 the complete title of the magazine became RADIO NEWS AND THE SHORT WAVE, due to growing interest in the higher frequencies for broadcasting, and a larger share of each issue was given over to short-wave information.

The magazine is published by Teck Publications Inc., Washington and South Avenues, Dunellen, New Jersey, with editorial and executive offices at 222 West 39th Street, New York City. The officers are Lee Ellmaker, President and Treasurer, Abner Germann, Secretary. The editorial staff is: Laurence M. Cockaday, editor; S. Gordon Taylor, Managing Editor; John M. Borst and William C. Dorf, Technical Editors; Howard S. Pearse, Associate Editor; Samuel Kaufman, Broadcast Editor; Joseph F. Odenbach, Art Editor.

RADIO NEWS starts its 16th year with greetings to its readers, with great hopes for the future of the radio industry and with a promise of added helpfulness and service to the whole radio industry.

QRD? QRD? QRD?

CONDUCTED BY GY

THE short-wave hams are enthusiastic over the news that the World's Fair at Chicago, which will be revived this year, will permit their exhibition of short-wave apparatus at the Travel and Transport building and amateurs will again be on hand to transmit any messages free to any part of the world to friends of fair sightseers. This again will keep the hams on their toes for practical purposes and give the laymen a break.

By the way, speaking of amateurs, the heading this month is a photograph of the amateur radio station of Miss N. Corry of Walton Heath, Surrey, England, with the call letters G2YL. She not only passed the Post Office tests and built all the apparatus herself but has communicated with amateurs in 56 foreign countries, including 30 in Australia and New Zealand.

Commercial and short-wave operators will be receiving some real competition from ordinary short-wave listeners. These persons who have been keeping the "wee sma" hours searching for elusive distant reception via the megacycle freqs have developed a real liking for code instruction because of the code they occasionally hear coming through the phones from 'planes and ships. They eventually might turn out to be darn good key men also, and when that happens look to the old laurels, me bhoys.

Brother Stevens, who is key man out at NJY, the radio-compass station situated on Fire Island, N. Y., writes in the complaint that operators on ships during the terrific weather we had during the winter were not fair, insisting on QTE's and cluttering up the air so that he couldn't break through them. ". . . if they will only listen on 800 before blasting out with a *spk* or *hi-pwr* ICW, they will get much quicker answers to their requests for bearings. On many occasions, especially on busy days, there are as many as ten ships all trying to work NJY at the same time. Or some op will blast in and ask for a QTE while we are taking a bearing on another station. This balls up the works and makes it necessary to take the bearing all over again. Lots of times I get disgusted trying to straighten out the jam and getting the ships to wait their turn. When they continue calling, after I have told them to wait, I simply park my feet on the desk until they are all tired out trying to drown out the others and then I begin to work with them. I realize their OM is pushing them, but they will get much faster service if they co-operate and listen first."

The IBEW and the ARTA are at hammer-and-tongs again and ye Ed (for one) believes that there cannot be any help for the middleman, the op, unless there is harmony in the home. These organizations are the only two dedicated to the betterment of conditions for radiomen, whether they be ship operators, aircraft men, or broadcast ops. Unless these outfits patch up their petty differences, there will never be any succor for the operator who, it seems, cannot be organized without the entrance of selfish motives. If things continue in this manner, there is no doubt but that ops *will just depend on their own initiative to barter and bargain for individual rights and pay!*

Some months ago, this column published the statement that Mr. Hoyt Haddock had represented the broadcast operators at the Washington code hearing, based on the statements made by Mr. Haddock to ye Ed. He also showed him the minutes of the meeting, which stated that he had been there, and which contained various other statements pertinent to the fact that Haddock had represented himself to be a representative of the operators. In the February issue of the IBEW Bulletin a statement appears in which it seems that Mr. Haddock did not act as a duly authorized representative of the ops. It states that ". . . He (Mr. Haddock) was then asked if he had any authority for representing radio-broadcasting technicians and he was unable to produce a single authorization. He said there were some Baltimore ops in the audience and they would appear in behalf of ARTA if the deputy administrator would call on them. These men ducked out on Mr. Haddock and refused to make any appearance. This left Mr. Haddock without consideration by the administration." Therefore, what does it all mean? Who is representing whom and if so, why? Are the operators being considered in all this controversy? If they cannot get together as to who shall represent whom, could not the two organizations merge, so that the op will be taken care of and not permit petty strife to burn up all the effort and confidence that has been built up in the past? We only hope that something can be done where the white dove of peace will be flying over the main ship, the operator, and leave him with the feeling that something is being done for him by

those who leave the human element equation out of organization.

Cheering news was brought to the desk when it was learned that a request by the Administrator for Broadcast hearings, which was sent to the 610 stations in the United States for information as to the increase in operator strength, brought back the reply that almost 211 men were added to their staffs. Of the 610 only 40 did not show their figures. This average shows that the code hearings were successful in the pay increase and the lesser hours now enjoyed by ops in broadcast stations. These men will be kept on permanently as it seems that greater efficiency has been developed in the handling of programs over the air.

The Broadcast Code Hearings which were to be held the twelfth of March were delayed indefinitely due to other matters which the administration was taking up in regards to broadcasting and wave lengths. They will again be resumed upon notice from the administrator for this division.

Enrici Gorbea left his ship for the pot at the rainbow's end. Ah, these adventurous ops about whom so many stories have been written! Brother Gorbea, an ardent supporter of the ARTA, was to leave very shortly for the interior of Brazil via the Amazon River, where crocodiles and alligators flourish in abundance. He was to be op in charge of the yacht S.S. Scotian leaving from Ceiba, Honduras, for the above mentioned wilderness. Payday was to be left to a fickle providence, if and when, plenty of skins of the alligators and crocodiles were brought back to these states for an, if and when, sale, and a percentage of the profits were to be delivered to him. It was rather a fantastic idea but it seems that the whole thing has fallen through for the present. But here's hoping the mighty hunter achieves his ambition.

Well, it seems as though this maestro's pleas have not gone into unretentive ears as many requests have been coming into the old folder about study courses we have been advocating. Ops have always known that progressive radio engineering must be met by continuous study for future advancement, but all that was needed was the push, and now that the plunge has been taken the water feels a lot finer than the cold appearance it gave off.

Well, well, J. J. Maling from Colwyn Bay Wireless College, United Kingdom, shoots the works by telling us that RADIO NEWS is avidly read out in that thar hemisphere and sez that although only an embyro op, he is interested in operating immensely. . . . From the Windy City we hear from John Momich, who would like to put up a two-way communication system, via short-waves, with some femme down in Phoenix, Arizona, but doesn't want others butting in on the convers. Stuff we haven't got beam trans. for commercial use yet. . . . W. H. Hardy of KGFL, New Mexico, is op in charge of said station and insists that the code will help him if they ever get around to that part of the country. . . . Peru, Indiana, blasts out through Brother Hull who has been trying long-distance job seeking, but so far hasn't had much success thataway. We suggest the Great Lakes for direct contacts, OM. Good luck. And so to the end of all good things until next month, when the operating profession will receive another boost through the greater movement of ships. So, bon cheerio and 73 from GY.

6C6—6D6 Tubes

(*Continued from page* 31)

filaments in a.c.-d.c. receivers. Since the available plate voltage in such sets is approximately 100 volts, data on the correct voltages to employ are included in Table 1. The required r.f. signal voltage, listed under the conditions for use as biased detector, is sufficient to deliver 17 volts output when it is modulated 20%. This will drive a power pentode, such as a 42, to full output. The suppressor grid is connected to the cathode in these circuits.

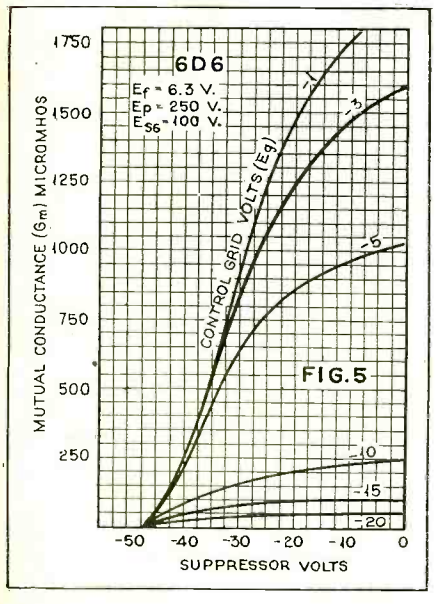


FIG. 5

The variable-mu, type 6D6 tube is a triple-grid tube, suitable as an r.f. or an i.f. amplifier. It can also be used as a mixer tube, in superheterodyne service. In this circuit it will not be as efficient as the 6C6, but it has the advantage that the translation gain can be controlled by the a.v.c. system. The characteristics for 250-volt and 100-volt B supply are in Table 1. Figure 3 shows a family of plate characteristics.

