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RADIO NEWS AND SHORT WAVE RADIO

JULY

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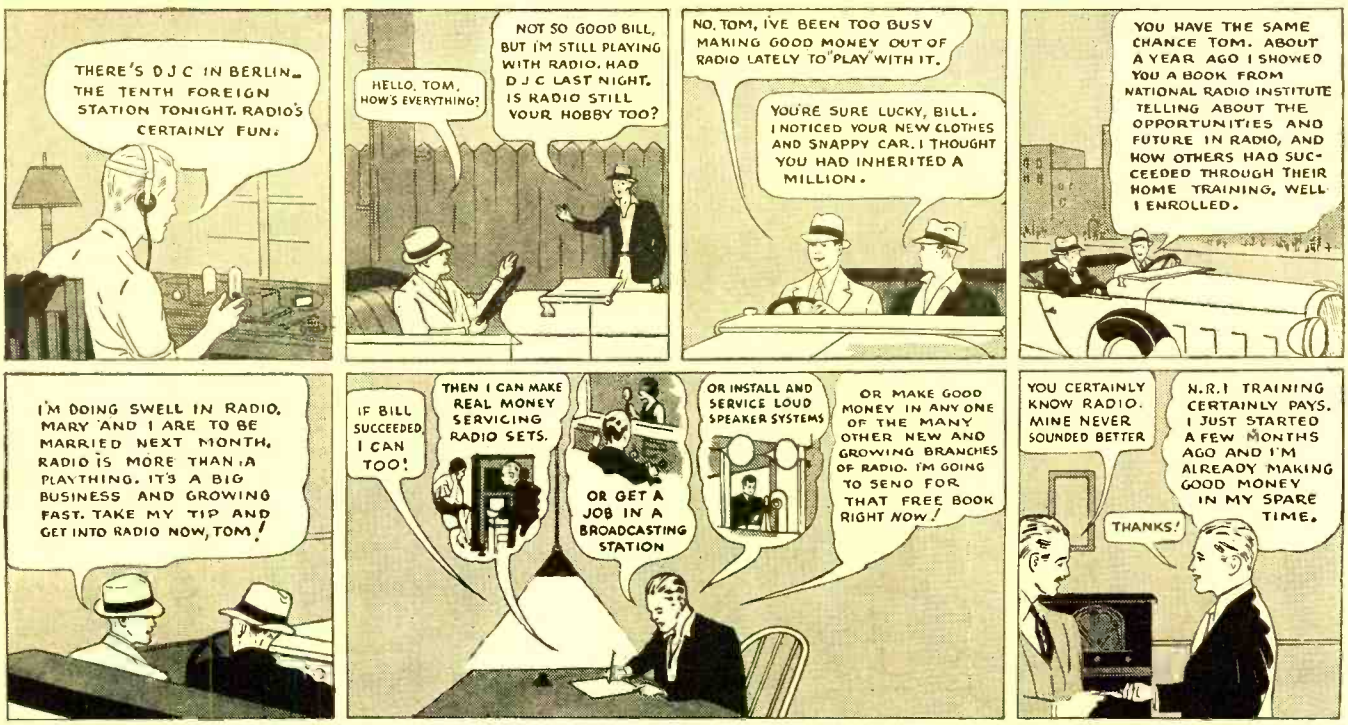

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Dept. 7GR, Washington, D. C.

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RADIO NEWS

Vol. XIX July, 1937

Edited by LAURENCE MARSHAM COCKADAY

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No. 1

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Our Apologies

WE wish to apologize to the many new subscribers who asked to have their subscriptions start with the May or June issues of RADIO NEWS. The unusual volume of recent new subscriptions has completely exhausted our supply of these issues and made it necessary to start many subscriptions with the current July number instead of the previous issues ordered.

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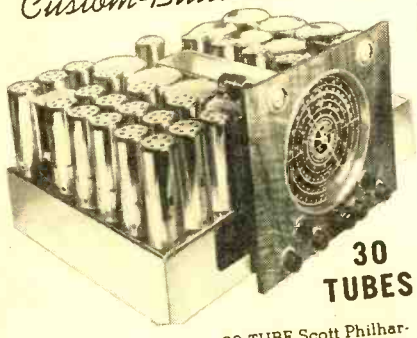

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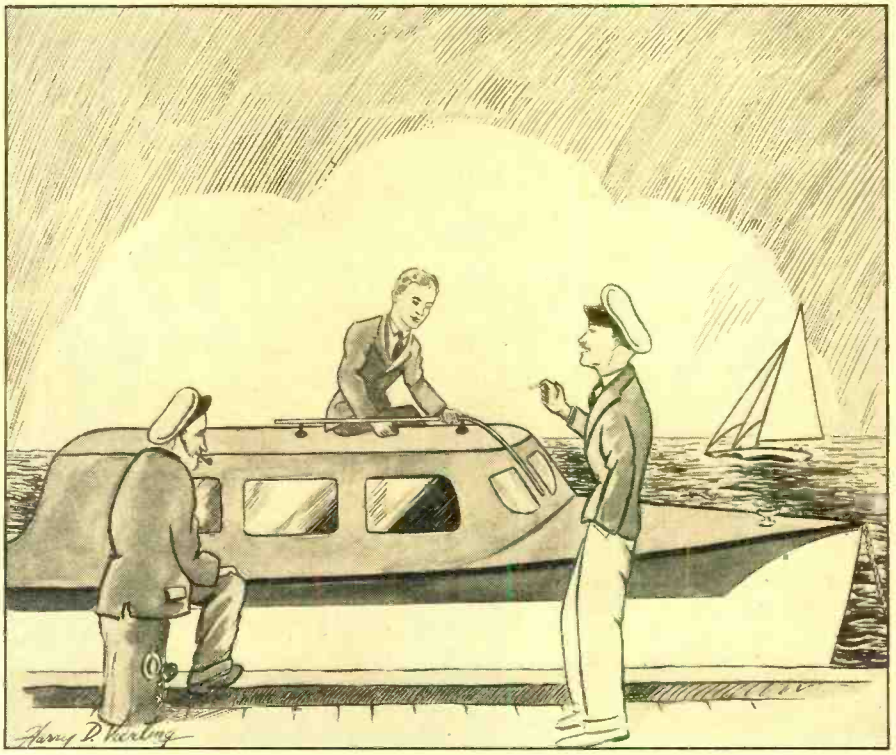
Pages From A Serviceman's DIARY