The mutual conductance of this tube can be controlled by varying the bias on the control grid. The relation between bias and mutual conductance is illustrated in Figure 4. It is also possible to control the mutual conductance by means of the suppressor voltage. Figure 5 gives the mutual conductance plotted against suppressor volts for different grid voltages. These curves suggest that a greater degree of control is possible, when the suppressor and grid voltages are varied simultaneously. In most circuits, the suppressor is connected to the cathode. The technical data on which this article is based were supplied by RCA and Sylvania engineers.

N. B. C. Reports Power Increases for Its Stations

NEW YORK—The National Broadcasting Company announces seven of its network stations have been granted power increases within the past few months. These include WBZ, WHAM, an increase from 2500 to 50,000 watts, KVOO increased from 5000 to 25,000 watts, KFI and WLI increased from 500 to 1000 watts, WSAI (night) increased from 500 to 1000 watts and (day) increased from 1000 to 2500 watts.

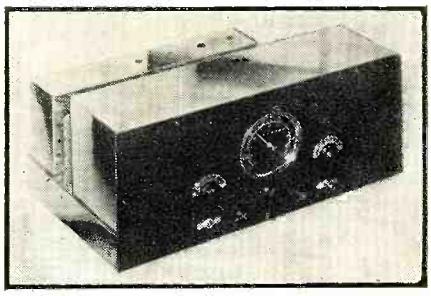
New All-Wave Sets

(*Continued from page 27*)

electron-coupled oscillators, air-dielectric tuning condensers in the i.f. amplifier, front-of-panel coil changing and a panel switch for phones or speaker.

Custom-Built All-Wave Receiver

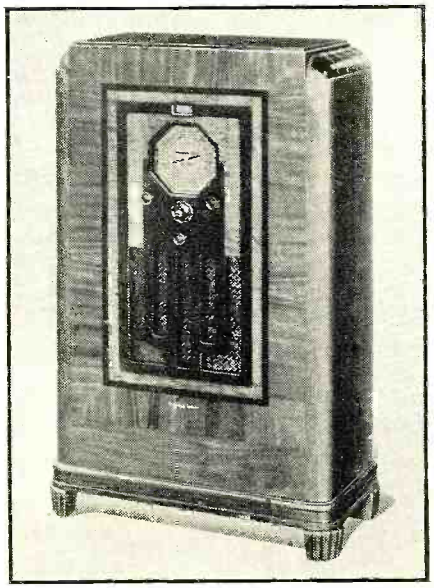
Description—The new Lincoln deluxe 34 all-wave 15-to-550 meter receiver employs a superheterodyne circuit using twelve tubes of the latest design. The high-gain i.f. amplifier is both plate and grid tuned,



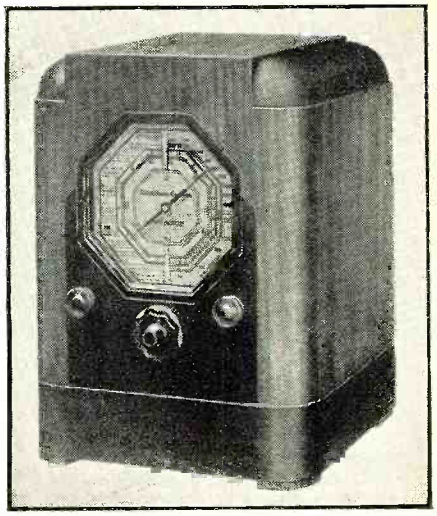
using isolantite insulated air type condensers. The push-pull power output stage employs the new 2B6 type tube to provide a high wattage output with minimum distortion. The receiver is equipped with a visual signal indicator, a new system of automatic volume control, band-spread on all frequencies, and a calibrated 280-degree airplane type dial.

All-Wave Receiver and Converter

Description—The first illustration shows the new Stromberg-Carlson model 68 all-wave ten-tube superheterodyne receiver. The wavelength range is from 12 to 576 meters. One of the outstanding features of the set is the Selector Lite, a large full-vision airplane type dial, octagonal in shape and divided into four sections, one for each of the four tuning ranges covered by the receiver. Four sets of pilot lights, operated by contacts on the wave-range switch illuminate only that section which is in actual operation. The sturdy console cab-



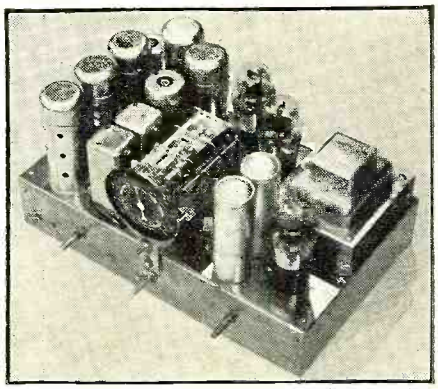
inet uses heavy solid core wood in all walls with all exposed surfaces of American walnut and fancy wood panelings. The Stromberg-Carlson 69 selector shown in the second illustration is a self-powered short-wave converter. This unit is designed to be connected between the receiver antenna and the regular broadcast receiver to provide reception on the low wavelength



ranges from 12 to 200 meters. The selector employs four tubes and installation is simple.

A Modern Radio Set

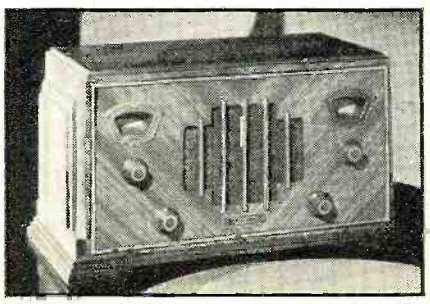
Description—The eight-tube superheterodyne shown in the accompanying illustration is the new Hetro all-wave 15 to 550



meter receiver. The set is equipped with tone control, automatic volume control, phonograph jack, special high gain i.f. transformers, an oversize power transformer and the new airplane type dial which is calibrated in kilocycles and megacycles. The parts used in the construction of this set are processed and protected for operation under tropical conditions. The receiver is available in chassis form, console cabinet or combination phonograph console.

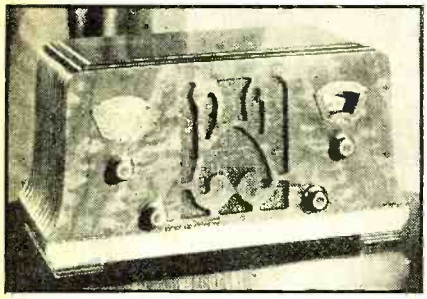
Table Type All-Wave Sets

Description—This company is introducing the two attractive table type all-wave



sets illustrated below. Both receivers are seven-tube superheterodynes, to operate

from 110-volt, 60-cycle a.c. supply, and are designed to cover a tuning range from 25 to 560 meters. Each of the sets is equipped with a built-in code rejector system, hair-line shadow dial indicator, angled dial escutcheon which permits of easy tuning

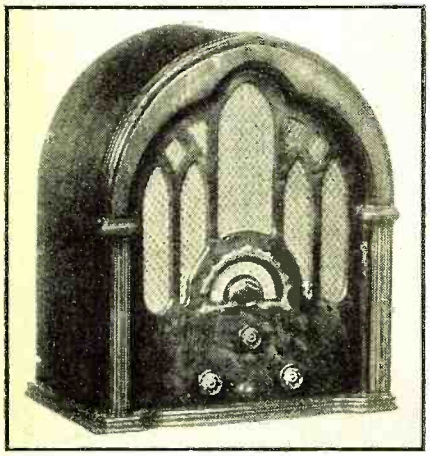


when the operator is in a standing position, and a positive-action, high-ratio tuning control. The model 825 shown in the first illustration is enclosed in a cabinet with solid American walnut top, and front of butt walnut trimmed with selected Zebra wood. The second set, model 827, is housed in an American walnut cabinet, the top half of which is diamond striped. The first set is 16 inches long and the second model 15½ inches long. Both are 8½ inches high by 7½ inches deep.

Maker—Zenith Radio Corp., 3620 Iron St., Chicago, Ill.

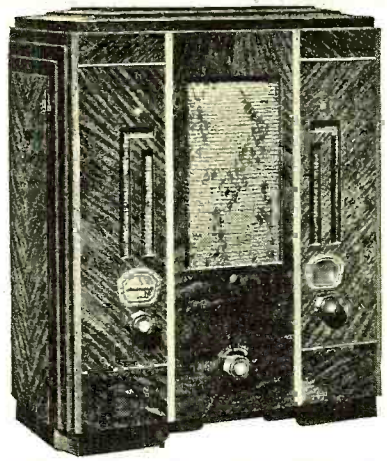
Two Attractive Receivers

Description—The Audiola Company announces a console and table type all-wave receiver. Both sets employ a superheterodyne circuit with the following type tubes: two 2A5's, one 55, one 56, one 57, four 58's and one 80 type rectifier. The receivers cover a wavelength range from 15 to 550 meters, and are of modern design, incorporating such developments as tone control, automatic volume control and a noise suppression circuit. The table type cabinet is of Gothic design with a matched butt walnut front panel. The six-legged console is finished with figured wood pilasters incorporating a little marquetry with a matched butt walnut front panel.