SERVICEMAN: HERE'S A "TWO-IN-ONE" JOB THAT'S PROFITABLE
A thrifty boat-owner, sold on the idea of having an auto radio installed on his boat, then at the end of the cruise (or season) having it transferred to his car. Money saved for the owner—and two installation jobs for the serviceman, with perhaps two more next season.

FRIDAY—How would you like to establish yourself abroad, in a country where there are plenty of expensive sets, many dealers, and yet not a single man who knows anything about radio repairing—where a leading dealer offers excellent shop facilities and his service trade absolutely free and will cooperate with you in building up a larger business—where you can knock out two or three hundred dollars a month or more working only six or seven hours a day and have no competition? The climate is ideal, the scenery beautiful and it is unlikely to become involved in war. If you're interested, write to the Editor and tell him about yourself. If he thinks you will fit in, full details will be forwarded. Remember, this is not a salaried job—it's an opportunity to start your own business with very little capital in ideal territory. There will not only be radios to service, but also sound movies, broadcast transmitters, P.A. systems and nearly everything else which employs vacuum tubes. If you are an American and can fix radios and possess some knowledge of the other fields as well as a smattering of French or Spanish, this looks like a real opportunity. You will need only a few hundred dollars reserve funds to tide you over while getting started, plus some modern portable test equipment and tools.

A Quick Installation

Drove off to the yacht harbor, still thinking of the foreign job. Who wouldn't get a kick out of such a chance? But it's no place for a married man; there are too many unattached damsels over there looking for attention.

Was met at the pier by a sailor, who helped me load an RCA model 123 auto-radio and accessories into a dinghy, along with my tools and analyzer (you need everything for boat installations). He rowed out to a small cabin cruiser anchored in the harbor. The owner wants only a temporary installation for a month's cruise, after which the set is to be removed and installed in his car. Salt air is not so good for any radio, so we thought this a good idea to recommend, particularly since he could not afford two sets but would not object to having two installations, which would bring us about the same net profit.

The set was mounted on a panel previously prepared for the job, with a cut-out for the speaker. There is very little available space in small boats for radio so this had to fit into the door leading from the cabin to the prow. For the aerial, always a headache on such boats, the new "towel rack" auto-radio type was selected. It can be installed quickly without marring the woodwork by means of its rubber suction mounting supports and can be removed easily when not needed.

Cleaned up this job in a reasonably short time and stopped at the club restaurant for a bite, even though it was a little early for lunch. Then went on to a noon-time date with a Radiola 48, owned by a charming young woman with an old but wealthy husband. They have other sets but this one is a tuned r.f. job which is unusually quiet when operating properly. I found it needed a new volume control on a previous call, so brought it along to replace on the spot. It is not practical to pull the chassis on this set due to its mechanical construction so the replacement is most easily made by simply swinging the chassis out into your lap while seated on a low stool or a turned-over kitchen chair.

Pulled up in front of this old Colonial house and was greeted at the door by the young lady, apparently not fully clad. "You came a little earlier than I expected," she said, "but I'm very glad to see you are so prompt."

Seeing America First

I stopped at the kitchen and picked up a small folding step-ladder then went with her to the front room and started to work on the set. She flopped down on a couch and made herself comfortable. I told her about the yacht job I had just done and also about the letter from abroad. She seemed much interested about Europe and asked many questions about places which I had visited years before. "I hope I am not exposing my ignorance," she laughed, negligently swinging a silk-clad leg over the arm of the sofa, "but don't you think you should see America first?"

Scenery Improves

The scenery here, I began to realize, deserved far more attention than it had been given. I attempted to solder the shield-wire to the new volume control but unfortunately pushed the hot iron against my thumb. A yellowish-white spot formed which will soon blossom out into a nice blister. Funny how absent-minded a fellow will get at times!

As a rule, I believe it is better never to do any set repair work in the customer's home. But, like all rules, there are exceptions.

THESE records from an anonymous serviceman's diary should be of decided interest to veteran servicemen, as well as to those whose experience in the service field is more limited. Written by a man who "knows his stuff," and shot with an occasional outcropping of humor, these items provide many hints not found in text books. More of these pages will appear from time to time.

6W5G

NEW YORK, N. Y.—A new rectifier tube, the 6W5G, has been announced by Raytheon. It is a high-vacuum full-wave rectifier of the indirectly heated type with the cathode insulated from the filament. It can be used to replace the 6X5 and 6X5G in automobile receivers when a higher rating is desired. The maximum a.c. voltage per plate is 350 volts r.m.s.; the maximum output current is 100 ma. d.c. and the maximum voltage between heater and cathode is 500 volts. The filament requires 6.3 volts at 0.9 amps. The octal base has 6 pins, which connect as follows: 1, no connection; 2, heater; 3, plate; 5; plate; 7, heater; 8, cathode.

New Station for Rome

NEW YORK, N. Y.—The Italian Broadcasting Company has placed an order for a 100 kw. short-wave transmitter with the Electrical Apparatus Company of Milan, an affiliate and licensee of the I. T. & T. This station is to be installed in Rome and go into service in 1938.