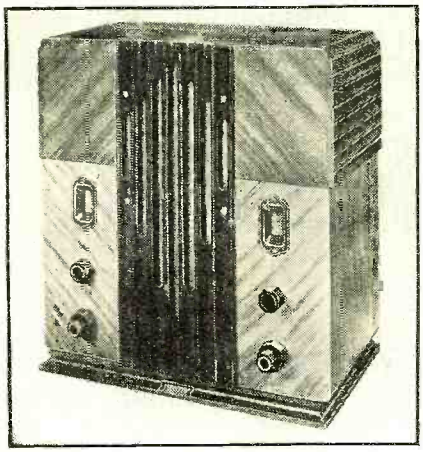
Midget Receiver

Description—The Atwater Kent model 185A five-tube superheterodyne is a dual-wave receiver, designed to provide reception from the principal domestic and foreign short-wave stations, in addition to the regular domestic broadcast programs. The frequency range covered for the broadcast band is 540 to 1700 kc., extending over to the police signals. The short-wave reception range is 5500 to 15500 kc., or approximately 64.5 to 19.4 meters. The set is equipped with tone control, 8-inch dynamic speaker and automatic volume control. It utilizes the following tube equipment: one 2A7 for the first detector and oscillator; one –58 for the intermediate-frequency amplifier; one 2A6 as a combined second detector, automatic volume control and first audio, one 2A5 output power tube and one –80 type rectifier.



Midget Receiver

Description—Here is the latest Lafayette table type all-wave receiver. Four wavelength ranges are available, as follows: the regular broadcast range from 200 to 550 meters and three short-wave bands of 15 to 30, 30 to 75 and 75 to 200 meters. The latest development incorporated in this superheterodyne set includes a shadow line tuning meter and and a simple wave range dial indicator. The tube equipment comprises: one 2A7, two type –58's, one 2A6, one 2A5 and one –80 type rectifier.



The DX Corner (Broadcast Band)

(*Continued from page 35*)

trans-oceanic or other far distant stations. Such reports published in these pages would give the residents of each state at least some idea of the DX reception accomplishable in their general locations (with due allowance for local conditions, of course). If you have compiled a log of good catches during the past year, why not send in a list of the stations over 3000 miles distant that appear in it? If you include the stations' calls, the frequency, the time of the year and the time of day when best received, for each station listed, the report should be very helpful to many residents of your section of the country who, from this information, will have some definite idea as to where and when to tune for the best catches.

Speaking of California——

Warren E. Winkley, of Hughson, California, has been going places and doing things with his Atwater Kent, Model 40 (1928) receiver, using a choice of 3 antennas—320 feet, 200 feet and 80 feet. We gather from his letter that he has heard all the Japanese stations (34 of them), 5 Chinese, 15 Australians, 2 Hawaiian, 3 New Zealanders, 2 Alaskans, 3 Cubans, 34 Canadians, 32 Mexicans and 1 each in Indo-China, Argentina, Porto Rico and Heilsburg (Germany). Mr. Winkler feels that he established a record in hearing 31 Japanese stations at one sitting, on the morning of March 3, this year.

Can Readers Help?

Can anyone inform Mr. Winkley through these columns as to the following: What station is on approximately 600 kc. nearly every day from 1:00 to 6:00 a. m., P.S.T.? What station on 830 kc. was broadcasting a special Easter service at 6:15 a. m. P.S.T. Easter morning?

Bone Construction Unit

Description—The Audi-Bone oscillator shown in the illustration measures only 1¼ inches long by ½ inch high by ⅝ of an inch wide, and may be used with radio sets or with hearing aid equipment. It can be used for any purpose for which ear phones are employed. Sound vibrations

are conducted by this instrument through the bones of the head to the inner hearing organs. The bone conduction oscillator can be worn inconspicuously behind the ear on the mastoid bone and held snugly but comfortably by a slender flexible headband. The conductor is finished in black or mahogany bakelite and is furnished with an ultra thin cord. For use with hearing aid apparatus the bone conductor is available in 100 ohms impedance and for radio work in 2000 ohms impedance. The principal features of the conductor as set forth by the manufacturer follow: shock proof, attachable to any radio set by means of an adapter, will not cut down the volume or interfere with the operation of the radio set, and carries independent volume control and on-off switch.

Maker—Kurman Electric Co., 241 Lafayette St., New York City.

The DX Corner (Short Waves)

(*Continued from page 19*)

sends in the following Best Bets using a detector and two-stage receiver with three-element tubes. He has picked up well GSB, GSD, GSE, W1XAZ, W8XK, W3XAU, EAQ, HBL, FYA, I2RO, PHI, PMN, KSL and, of course, the Australian stations.

Offers His Services—Accepted!

Mr. Victorino Leonen, chief radio mechanic for the Heacock's-Alkan agency for radio apparatus for the Philippine Islands and also a graduate of the Government Radio School in the Philippine School of Arts and Trades, has applied for and is now acting as O. R. N. S. W. L. P. O., residing at Iloilo.

To Relatives and Friends of the Byrd Expedition

Mr. C. D. Wagoner, News Bureau of the General Electric Company, Schenectady, has asked us to quote the following schedule for Sunday night South Pole broadcasts for the following months. These will be on June 17, July 1, July 15, July 29, August 12, August 26, September 9, September 23. Letters from relatives and friends of members of the Byrd expedition should send their letters to Mr. Wagoner to reach him by the Friday preceding any single broadcast. They should not be longer than 100 words. They will be transmitted to Little America through the Schenectady short-wave station, W2XAF, on 31.48 meters. If friends or relatives wish to stop off at Schenectady, they may talk directly to the men in Little America.

A Report from Poland

Mr. Peter Dowbor Musnickie of Luck, Wolhynien, Poland, sends in the following Best Bets he receives on a three-tube short-wave converter and receiver: CNR, RNE, FYA, GSE, I2RO, GSD, DJD, PHI, EAQ, GSC, W2XAF, GSB, HBP, LCL, W8XK, W3XAL, OXY, GSA, DJC, RV59, G6RX. He also reports amateur 'phone transmitters from all over the world.

A Report from British West Indies

Mr. E. G. Derrick reports the following Best Bets from Antigua: W2XAF, GSC, W1XAZ, W3XAL, GSB, FYA, DJD, W3XAU, W2XAD,, W2XE, DJB, EAQ, VK2ME, VK3ME, W4XB, W8XAL, WEF.

A Report from Massachusetts

Mr. Arthur Hamilton of Somerville, Massachusetts, reports the following Best Bets for his location: GSE, GSD, PHI, DJB, EAQ, GSA, GSC, GSB, VK3ME, VK2ME, PSK, DJA, HBP, CT1AA, XETE, HJ1ABB, YV3BC, YV1BC, DJC, HJ4ABE, G6RX, COC, LSX, KJTY.

A Report from Saskatchewan

Mr. R. H. Raines, using a General Electric K85 all-wave receiver, reports the following Best Bets for Saskatoon, Sask., Can.: W3XAL, GSG, W2XAD, FYA, W2XE, W8XK, DJB, GSE, GSD, PHI, VE9GW, EAQ, W3XAU, VK2ME, GSC, DJA, W2XAF, GSB, PRAG, PSK, HC2JB, HJ3ABD, PRADO, HJ1ABB, W3XL, HI1A, TGW, YV3BC, VE9HX, YV1BC, CP5, W8XAL, GSA, W1XAL, HIX, G6RX, WEF, WEL, LSX, PLV, XETE.

Best Bets from India

Our Official Observer, D. W. D. Wadia, of Bombay, India, writes that DJC is coming through fine as well as the following stations: IST, Medan, Sumatra, call letters DEI, has recently gone off the air. All the Daventry stations are not heard since they have gone down to lower waves for the summer. GSB and PHI come through fine, however. The usual lot of Javanese and Russian 'phones come through R9 to R6. He asks, "Has any American 'ham' heard VU2FY on about 7 mc. using 'phone or c.w..? His best DX so far is reported as a ham in Buenos Aires. He uses only 10 watts. Reports will be appreciated."

An Editorial

Quoting President Charles Morrison of the International DX'ers Alliance in an editorial recently published on the first page of the *Globe Circler:* "Unfair or unsportsmanlike methods of obtaining verifications *do not pay*. A cheating DX'er is invariably caught, and for what price—a few sheets of paper, or postal cards. These actions reflect seriously not only on the DX'er, but on his comrades, the radio stations, and the entire sport. The vast majority of DX'ers are honest and would not think of reporting a station unless they had some posiive proof of identification. It therefore seems logical that the major radio clubs should unite to stop once and for all this menace to the wholesome atmosphere that has always been associated with DX'ing. We do not wish nor do we intend to condemn anyone unwarrantedly, nor is it our wish to stifle or censor any sincere reports. We shall continue to admire all exceptional achievements in DX'ing as we have in the past—but the day of the verification faker is over. To those who while not openly dishonest, nevertheless use unethical DX'ing methods, we beg of you to give them up *now*, and become a credit to the high standards adhered to by all *real* DX'ers." (Signed) President. (The Editors of RADIO NEWS certainly subscribe to these remarks and feelings and we believe most of our readers do also.)

A Word from New Jersey

Mr. L. Desch of Irvington, N. J., claims the distinction of possessing the second worst short-wave set in existence. He says: "A friend of mine owns the worst set and I will not dispute his claim, but, anyhow, the Best Bets in this location on my set are: Daventry on six of its wavelengths, DJA, DJB, DJC, DJD, LSX, I2RO, EAQ, VE9GW, VE9HX, YV3BC, RV59, CNR, YV1BC, G6RX, PSK, VK3ME, VK2ME, HBL, HBP, FYA, COC, HA1ABB, IRM, H2RL and most of the United States stations." (We do not think this is so bad after all.—ED.)

Readers Who Helped Log Stations for This Month's Report

We are indebted to the following readers of RADIO NEWS who sent in reports of reception this month: W. Schumacher, Ellis, Kans.; F. Waters, Charleston, Ill.; A. B. Baadsgaard, Ponoka, Alta, Can.; V. Scott, Rockland, O.; J. T. Spalding, Louisville, Ky.; G. Gallarati, Woburn, Mass.; R. Woods, Sand Springs, Okla.; W. A. Jasiorkowski, Milwaukee, Wis.; H. Adams, Jr., Baltimore, Md.; Russell Leader, San Francisco, Calif.; W. Howald, Los Angeles, Calif.; F. C. Balph, Indianapolis, Ind.; A. Barber, Lancashire, England; F. L. Saldana, Huamantla, Tlax, Mexico; C. H. Armstrong, Atlanta, Ga.; K. Boord, Smithfield, W. Va.; G. H. Krebs, Louisville, Ky.; G. H. Fletcher, Gainesville, Fla.; N. C. Smith, Sidecup, Kent, England; R. Lawton, Whitefield, near Manchester, England; R. L. Weber, West McHenry, Ill.; L. Swenson, Eden, Idaho; C. W. Bourne, Council Grove, Kans.; C. A. Morrison, Bloomington, Ill.; R. Stevens, Romford, Essex, England; H. F. Polm, Harrisburg, Pa.; K. H. Moffatt, Auckland, N. Z.; L. C. Styles, Ingatestone, Essex, England; C. H. Matthews, Victoria, Australia; G. R. Bigbee, Fort Benning, Ga.; V. Leonen, Iloilo, P. I.; C. Nick, Philadelphia, Pa.; G. K. Harrison, Hobbs, N. M.; E. F. Bohan, Greenville, S. C; Mrs. L. R. Ledbetter, Vicksburg, Miss; A. J. Darwin, Detroit, Mich.; J. E. Brooks, Montgomery, Ala.; C. McCormick, Johannesburg, South Africa; Capt. I. A. Williamson, Philadelphia, Pa.; Dr. Max Hausdorff, Lugano-Viganello, Switzerland; C. H. Long, Winston, Mo.; W. W. Warner, Exeter, Devon, England; J. B. Wynkoop, Chickasha, Okla.; M. C. Westrate, Grand Rapids, Mich.; H. L. Pribble, Duncan, Okla.; P H. Clute, Hastings, Neb.; C. L. Platts, Kittanning, Pa.; J. C. Kelley, Ashland, N. H.; Dr. F. C. Naegeli, Devils Lake, N D.; B. Scott, Corpus Christi, Tex.; C. P. Peters, Troy, O.; A. Akell, Malden, Mass.; C. Will, Glencoe, Ill.; W. P. Kempster, Ulverston, Lancs., England; W. Dixon, Plainfield, N. J.; J. J. Maling, Norfolk, England; Dr. G. W. Twomey, Fort Snelling, Minn.; R. S. Houghton, Abram, Lancs., England; R. Edkins, Transcoma, Man., Can.; Dr. S. G. DeMarco, Easton, Pa.; P. D. Musnicki, Luck, Wolhynien, Poland; C. W. Burton, Toledo, O.; W. J. Vetto, Denver, Colo.; A. J. Leonhardt, Brooklyn, N. Y.; A. B. Ray, Burnsville, N. C.; K. A. Staats, Aliquippa, Pa.; E. G. Derrick, Antigua, B. W. I.; F. F. Anderson, Caracas, Venezuela; E. S. Allen, San Francisco, Calif.; F. Comstock, Topeka, Kans.; G. Hampton Allison, Emory, Va.; J. L. Davis, Savannah, Ga.; R. Wright, Brooklyn, N. Y.; W. W. Ayotte, Providence, R. I.; E. H. Davenport, Pittsford, Vt.; A. Hamilton, Somerville, Mass.; D. W. Shields, Roseville, O.; C. V. Wilson, Malin, Ore.; A. A. Boussy, Springfield, Mass.; R. H. Baines, Saskatoon, Sask., Can.; L. T. Lee, Jr., Union Springs, Ala.; A. Douri, Sussex, England; S. Carbone, Montreal, Can.; D. W. D. Wadia, Bombay, India; F. H. Kydd, Ceballos, Cuba; A. G. Taggart, Reedy Creek, Man., Can.; G. E. McJunkin, Kansas City, Kans.; O. L. Ramsey, Struthers, O.; R. Bills, Elkhart, Ind.; G. Klein, Brooklyn, N. Y.; A. E. Emerson, Cleveland, O.; L. Desch, Irvington, N. J.; D. W. Weil, New Haven, Conn.; C. O. Gould, Stockton, Calif.; N. F. Schilling, Brooklyn, N. Y.; J. J. Simpson, Jamaica, N. Y.; E. Weaver, Pittsfield, Ill.; W. H. McKinley, Des Lacs, N. Da.; G. L. Crenshaw, El Corada, Ark.; C. J. Sharp, Toronto, Ont., Can.; J. C. Hayes, San Rafael, Calif.; J. Florentino, W. Los Angeles, Calif.; G. W. Barber, London, England; J. G. Claiborne, Houston, Tex.; W. W. Enete, Rio de Janeiro, Brazil; A. S. Rennord, Steilacoom, Wash.; M. Teske, Sioux City, Ia.; R. C. Hamwick, Macon, Ga.; W. Sanders, Glen Burnie, Md.; E. C. Lips, Pittsburgh, Pa.; W. F. Norton, Alapaha, Ga.; DeMaistre Xavier, Beaune, France; D. E. Bame, Copaigue, L. I.

Send in Your Reports

The Editors acknowledge with thanks the assistance of public-spirited readers who have thus co-operated to make these columns so successful and helpful. Let us urge our readers, one and all, to continue, in even a larger way, to send in these reports. We would be grateful if every reader who hears even a single station would send it in to us with just the data as to its wavelength, the time which it was heard, etc. Of course, we would prefer to get more information, including the Best Bets in each listener's locality, as well as definite logs of stations, their wavelengths and times of transmission. Readers will also help by stating what type of receiver they use in logging these stations.

2-Tube Home-built Set

(*Continued from page 23*)

prong connections are shown in Figure 2.

A novel method of antenna coupling is used with this receiver. Three fixed resistors are arranged to form a "T pad" network in connection with the usual compression type mica antenna series condenser, C2. The chief advantage of this particular type of coupling is the almost complete elimination of "dead spots" from the tuning range. In fact, the receiver can usually be tuned through the complete coverage of each coil without having to manipulate the antenna coupling condenser or the regeneration control—and still employ plenty of antenna coupling!

If a transposed doublet antenna is to be used, it is best to arrange an "H pad" rather than that shown, in order to utilize the full benefit of this system. The series resistor values are 400 ohms each; the shunt resistor is 500 ohms.

The construction of this receiver is so simple that a further detailed description is unnecessary. The schematic circuit in Figure 1 and the picture wiring diagram in Figure 3 will provide all necessary constructional information even for the novice.

An outstanding feature of this receiver which will be particularly appreciated by experienced short wave fans, will be the extremely smooth control of regeneration. As the regeneration control, R5, is advanced the point of oscillation is approached gradually with the result that maximum sensitivity may be obtained without the usual sudden plopping over into oscillation. In reception of c.w. signals, the same action is obtained with a smooth and gradual approach to the point of non-oscillation.

With a potentiometer used for control of regeneration as it is in this receiver there is a small current drain from the B battery at all times, whether the receiver is tuned "on" or "off." Where heavy duty B batteries are employed this current drain is not especially important because it amounts to less than 1 milliampere. However, where standard or midget B batteries are used and especially if the detector plate voltage is 90 or 105, this loss will mean somewhat shortened battery life. In such cases it will be advisable to connect a switch in the B— lead as indicated by the "X" in Figure 1. This may either be a separate switch or may be one which is mounted on, and operated by the rheostat, R8. The latter arrangement is recommended because the switch operation then becomes automatic. The purpose of the switch is to break the B battery circuit when the set is turned off so this continuous slow leakage of B current through R5 is eliminated.