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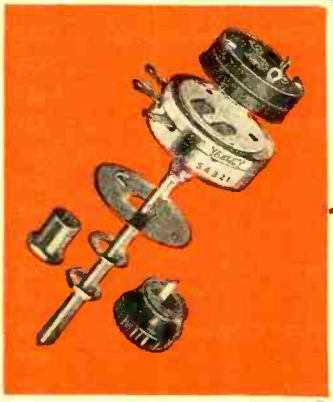

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MALLORY VIBRATORS *cost no more!*

MALLORY-YAXLEY

Precision Radio REPLACEMENT PARTS COST NO MORE THAN ORDINARY PRODUCTS

Every once in a while there's an idea that because Mallory-Yaxley products have a reputation for higher quality that they must be higher in price. A service man feels that he ought to use them but he thinks that maybe he can't afford to use them.

Mallory-Yaxley are *big*, he reasons, they'd have to be big to put out a help like the Mallory-Yaxley Radio Service Encyclopedia. They'd have to be big to have given the industry its first real honest-to-goodness Vibrator, Volume Control, and Condenser Service and Replacement Manuals. And the very size of Mallory-Yaxley—the wide scope and the great help of Mallory-Yaxley activities gives him a bad case of "price fright".

He thinks the products of the little fellow may be cheaper . . . and of course he finds plenty of people who'll encourage this belief.

Then some day he checks prices and makes comparisons. He finds that Mallory-Yaxley products *do not* "cost too much"—he finds that Mallory-Yaxley Precision Radio Replacement Parts *do not cost any more than ordinary replacement parts.* He finds they create the kind of customer satisfaction that helps his reputation and his bank account. He puts his radio servicing on easier and a more profitable basis.

It may be that *you* believe that because Mallory-Yaxley have done more for the service man that they expect to *charge more from* the service man. We say that isn't true and don't want you to take our word for it—or any man's word for it. You can compare prices and see for yourself! And—the more Mallory-Yaxley installations you make, the more you'll realize that the complete satisfaction assured by these precision replacement parts makes them *actually cost less in the long run.*

THE RIGHT "DOPE" *On Over 12,000 Different Radios*

. . . Completely analyzed under *one* cover . . . in the MALLORY-YAXLEY RADIO SERVICE ENCYCLOPEDIA. The book that gives the correct answers to all questions—always! Ask the Mallory-Yaxley distributor about *your* copy now!

Use P. R. MALLORY & CO. Inc. MALLORY REPLACEMENT CONDENSERS . . . VIBRATORS

P. R. MALLORY & CO., Inc.
INDIANAPOLIS INDIANA
CABLE ADDRESS—PELMALLO

Use YAXLEY REPLACEMENT VOLUME CONTROLS

Radio News

July, 1937

"Empire State" TELEVISION

Shows Marked Advance

Latest experimental transmissions from the NBC television transmitter using the new standard 441-line picture bring video images to a point of clarity in marked contrast to earlier efforts. Field tests continue.

***By the* Television Reporter**

LIKE its chief rivals in the race for American television supremacy, the Radio Corporation of America has adopted the 441-line picture standard recommended by the Radio Manufacturers' Association. In this move, RCA was paralleled by Philco and Farnsworth. These new systems were described in May, 1937, RADIO NEWS. This arbitrary agreement on standards between rival contenders for national leadership in sight transmissions is conceded to be one of the greatest strides made toward the establishment of the new industry.

RCA, joined in its television ventures by its energetic subsidiary—the National Broadcasting Company—is always quick on the trigger in its developmental activities but ever conservative in announcing its new findings. And this has been especially true in television.

More Optimism

As far as public statements were concerned, this company always maintained a timidity in relating its experiments with visual transmissions. But, now, with the definition boost to 441 lines—a much higher element image than England's—we find a more optimistic tone in the television statements of the company's chieftains.

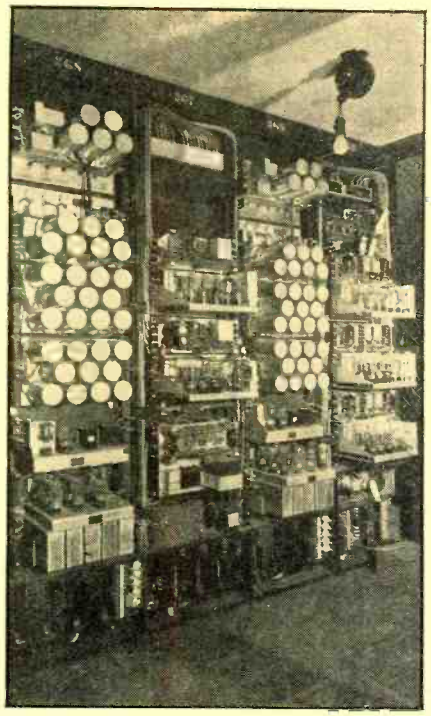
This was particularly noted in the Annual Report for the year ending December 31, 1936, by General James G. Harbord, chairman of the board, and David Sarnoff, president. Instead of the anticipated prediction of an indefinite period of development, the report, while not offering an exact prediction of television's commercial arrival, contains the phrase: "The need for additional experimentation indicates that this work will continue for some months to come." To this writer—and to many industry leaders—the use of the word "months" rather than years by the television-conservative RCA heads does truly indicate that sight broadcasting will soon turn that much exploited corner after traveling in a straight line for years.

SHE WILL VISIT YOU AT HOME

Betty Goodwin, NBC's television announcer, as she appears on the screen of the RCA television receiver. When commercial broadcasts are started, you may expect to see and hear her as a regular visitor in your living room.