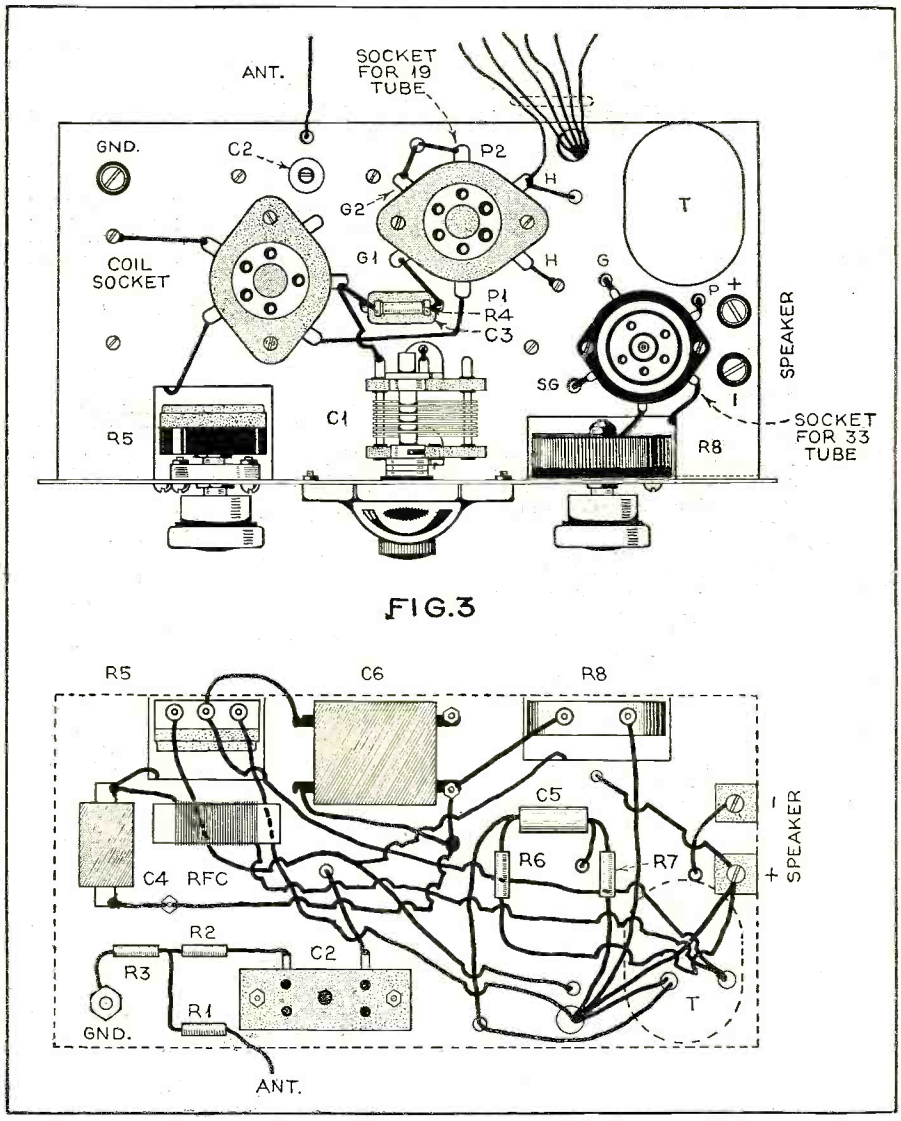


FIG. 3

List of Parts

C1—Hammarlund Type MC-140M Midget

condenser, .00014 mfd.
C2—Compression type condenser (neutralizing type)
C3—Fixed condenser, .0001 mfd.
C4—Fixed condenser, .002 mfd.
C5—Fixed condenser, .01 mfd.
C6—By-pass condenser, 1 mfd., paper type
L1, L2—(see text)
R1—½ watt resistor, 400 ohms
R2—½ watt resistor, 400 ohms
R3—½ watt resistor, 500 ohms
R4—½ watt resistor, 4 megohms
R5—Regeneration control, 0 to 100,000 ohms potentiometer, insulated shaft type
R6—2 watt resistor, 250,000 ohms
R7—½ watt resistor, 100,000 ohms
R8—Filament rheostat, 20 ohms
RFC—R.F. choke 2½ millihenries
T—Audio frequency transformer
One Eby "Low loss," six prong socket (for 19 tube)
One Eby "Low loss," five prong socket (for coils)
One base-mounting type, five prong socket (for 33 tube)
One Aluminum sheet, size 7 x 10 inches (for chassis)
One Aluminum sheet, size 6 x 10½ inches (for panel)
One type 19 tube and one type 33 tube
Necessary dial, knobs, coils, wire, speaker, batteries, etc.

Short Waves

(*Continued from page 25*)

signal has been considerably amplified in its journey through the three tubes, the output of the set is not always sufficient for loudspeaker reception on weak stations. This type of receiver is primarily designed for earphone operation. This type set is operated in conjunction with a power supply unit, like that shown at C. The receiver is plugged into the power supply, and the power unit into a 110-volt receptacle. The power unit requires a type –80 rectifying tube, so, from the standpoint of the broadcast enthusiast, the combination may be referred to as a 4-tube rather than a 3-tube receiver.

As has been mentioned, the receiver described above was designed principally for earphone reception. A more elaborate type of receiver, employing the same radio-frequency arrangement, adds two –45 tubes in push-pull, on the audio end, providing the further amplification needed for loudspeaker operation on weak signals, and is shown at D. It is a 5-tube receiver—or a 6-tube set if you count the rectifier in the separate power unit.

As we have pointed out earlier in this series, the short-wave converter, in conjunction with a good broadcast receiver, provides an efficient all-wave combination. The converter, you will recall, "converts" the short-wave signals to longer waves within the band covered by the broadcast set. The converted signal is then passed on to the receiver, where it is amplified, detected and reamplified, just as if it were a broadcast-band signal picked up by the antenna. An efficient converter should supply additional amplification and pre-selection to eliminate undesirable interference on the short-wave end. Such a converter is shown at E and requires five tubes. In addition to the usual type –80 rectifier, there is a harmonic-tuned radio-frequency amplifier, which amplifies the short-wave signal and passes it on to the tuned detector circuit, where it is "mixed" with the frequency of a local oscillating tube. The oscillator is tuned simultaneously with the detector, and the circuit constants are so arranged that the difference between the oscillator frequency and the signal frequency is always the intermediate frequency of 575 kilocycles. This intermediate frequency is transferred to another amplifying circuit, sharply tuned to 575 kc., the output of which is input to the broadcast receiver for further amplification. The broadcast set, of course, must be tuned to this frequency, which is about 521 meters.

The converter is permanently connected to the broadcast set, a convenient switch transferring the antenna from the short- to long-wave adjustment.

The single-control short-wave superheterodyne presents unusual design problems. Due to the relatively great frequency shift occasioned by slight variations in inductance and capacity on the high frequencies, absolute precision is predicated in coil and condenser design and in wiring if satisfactory tracking is to be insured. By tracking we mean, of course, the simultaneous tuning of the oscillator and signal frequencies so that they always differ by the intermediate frequency. An excellent example of this is illustrated at F. This is a 7-tube receiver, exclusive of the type –80 rectifying tube in the separate power unit. The efficiency of plug-in coils has been retained, at the same time achieving a definite contribution to convenience by arranging for coil insertion from the front of the panel. Details of the coil assembly will be seen in the cut-away view of Figure 2.

Carrying superheterodyne design another step forward, we have the type shown at G, which, designed for commercial requirements, may be recommended to the short-wave fan who demands the finest in consistent reception. This receiver employs two more tubes than the previous one—providing an extra stage of pre-selection and amplification, and *automatic volume control*. Three plug-in coils are required for each wave-band and are conveniently inserted from the front of the panel. The precision vernier dial—which makes it possible to log to one-tenth of a dial division—is balanced with a tuning chart on the left and a station log on the right-hand side.

All the receivers described in the foregoing are designed for beat-frequency reception—that is, some portion of the circuit can be made to oscillate at close to signal or intermediate frequency so that an audible beat-note can be heard. This facilitates fishing for weak phone stations, and also makes possible reception of continuous-wave code transmitters. These receivers are readily adapted to band-spreading—a system of tuning which should be featured in every modern short-wave receiver and which makes it possible to spread any desired portion of the short-wave spectrum over the entire dial. The effect is that of an extremely high-ratio dial without any backlash or other defects associated with mechanical arrangements.

All-Wave Sets

There are also on the market several excellent all-wave sets employing switching arrangements for the various wave-bands. The preference for either a separate short-wave receiver or an all-wave set of types like those shown at H and I is pretty much a matter of personal desire. The convenience of the combination must be admitted.

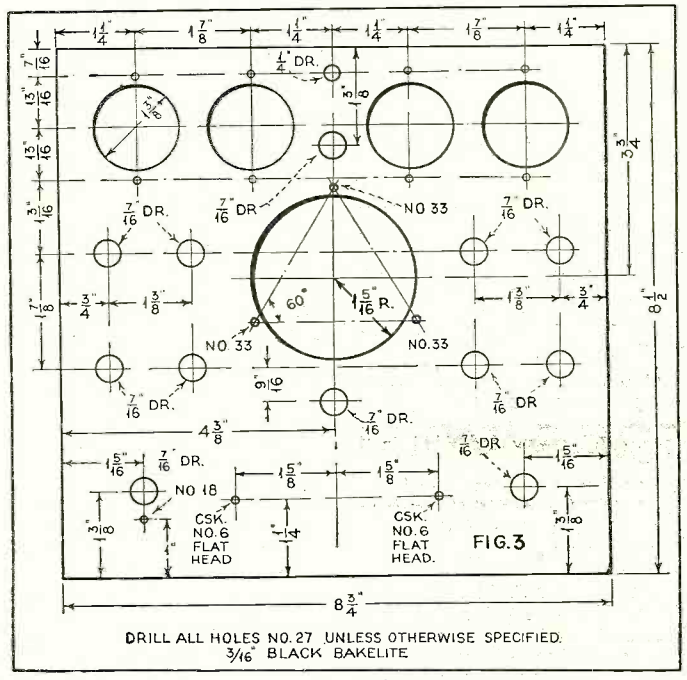
The cost of factory-built s.w. receivers will vary upwards from $5.00 for the most simple 1-tube gadget. Good tuned r.f. receivers will cost from $25.00 to $65.00—with power supply. The supers start at about $50.00, and a really good converter may cost from $60.00 to $70.00. A superheterodyne, qualified for commercial work, may set one back well over $100.00. The all-wave sets start at about $50.00, and the sky's the limit—depending on cabinets. As in everything else, in modern merchandising, you get just about what you pay for!

R. N. Tube Checker

(*Continued from page 33*)

to keep all readings within the range of the meter.

To construct this tester, drill the panel in accordance with the layout shown in Figure 3. It is well to drill the holes for the toggle switches undersize and then ream them out just enough to make a tight fit. This will tend to remove any strain on the wiring due to the switches turning out of position. Mount the sockets, bending the terminals so they will project through the socket holes. It is a good idea to mark the underside of the panel opposite each terminal with the terminal designation, using a glass pencil or scriber, to avoid mental confusion in wiring. Try out the meter holes to make sure the meter will fit, but do not mount the meter until the wiring has been completed, to avoid risk of damage in handling. Mount the remainder of the apparatus and proceed with the wiring. It is best to wire the rotary switch controlling the filament voltages first. The transformer has 12 voltage taps, but only 10 are used. The 1.1-volt tap is required only for 864's and WD11's. If you expect to test these types, this tap may be wired in and 25-volt tap omitted; 25-volt tubes may be tested on the 30-volt tap. The 15-volt tap is also not used; 15-volt tubes may be tested on the 12.6-volt tap. There are primary line voltage taps for 105, 115 and 125 volts. It is best to wire in the 115-volt tap unless the line voltage is consistently below this value. The bracket for the pilot light socket is mounted on one of the socket retaining screws.



Operating Instructions

If the tube is known to have no shorted elements, proceed as follows:

(1) Set switch 9 for rated filament voltage of tube, the voltage applied at each setting being indicated in the following table:

Switch Position	*Filament Voltage*
1	1.5 volts
2	2.0 "
3	2.5 "
4	3.3 "
5	5.0 "
6	6.3 "
7	7.5 "
8	12.6 "
9	25.0 "
10	30.0 "

(2) Throw switch 11 to right, switch 10 to left and switch 7 to UP position. All other switches, DOWN.

(3) For all filament type 4-, 5- and 6-prong tubes, simply read meter. If reading is below 20, depress shunt switch 8 and read.

(4) For all heater type tubes, proceed as above but throw switch 4 to UP position and read. If no reading results, the tube is of a special type and the cathode is not in the usual place. If the location of the cathode is unknown, move each switch up and down, one at a time, until the maximum reading is secured.

(5) For duo-diode-triodes, the diodes should be tested independently by throwing the switch connected to one diode down, switch 10 to right and all other switches UP. Then test the other diode the same way. The triode can be tested independently (see notes accompanying the chart below).

(6) For all full-wave rectifier tubes, proceed as in (5) above. For half-wave rectifiers, proceed as in (3) above. Do NOT depress shunt button when testing mercury-vapor rectifiers, such as the -82 and -83. For all others, depress shunt.

Short-Circuit Test

Throw switch 7 to DOWN position. With switches set as specified in (2) above, if bull's-eye glows, some element is shorted to the filament. If not, throw switches 1, 2, 5 and 6 successively to UP position. If bull's-eye blows, some other inter-element short-circuit is present.

Cathode-Heater Leakage Test

Depress switch 3 while reading meter for tube condition test. If pointer does not drop to zero, cathode-heater leakage is present. A list of readings obtained with this tester is given in the chart below. All tests were made at a line voltage of approximately 120 volts, using the 115-volt tap on the transformer. The last column gives the readings obtained with all elements except the filament and cathode connected to the plate. With the switches set for this reading, the other readings are obtained (except as otherwise noted) by moving each switch in turn to the UP position. After the reading has been noted by doing this with switch 1, for instance, return the switch to the DOWN position and repeat this operation with switch 2 in the UP position, etc., until all readings have been

obtained. The blank columns indicate that the operation does not affect the reading, due to the switch being out of the circuit for the particular tube being tested.

The table does not contain all tube types because at the time of making it, there were not sufficient tubes of certain types on hand to establish an average reading. All figures given are averages of several tubes which are known to be good.

It is suggested that, unless his readings check reasonably well with those given below, each constructor prepare his own chart in the manner described, as variations in average line voltage conditions, individual parts, etc., coupled with the normal production variations in tubes, may affect the readings considerably.

Tube Test Chart

TYPE	SW1	SW2	SW4	SW5	SW6	SW10	Total
24A	23	2				32	35
26	2					16	25
27	2					17	29
34	17	2				22	23
35	21	2				29	32
36	22	2				29	32
37	2					19	28
38	23	2				28	32
40	27	2				33	36
41	3			21		30	30
42	3			22		28	28
45	7					18	42
46	5		23			30	37
47	3		26			32	40
53(d)	33		43(a)	33	(c)	43(b)	20(s)
55(d)	6	14		6			35
56	2					24	35
57	37	2		32		37	43
58	38	2		32		38	42
59	36			24	3	34	40
71A	7					14	34
75(d)	4	27		4		1	37
77	33	2		27		34	37
78	24	2		18		25	28
79	(c)	36	56	38		17(S)	20(S)
80	18					18	36
82	32(S)					32(S)	R
83	33(S)					33(S)	R
84	40					40	R
2A3	12					42	22(S)
2A5	2			22		26	28
2A6(d)	10	28		12			42
2A7	2	40		32	42	42	44
2B7(d)	6	14		2	6		30
6F7	18	8		20	22	24	24

Notes

Test –30, –31, –32 and –33 tubes at 1.5 filament volts, not at their normal filament voltage. This is recommended because these tubes are subject to deterioration if all elements are made highly positive at full filament emission.

(a) SW1 DOWN also.
(b) SW5 DOWN also.
(c) UP for all readings.
(d) Start readings with all switches UP. Move alternately downward, read, and return to UP position.
(R) Rectifier—Readings of both plates unnecessary.
(S) Shunted.

Variations of 15-20% in these readings are normal.

Tubes reading 40% below these readings are doubtful.

Tubes reading 50-60% below these readings should be replaced.

As the foregoing description has indicated, this tube checker will test any tube on the market, regardless of design, provided only that the tube fit one of the four sockets provided. Since the 7-prong socket is of the composite type, the only tube which will not fit is the obsolete WD11. There is plenty of room on the panel for an 8- or 9-prong socket and the single additional switch required, should such type tubes appear.

Intelligently used, the writer believes this tester will prove an invaluable component of any serviceman's equipment. On the basis of results per dollar cost, it is believed that it is unsurpassed by any instrument on the market.

Parts List

M—Weston model 301, d.c. milliammeter, 0-50 ma.

R1—20-ohm resistor, 1 watt
R2—1.5-ohm wire-wound resistor, 5 watts
R3—50-ohm resistor, 1 watt
S1, S2, S3, S4—Eby type 12 moulded 4-, 5-, 6- and composite 7-prong sockets
SW1, SW2, SW4, SW5, SW6, SW10—Cutler-Hammer s.p.d.t. nickeled toggle switches
SW3—Yaxley s.p.s.t. push-button switch, non-locking
SW7—Cutler-Hammer d.p.s.t. 2-circuit toggle switch
SW9—Yaxley 10-point, single-deck, non-shorting rotary switch
SW11—Cutler-Hammer single-circuit, on-off nickeled toggle switch
T1—One Wholesale Radio Service Company tube tester filament transformer
One Yaxley pilot light socket and mounting bracket
One Yaxley s.p.d.t. push-button switch, non-locking
One Yaxley red bull's-eye
One Yaxley pin-jack
One control grid cap, with 8-inch lead and phone-tip terminal
One 6.3-volt pilot light
One bakelite panel 8½ x 8¾ by $\frac{3}{16}$ inches
6 feet double conductor lamp cord
One a.c. plug

110v. A.C. Supply

(*Continued from page* 12)

lower frequencies than those for which they are designed.