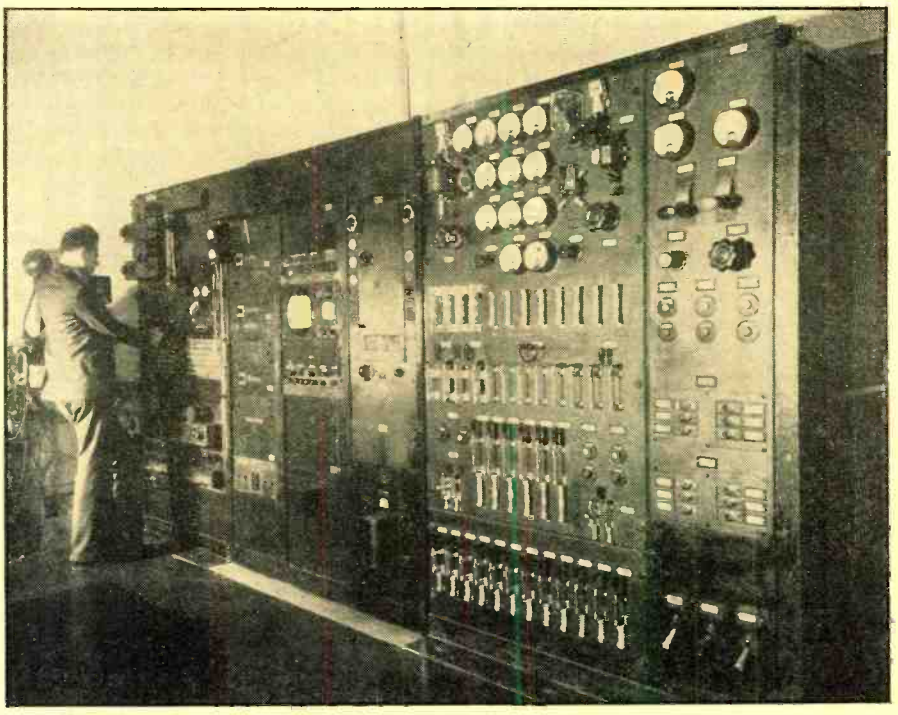
Finer Images

NBC experimental transmissions from the video station atop the Empire State Building in New York were boosted from 343 to 441 lines last January. The earlier standard was put into effect in June, 1936. In just little more than a half-year, the definition grew by 100 lines! A finer image was achieved. The photographs accompanying this article contain reproductions of actual images received over the air on the new standard. Here, indeed, is progress! Even the non-technical observer is readily impressed by such evidence.



BEHIND THE SCENES

This apparatus, the synchronizing signal generator, is the heart of the experimental television system.



TELEVISION OPERATORS WILL HAVE PLENTY TO DO

One glance at this Empire State transmitter control board would indicate that future television operators have plenty to learn to thoroughly understand their job. Thus television has become an added subject in radio schools.

The Empire State transmitter is fed by a coaxial transmission line with programs originating in the NBC television studio in Radio City—about three-quarters of a mile away. The picture wave-frequency is 49.5 megacycles while the sound channel is 52.75 megacycles; provision of 2.5 megacycles is made on each side of carrier. The 441-line system is employed at 30 frames per second. Messrs. Sarnoff and Harbord declared that, in the field tests now in progress, images of motion pictures as well as live performers are being successfully received in about 100 homes of RCA engineers in the metropolitan New York area and in the outlying suburbs.

Larger Service Area

"The distance over which these television programs have been received," they stated, "has exceeded our immediate expectations. In one favorable location programs have been consistently received as far as 45 miles from the television transmitter."

In answer to the writer's query on the power used for television transmissions, NBC referred to a paper by R. R. Beal, RCA Research Supervisor, which stated that "the filament power is sufficient to produce an electron emission of 18 amperes per tube which permits a video carrier power of 8 kw. With a tank circuit loading to pass the 1.5 mc. sidebands." The paper, though, was based on the old 343-line standard and while the author set forth some facts on the boost in definition, no exact mention was made of the new power rating. Likewise, there is still some reluctance to give out data on the probable cost of receivers, the number of tubes to be used in home models, etc. The parent company and the subsidiary hold that it is premature to make such statements as the definite day for public participation and commercial programs has not been named.

It is understood that the 100 test receivers around the New York area retain the tuning range of 42 to 84 megacycles. As in the case of other leading systems, the receiver gets sight and sound simultaneously. Single-knob tuning is employed and separating is easily achieved by the spacing of the transmitted carriers. A complex array antenna to produce a horizontally polarized field is employed.

Collecting U.H.F. Data

That the tests have been highly instructive was emphasized in the Sarnoff-Harbord report. "Much has been learned about the behavior of ultra-short waves and how to handle them," they stated. "More is known about interferences, most of which are man-made and susceptible of elimina- (*Turn to page* 60)

"FELIX" IS NOW A GUINEA PIG!

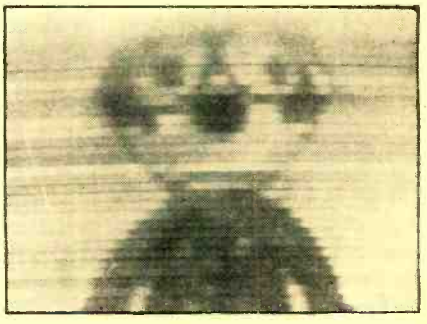
This photograph of the grinning cat was received over the new 441-line system. No longer a "ghost" but clear and distinct in every detail.

TELEVISION'S CONTROL ROOM

It takes three trained engineers, pictured below, to keep the system working satisfactorily. In the foreground: One monitors the sound. Center: The program director. At rear: A third engineer monitors the video system.

A "GHOST" OF YEARS AGO

This is Felix as photographed a few years ago with the early 60-line transmissions. Compare this picture with the one on the left of this page.



WHAT'S NEW in RADIO

By The Associate Editor

Twin Gadgets for Radio Trouble Shooting

Two new pocket-size trouble shooting cards were recently announced by Alfred A. Ghirardi, author of "Modern Radio Servicing" and other well known radio books. These eyeletted, conveniently indexed cards list all common radio troubles in home and automobile radio receivers. They not only give the probable remedy for each trouble, but also indicate exactly what test to make to definitely "spot" it. The card covering home radio sets is a new, revised, and enlarged edition of Ghirardi's Pocket Trouble Shooter.

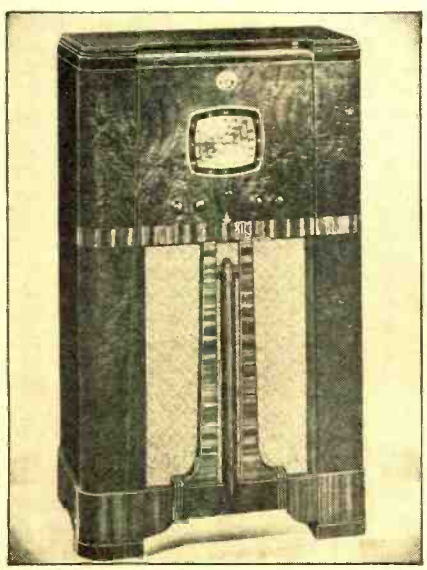
Panel Control Kits for All Cars

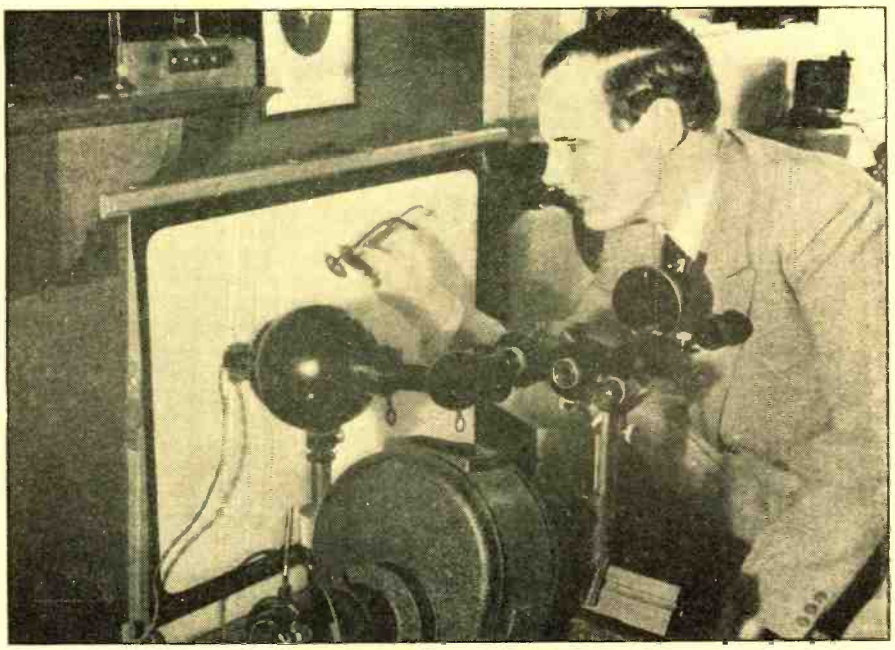
Because car owners have become "interior-conscious" during the past few years, General Electric has designed a series of instrument panel-board radio control units for the new 1937 "G-E" auto radios to harmonize with the interiors of 1937, '36 and '35 models of all leading makes of cars from Plymouth to Packard.

For cars over three years old, there's an attractive underpanel-mounting control which goes well with any instrument panel. Each individual kit contains an escutcheon plate, essential hardware and control knobs which all harmonize with the instrument panel-board for which it was designed.

New 15-Tube Set Delivers 15-Watts and Uses 15 Inch Speaker

The Emerson model X146 High-Fidelity superheterodyne is equipped with a number of new developments that will recommend it to both the short-wave and broadcast listener. It employs 15 tubes comprising two 6K7's, one 6A8, seven 6C5's, two 6F6's, two 80's and one 6G5 tuning eye. Covers a tuning range from 16 to 555 meters, has full range volume expansion, and features the "Gemloid" time-tuning indirectly lighted dial with band-spread pointer and mechanical band-spread tuning. The band indicator identifies tuning band in use.





WILL WE HAVE STEREOSCOPIC TELEVISION?

Manfred von Ardenne, German television expert, shows the apparatus with which he can produce stereoscopic moving pictures. If it can be done with movies, we might expect to see three-dimensional television scenes in the future.

Replacement Condensers For Refrigerator Servicing

A still greater variety and a larger choice of replacement condensers for electric refrigerator servicing is announced by the Aerovox Corporation. Many exact duplicate replacement units have been added to the line and are listed in their new catalog. The catalog lists the various brands and types of electric motors used for refrigerator and other motor-driven appliances, together with their capacitor specifications.

De-luxe Receiver

Setting a new standard for artistry in radio receiver cabinet design, the Scott Radio Laboratories recently announced the "Georgian" model, the latest addition to their line of custom-built de-luxe receivers. This striking console, of distinctive period design, measuring 55 inches high by 52 inches wide by 22 inches deep, houses the Scott 30-tube Philharmonic chassis. It is equipped with 3 speakers, a standard 15 inch type and two reproducers to cover the high frequencies. This model features a new type record changer that plays both sides of the record, also the new Scott "no-needle-scratch feature" which practically eliminates annoying needle scratch, without cutting off the high frequencies.