Excitation current drain from the charging generator for the various units are as follows: Model 22 (50 watts), 3.1 amperes; Model 24 (100 watts), 3.5 amperes and Model 26 (175 watts), 5.1 amperes. This extra drain of course can be compensated for, by advancing the charging rate of the car generator. However, this charging rate should not be advanced beyond 15 amperes, as indicated by the meter on the dashboard.

The Powerack has no brushes, commutator or slip rings or any moving contacts to cause any noise in radio reception. It is ruggedly constructed and is easily installed by the average radio mechanic in thirty minutes. No cut-outs or complicated drilling is required.

The illustration in Figure 2 shows the installation of the Powerack in an automobile. The output voltage from this device has been conveniently cabled to an a.c. outlet installed on the dashboard of the car. A compact style a.c. operated receiver is shown on the seat of the car with its line plug inserted into the outlet socket. The lead-in from the car antenna has been connected to the antenna binding post of the set and that's all there is to it—the receiver is ready for operation.

The Powerack unit itself is noiseless. However, where it is used to operate a radio set it is of course necessary to install the usual ignition noise suppressors. Most of the noise coming from the ignition system of the motor is picked up by the receiving antenna and the regular stunts of shielding the antenna lead-in and suppressing the noise right at the motor is necessary for enjoyable reception.

Radio Physics Course

(*Continued from page* 44)

are connected in series and brought close together, we can have many conditions. If they are placed so the direction of current flow and hence the lines of force of one are exactly opposite in direction to the lines of force of the other as shown at (A) of Figure 1, the total inductance will be zero. This is called the "series opposing" position.

If they are connected together in series, with the currents flowing in the same direction and are brought up to each other so that every line of force of the primary links with every turn of wire of the secondary, and every line of force of the secondary links with every turn of the primary, and the fields of each are in the same direction, the result is the same as though we had a single coil made up of the two coils together, that is, a single coil having twice as many turns as each of these coils. This condition is shown at (B) of Figure 1. Since the inductance is proportional to the *square* of the number of turns, it is evident that this combined inductance is equal to 2×2 or 4 times that of either coil alone. Therefore the combined inductance of two similar coils connected and placed so as to be "series aiding" is four times that the self inductance of either single coil.

In the case of series-aiding coils, the total inductance is made up of the self-inductances of coil 1 and coil 2, the mutual inductance due to the lines of force from coil 1 linking with coil 2, and the mutual inductance associated with the lines from coil 2 which link with coil 1. These two latter mutual inductances (M) are equal, since the coils are the same.

Therefore $L=L_1+L_1+2M$.

Since $L_1=L_2$ and $M=L_1$ if we substitute these values for L in the above formula, we have $L=L_1+L_1+2L_1$

from which $L=4L_1$

where L is the total inductance. If some of the lines of force from one coil do not link with the other—as is the case especially if air forms the core—the total inductance will be less than four times the inductance of one coil in this case. In the series opposing case it will be less than zero. In any general case the total inductance of two coils of any inductance value, connected so as to be series-aiding, will be:

$L=L_1+L_2+2M$

If they are connected in series-opposing, the total inductance is:

$L=L_1+L_2-2M$

In order to know then just what the total inductance will be, the degree of coupling must be known. The term "coefficient of coupling" enables us to predict just what the total circuit inductance will be if the amount of coupling is known. Of course the coefficient of coupling depends upon the total inductance in the primary and secondary circuits as well as upon the mutual inductance between the inductances. The coefficient of coupling is really a measure of the ease with which energy may be transferred from one circuit to the other. The coefficient may be found from $K=M \sqrt{L_1 L_2}$, all units being in henries, microhenries or millihenries.

The maximum possible value of K is of course 1.0. This is called *unity coupling*. The value of 1.0 is only approached in well designed iron-core transformers where there is very little magnetic leakage. In air-core transformers the coupling may be very "weak" since a large portion of the lines of force of the primary may never reach the secondary. A low value of coupling for this type of coil would be about 0.1, and a high value 0.7. In a well designed iron-core transformer, coupling as high as 98 or 99% (K=0.98) may be obtained, depending upon the design and the amount of magnetic leakage present.

The mutual inductance depends only upon the two coils, and the coupling between them or $M=K \sqrt{L_1, L_2}$. The coefficient of coupling K, between any two circuits depends upon the total inductance in each circuit. Thus if one of the two circuits had two inductors in series, the total combined value of the two series inductances in this circuit would be substituted for L_1 in the above formula for K.

The Technical Review

(*Continued from page* 41)

broadcast and short-wave reception.

26. *Auto-Radio Antennas, Filters and Noise Suppressors.* Lynch antennas, filters and ignition noise suppressors especially designed for motor-radio installations.

34. *Serviceman's 1934 Replacement Volume Control Guide.* Complete list, in alphabetical order, of all old and new receivers showing model number, value of control in ohms and a recommended Electrad control for replacement purposes.

41. *How to Build the "Economy Eight."* Constructional information, diagrams, list of parts etc. of an efficient 8-tube receiver which can be built from a kit which sells for $13.75.

52. *The Servicer.* Information designed to help the serviceman do better work and make more money doing it.

56. *Servicing and Testing Instruments.* Descriptions of a new line of low-priced analyzers, set testers, tube testers, ohmmeters, capacity testers, oscillators and universal meters. Information is also given on the new Model 55 Tube Tester and the new Master Diagnometer which employs the "free reference point system of analysis."

57. *How to Build a High-Quality Condenser or Ribbon Microphone.* This circular describes a microphone kit with which it is possible to build, easily and quickly, a high-quality condenser or ribbon microphone.

59. *The IRC Volt-Ohmmeter.* Characteristics and uses of the International Resistance Co. volt-ohmmeter, a combination voltmeter and ohmmeter specially designed for the point-to-point method of trouble-shooting.

60. *Public Address Amplifiers and Radio Receivers.* Information on the character-

(*Continued on next page*)

JULY, 1934
RADIO NEWS Free Technical Booklet Service
222 West 39th Street
New York, N. Y.

Gentlemen: Please send me, without charge, the booklets or folders I have filled in below:

Numbers.....
.....
.....

My occupation or connection in radio is checked off below.

☐ Serviceman Operating Own Business
Serviceman Employed By:
☐ Manufacturer
☐ Jobber
☐ Dealer
☐ Servicing Organization
☐ Dealer
☐ Jobber
☐ Radio Engineer
☐ Experimenter
☐ Laboratory Technician
☐ Professional or Amateur Set Builder
☐ Licensed Amateur
☐ Station Operator
☐ Public Address Work
☐ .....

I am a ☐ subscriber ☐ newsstand reader.

I buy approximately $..... of radio material a month. (Please answer this question without exaggeration or not at all.)

Name.....

Address.....

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

PLEASE USE PENCIL AND PRINT, IN FILLING IN COUPON

istics of a wide variety of Amer-Tran De-Luxe and Silcor (popular priced line) audio and power transformers and chokes.

62. *How to Make Money on Public Address.* Articles on how to make money with public-address equipment, together with descriptions and prices of a wide variety of Lafayette amplifiers and public-address equipment available through Wholesale Radio Service Co., Inc.

Listen to Byrd

(Continued from page 22)

But, out of the large assortment of available channels, other frequencies are utilized to meet changing atmospheric conditions. The assigned channels include (in kilocycles) 6650, 6660, 6670, 8820, 8840, 9520, 11,830, 13,185, 13,200, 13,230, 13,245, 13,260, 15,270, 17,600, 17,620, 21,515, 21,600 and 21,625. These are the frequencies of particular interest to short-wave fans.

Whenever possible, the impulses of KFZ are picked-up direct at Riverhead—a distance of 9,000 miles from Little America. But the usual method is to have the programs relayed from Station LSX on about 28.9 meters, the Trans-Radio Internationale station at Buenos Aires. The programs, received at the Argentine transmitter, are then relayed by LSX on the 10,350 kc. channel, to Riverhead. When reception, via Buenos Aires is marred by interference, a few additional pick-up points try to "catch" the impulses and relay them to Riverhead. One is the RCA station at Point Reyes, California, while the other three stations are the same firm's base at Koko Head, Hawaii, KKP on 16,040 kc., KEQ on 7370 kc. and KKH 7520 or on a number of other frequencies. The frequencies of the commercial stations, and the Antarctic Communications System of the Mackay Radio Company can often be changed and the frequencies given are those on which they have been heard. At Rocky Point alone, there is available a choice of 141 frequencies for the transmission of programs to the Antarctic. The short-

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wave fan should search the dials for new points during the transmissions.

Cohan told the writer that the Byrd network broadcasts as well as the two-way short-wave conversations are "down to a nice routine" with most arising obstacles being eliminated. Voice transmission is always used from Little America. No relays are used in the programs going *to* the Antarctic from Rocky Point. These occur on waves between 30 and 32 meters. For this reason (taking in account the long distance) voice transmission is not always successful and code—or a combination of voice and code— is used. The air-line distance between Little America and New York is 9,000 miles. Including the Buenos Aires relay, the signals travel a total of 9,340 miles before reaching New York. The accompanying map shows the terrain around the polar expedition.