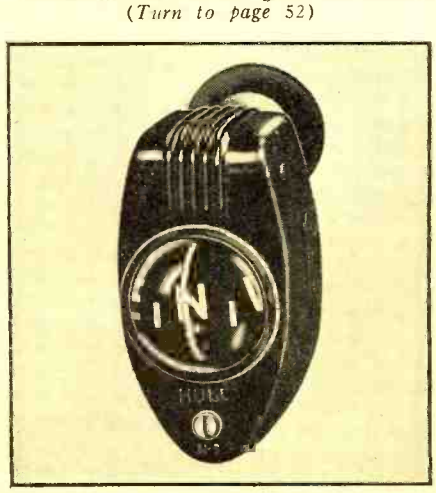
Midget Condensers

The Allen D. Cardwell Mfg. Company is producing a new line of standard double section "Trim-Air" midget condensers. The condensers use Isolantite insulation and they are constructed with sturdy over-size double bearings. A ¼ inch shaft extends at the rear for additional ganging.

New Auto Guide Saves Time and Miles

The Hull "Streamline," airplane type auto compass, of interest to any one owning an automobile, has special possibilities for the radio amateur. This instrument is of the liquid type, the dial rotating on a sapphire pivot. It tells your direction of travel every instant—changing with the slightest bend in the road. For the "Ham" it should be a worthwhile and convenient asset in direction finding and in use with mobile transmitting equipment. For general use it is an excellent guide for tourists

(*Turn to page* 52)



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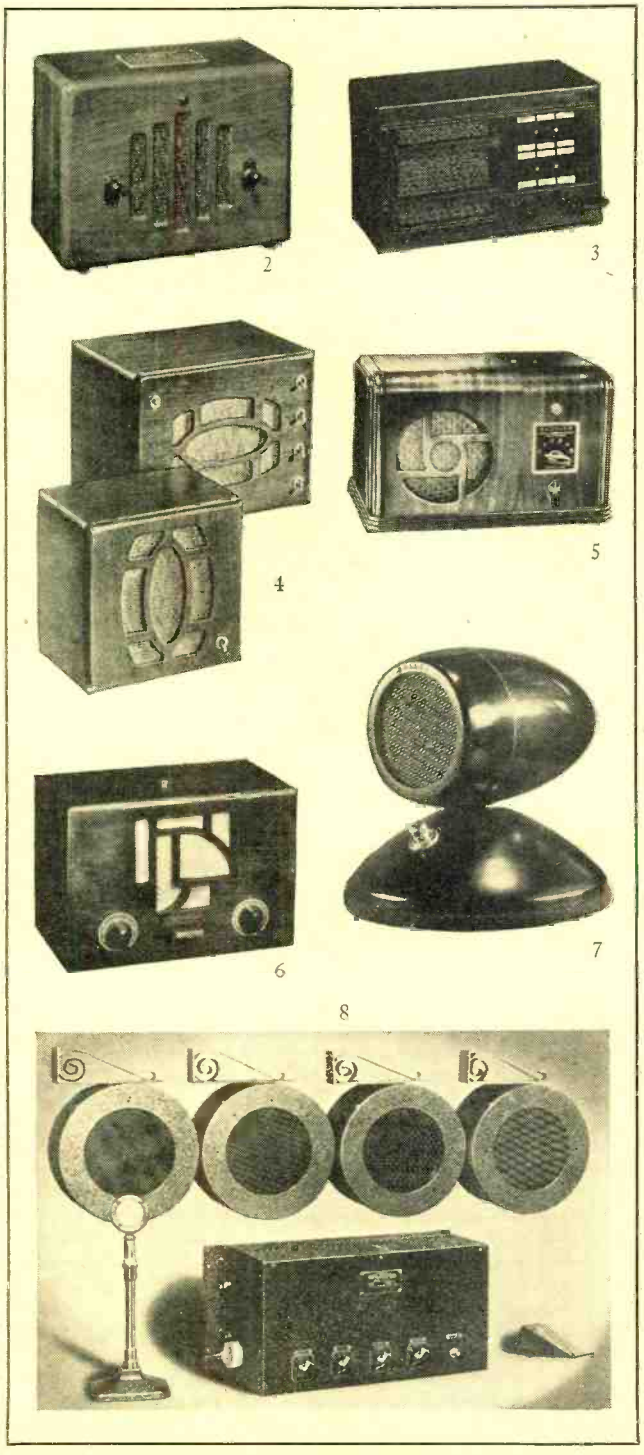

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Good Profits in

"INTER

Communication by

To borrow an appropriate slang
cation systems "have gone over with
were only two or three companies
kind, but radio manufacturers were
field and now there are over a score
tiple call systems designed

By **William**

SERVICEMEN and dealers who have taken on inter-communication systems as a sideline, report that public response has exceeded their best expectations. No special sales ability is required to sell these new instruments, they literally speak for themselves and often; the first demonstration means a sale. Installing any one of the instruments described in this article is simplicity itself. It requires no technical ability or special tools.

The market for call-systems is practically unlimited. Their applications range from all types of installations in offices, hotels, department stores, restaurants, and amusement places. Private homes, both large and small, find excellent use for them. The business executive and the professional man are finding in this new device a means whereby they save time and money and promote efficiency in their organization. Special inter-phone systems are now available for auto trailers. Simultaneous two-way talk is possible between the trailer and the car, the driver can talk and listen without taking his eyes from the road or his hands from the wheel.

The systems are divided into two general types, those that use connecting wires between stations and others that transmit the speech over the electric light lines. They are available in two-way and multiple systems, employing as high as eighteen stations.

Instant Two-Way Communication

THE "Philcophone" made by the Philco Radio and Television Corp. provides instant, two-way communication between a master control unit and from one to four remote units (see Nos. 1a and 1b). From the master control you can carry on a strictly private two-way conversation with any one of the remote units or talk with all four at the same time. The instrument features low initial cost, low current consumption and simple installation, which requires merely a wiring connection from the various stations to the master control. The master unit measures 10½ by 8¾ inches by 5⅝ inches, sufficiently small to stand on the ordinary desk without taking up valuable space. The remote stations measure 6⅞ by 6⅞ by 3¾ inches. The cabinets housing both units are finished in walnut and designed to harmonize with home or office surroundings. The system operates from either alternating or direct current. The master unit utilizes the following type tubes: two 6K5G's, one 25A6G, and one 25Z6G.