Many short-wave fans have reported picking up KFZ, LSX and the various commercial transmitters employed in the transmission of two-way conversation or in the relaying of broadcasts. But the CBS refuses to confirm any correspondent's report. To all writers asking for confirmation of the short-wave portions of the expedition's radio activities, they reply that the messages are point-to-point private communications, or tests pertaining thereto, and that there is an obligation of secrecy which prevents any confirmation. He invites correspondents to tune-in the Saturday night Byrd programs on the regular network channels. Many short-wave fans write to RADIO NEWS telling how they compare the short-wave and the rebroadcast signals.

The Byrd broadcasts from Little America are tinged with real drama and local color. The spirited narratives of real life adventure are making interesting program fare for the world's radio listeners who have been accustomed to the make-believe studio dramatizations usually available on the broadcast channels. Each highlight of the trip to Little America and the activities at that base are conveyed to radio listeners by radio, an exciting incident in itself. At times, static mars reception and, on one occasion, the antarctic rebroadcast had to be eliminated. But the average transmission results are very satisfactory in the minds of all concerned.

Officials are so satisfied with the Byrd programs that they decided to award the chain's medal for outstanding contribution to the radio art to Admiral Byrd. The presentation was made over radio from the Columbia Radio Playhouse, in New York, by Henry A. Bellows, vice-president of CBS, before a distinguished assemblage. Admiral Byrd heard the proceedings at Little America while the medal was handed to Captain Ashley C. McKinley, third in command on the first Byrd Antarctic Expedition, who will keep it until Admiral Byrd's return.

At the time of the award, Admiral Byrd was alone in an ice-hut 123 miles away from the expedition base. It is his intention to spend several months alone in the shack to test, among other things, the psychological effects of real solitude. But a New York representative revealed to the writer that Byrd's hut is equipped with two-way radio equipment. He is able to receive voice messages and reply in code. At times, the expedition commander's own code messages were relayed to New York via KFZ.

Past recipients of the medal (shown on this month's cover) include Colonel Charles A. Lindbergh and Amelia Earhart, famed aviators; Sir John Reith, Managing Director of the British Broadcasting Corporation; Leopold Stokowski, conductor of the Philadelphia Orchestra, and Nino Martini, Metropolitan Opera Company tenor.

At Little America, numerous ultra-short-wave receivers are utilized so that every individual or group exploring by dog-sled or plane can keep in touch with the base. Early reports indicated that the sets are proving very practical.

Special broadcast programs *to* the Antarctic base are jointly presented by the NBC and the General Electric Company on alternate Sundays. Newspaper publishers in various key cities serve as guest sponsors for the programs the expedition keenly awaits every two weeks. The programs are broadcast over a 51-station hook-up while Station W2XAF, at Schenectady, on a wavelength of 31.48 meters, conveys the special proceedings to the men at "the bottom of the world." For each broadcast, the newspaper serving as "guest sponsor" was free to select any type of material thought to be of most interest to the fifty-six men isolated on the frozen wastes of Antarctica. Most programs have consisted of two-thirds music and one-third spoken messages.

The network carries the first half-hour of the special Sunday programs. But short-wave enthusiasts have the advantage of listening in to the "mail" broadcasts which immediately follow the network period. The reading of letters to members of the expedition party has proven to be one of the most interesting features on the short-waves. Following each broadcast, the guest sponsors receive a message from Admiral Byrd, telling how well the presentation is received and enjoyed.

The W2XAF programs on 31.4 meters to the Byrd Expedition were arranged at the request of Admiral Byrd, who found a similar series highly valuable in his first South Pole expedition. Before his departure from the U. S. A., he told a General Electric representative how much the broadcasts meant toward keeping up the spirit and morale of the men.

Dr. E. F. W. Alexanderson's directional antenna, erected for the express purpose of sending the programs to Little America during the first expedition, is again in use.

The radio aspects of the Byrd Antarctic Expedition II are so extensive that they offer short-wave fans one of the most thrilling objectives for tuning-in. The fact that the programs *to* and *from* the South Pole regions are presented on regular schedules throughout the term of the expedition gives owners of short-wave receivers *repeated* opportunities to tune-in on history in the making for months and months to come.

Phenomena

(*Continued from page* 30)

that if this were done a condition exactly similar to that considered under the piezo action is brought about. Obviously the four effects, the two direct and the two inverse, are tied together.

With the Experimenters

(*Continued from page* 47)

job and it is not a wise plan to guess the starting point of that position of the record which is to be played. Quite often the pick-up will be started in the wrong place, ruining the program.

An easy way to overcome this condition is to make a record gauge. This device will show exactly where to place the pick-up so as to play only that portion of the record desired. The construction of this gauge is simple and it is inexpensive. All that is required is a celluloid drum dial scale and a length of strap iron or similar material, bent to form a bracket.

(*Continued on next page*)

As shown in the diagram, the calibrated scale is cemented to the top side of the bracket and an indicator or pointer is fastened to the pick-up. Select a scale with fine divisions so that you can be sure that the pick-up is placed at the correct spot.

To use the record gauge, play the record through and when the pick-up reaches the part you intend to use, note the setting on the scale. Now when you are ready for actual broadcast, your pick-up can be placed at the point indicated on the scale and guesswork will be eliminated.

T. A. BLANCHARD,
Reading, Pa.

The Service Bench

(*Continued from page* 43)

discovered a few peculiarities not ordinarily found in other sets.

"The center-tap resistor across the filament of the detector tube should be removed. Connect the grid return to minus filament. Next remove about one-quarter of the winding from the grid-suppressors. The rheostat is removed, of course.

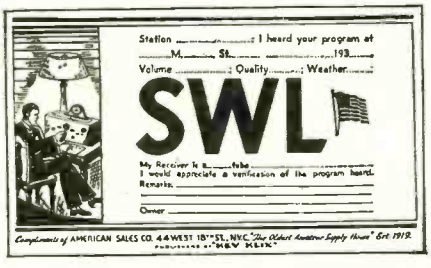
"The sensitivity and volume will be greatly improved by the above changes." H. D. Hooton, Radio Service, Beech Hill, West Va.

Mr. Frank J. Faulkner, of Brigham City, Utah, does a similar conversion on a Radiolo 20, and writes: "There are many Radiola 20 battery receivers in use in rural districts, and the modernization of these receivers for use with the air cell and 2-volt tubes is a source of profit which the serviceman should not neglect. Sensitivity, tone and volume are definitely improved.

"The following notes will be of assistance: Upon installing 30's, I had trouble in neutralizing and found it necessary to shunt a 1000-ohm resistor across the primary of the second radio-frequency transformer—as shown in Figure 2. In some receivers, it may be desirable to experiment with resistance values up to 5000 ohms. It was necessary to remove four turns from the secondaries in order to get down to 1500 kc. Remove turns one at a time until the trimmers peak sharply at the centers of their dials."

Short-Wave Verification Request Card

Through the courtesy of the American Sales Company, our short-wave listeners may obtain ten of these cards by simply writing, requesting them, to RADIO NEWS, Department AS, 222 West 39th Street, New York City. The cards contain a place for your address and a description of your receiver, the volume of reception, the date, quality of reception, the weather conditions and remarks of reception. The other side of the card is for the address and stamp. These will be sent gratis.



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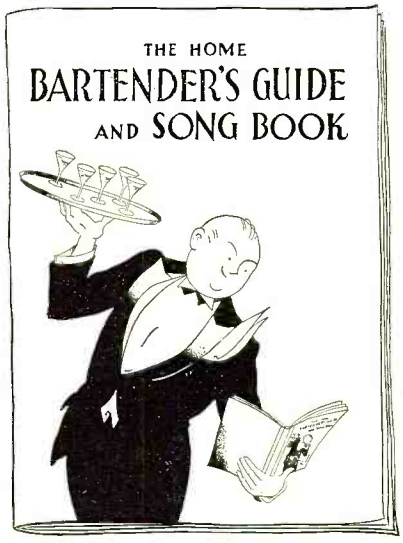

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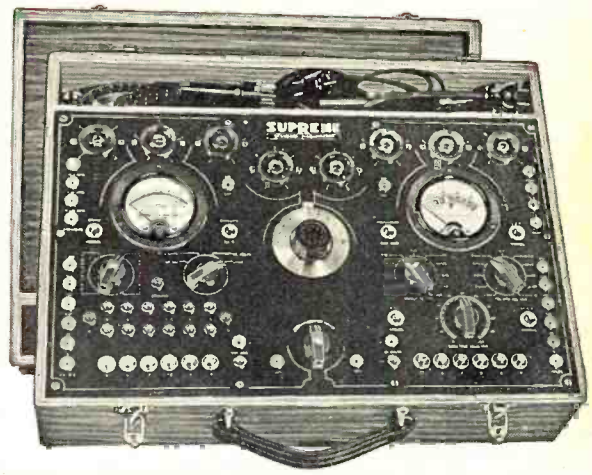

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