"Electro Call"

THE model 202 "Electro Call" inter-communication system (see No. 9) is a product of the United Scientific Laboratories, Inc. It is a multiple selective-system, consisting of a master station and as many as six outlying or branch stations, permitting instant two-way amplifying conversation with various individual departments. The single unit without switching facilities, model 200 (see No. 2) can be employed for two-station communication. Switching devices located on the back of the instrument conveniently control the voice and signal amplification. Both units operate from either alter-

Call Systems for OFFICE"

Wire and Radio

expression, the new inter-communi-
a bang." Not so long ago there
specializing in equipment of this
quick to see the possibilities in this
of companies offering single and mul-
to meet all requirements

C. Dorf

nating or direct current. They use connecting wires between stations.

Simple to Install and Operate

THIS multiple system permits communication between a master station and up to twelve outlying stations (see No. 3). It is made by the Remler Company, Ltd. and, as the manufacturer points out, the owner can start with the master unit and one or more branch stations and at a later time, install additional stations up to the maximum of twelve, thus providing for expansion for this communication service when needed. Metal type tubes are used in the master unit, comprising one 6N7, one 6F6, and one 5Z4 rectifier. A connecting line (single conductor and shield) hooks up the master unit to each secondary station. The system is designed to provide an audio power output of 2½ watts. Both master and secondary units are mounted in moulded bakelite cabinets, 5 by 6⅜ by 10 inches.

Announces Complete Line

THE Allied Radio Corp., introduces a complete line of inter-communication systems of the latest design to meet practically every need in this field. They include simple two-way outfits, master station call systems, and super-selective systems, as well as large factory calling equipment. The selective master station system (see No. 4) is designed for centralized control of inter-communication between the master unit and up to four sub-stations. The system comprises one master station unit with tubes, two sub-stations with 50-foot connecting cables and polarized connecting plugs. The tubes employed in the master unit consist of one 6C6, one 25L6 and one 25Z5.

Push-Button Gives Instant Automatic Direct-Communication

UP to five outlying stations may be used with the new Radolek master call-system (see No. 5). When the desired outlying station is selected on the selector control of the master station, you merely push the button to talk and release to listen. Outlying stations calling to the master station must press a button until identified, after that both sides of the conversation are controlled at the master station. The instrument is designed to be operated by means of connecting wires between stations. This company is in a position to furnish dealers and servicemen with a free illustrative booklet describing this and other communication systems.

"Belfone"

THE "Belfone" inter-communication device made by the Bell Sound Systems, Inc., measures only 5¼ by 7 by 9 inches and is no larger than a midget radio. Its installation is as simple as a system of buzzers. An ordinary twisted cable is used for inter-connecting the call units.

The master unit (see No. 6) employs a special permanent magnet dynamic-type speaker which serves both as the reproducer and microphone. The (*Continued on page* 54)

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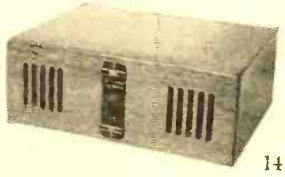

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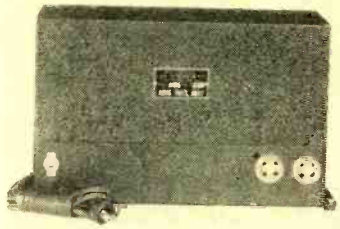


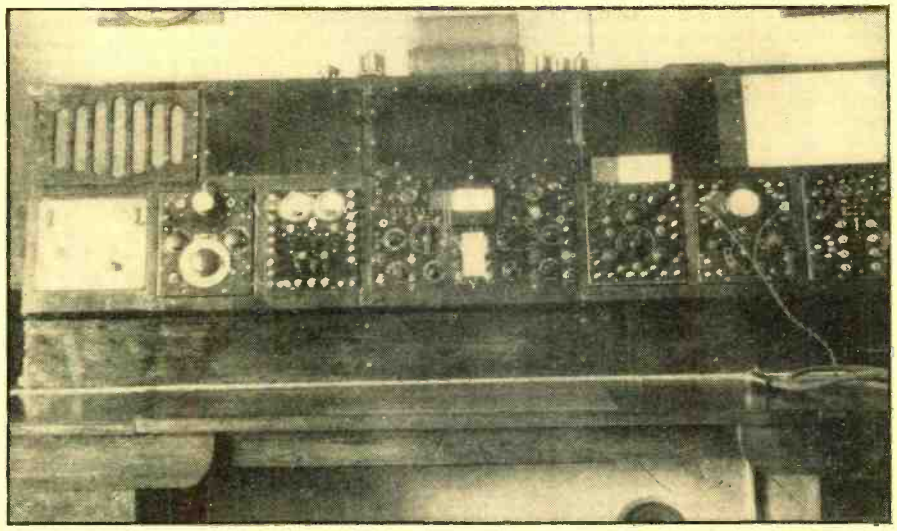


FIGURE 2
Complete service equipment and 100% home design and manufacture.

THE SERVICE BENCH

Free Inspection Again . . . Service Shops . . . Standard Frequency Transmissions . . . Service Notes . . . Wattage Tests . . . Selling Sound . . . Service Sales Promotion . . . SERVICING: Stewart-Warner . . . Dewald

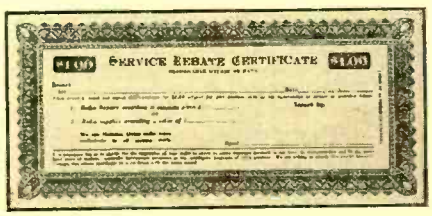
Conducted by Zeh Bouck, *Service Editor*

ANOTHER SOLUTION TO THE FREE INSPECTION PROBLEM

IN this department for May we pointed out that a "free inspection" policy was often good business and perfectly justifiable if absorbed by the advertising budget. The profit in free inspections, of course, bears a direct ratio to the number of service jobs resulting from such inspections.

IN an effort to raise the serviceman's batting average in this respect close to the one hundred percent mark, National Union has introduced a system that effects a compromise between free inspection and a charge for examination. Actually free inspection is provided *only when it results in a service job!*

The client is charged one dollar for inspection, and handed the "service rebate certificate" shown in Figure 1. This is filled out with the customer's name, date and an estimate of what the job will cost. This certificate can be redeemed for one dollar against the cost of the service job any time within sixty days, thus nullifying the charge for inspection. Of course, if the customer consents to having his re-



ceiver serviced then and there, no charge is made for inspection and no rebate certificate is issued.

The service rebate certificate can also be used in general sales promotion by mailing to a selected list of customers. This will remind many of them that it is time to have their receivers checked (particularly if the certificate is accompanied with a good sales letter or circular), and most of them will call upon the serviceman within the sixty-day, one-dollar-off period.

As a matter of sound business, at the expiration of sixty days, the number of certificates redeemed should be counted and the value of free service rendered should be added to the advertising budget over some future period and thus automatically absorbed as future job costs are computed.

THIS MONTH'S SERVICE SHOP

N. Davy, Philco dealer of Birch River, Manitoba, Canada, sends us the accompanying photograph, Figure 2, of his Service Bench. As he puts it, this is really a test bench, the heavy mechanical work being done on a workbench. The particular feature about this layout is the fact that every bit of equipment in it is of home design and construction. The bench is 30 inches high—a comfortable sitting height—17 inches wide and seven feet long. Plenty of elbow room in all directions with four blank panels for future additions in the way of equipment. Recessed in the bench at the left is a phono turntable and pick-up. The center section of the bench is also removable, and discloses a set of clamps which permit the operation of a receiver in an inverted position at bench level. A large baffle board, upon which are mounted a large and a small speaker, can be partially discerned under the bench. The test equipment includes a capacity bridge for measuring small capacities, an all-wave oscillator that can be modulated from any external source, a complete tube tester for emission and amplification tests, a condenser tester, and of course full provision for all voltage, current and resistance measurements.

THE DAY'S WORK

Arnold West, of Scotia, N. Y., points out the fact that while the American broadcasting stations provide a wholly satisfactory check for the all-wave oscillator on the lower broadcast frequencies, the international short-wave stations cannot be similarly depended upon. Changes in schedules, shift of frequency and the unreliability of foreign frequency statements make a calibration check on the short waves pretty much of a haphazard proposition if such stations are depended upon. Some servicemen resort to the laborious method of calibrating by means of harmonics. Mr. West makes the logical suggestion that the servicemen avail themselves of:

The Bureau of Standards Standard Frequency Transmissions

"WWV, the station of the National Bureau of Standards, transmitting from Washington, D. C., sends a standard frequency test on three frequencies, three times a week. The test days are Tuesday, Wednesday and Friday. The frequency of transmission from 12 noon to 1 p.m. is 15,000 kilocycles. From 1:15 to 2:15 the frequency is 10,000 kilocycles, and from 2:30 to 3:30 the frequency used is 5000 kilocycles.

"The Wednesday transmissions are by tone-modulated c.w., the modulation being at 1000 cycles. The tone is continuous for one hour, without announcement of any kind except at the beginning of the period, when the announcement is made in voice (on Wednesday only). The signal cannot be missed even if the announcement is not heard.

"On Tuesdays and Fridays, the transmission is exactly the same, excepting that pure c.w. is employed, and the station announces in code. (However, once again, no difficulty should be experienced in locating WWV, its presence being indicated by the long—one hour—period with constant carrier.) And if the serviceman knows his code at all, he will have no difficulty in copying WWV. The transmission is very slow—about ten words per minute—and the transmission is introduced by the following preamble: 'CQ CQ CQ de WWV WWV WWV National Bureau of Standards, standard frequency 15,000 kilocycles, accurate to better than a part in five million de WWV WWV WWV.' Of course the other frequencies are substituted in their respective transmissions. The accuracy of the tone modulation on Wednesdays is also better than one part in five million, which is better than two one hundred thousandths of one percent (.00002%)—which is fairly good!"

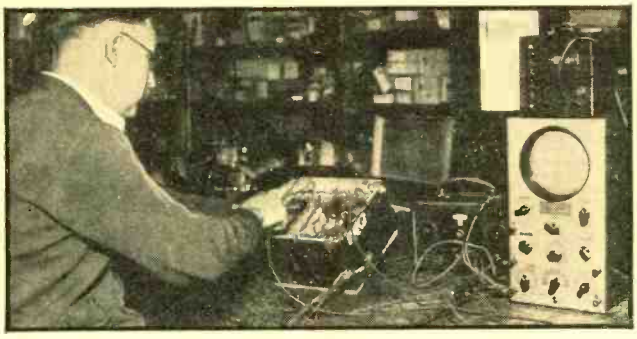
The Right Place for Service Notes

L. C. Warren, of the United Radio Service, Sioux Falls, South Dakota, sends through a good tip—"I have plenty of service notes which I am going to send along to the *Service Bench* as soon as I can copy them out of my Rider's Manuals. We write down the symptoms and the remedy right alongside the diagram and other dope. This saves a lot of time in duplication of tests when a like model comes in a few months later—impressive to the customer also."

Wattage Tests

Commenting upon the article appearing in this department for April, 1937, which described the use of a watt-hour meter as a radio test instrument, George Olsen, of Olsen's Radio Service, Carrington, N. D., writes: "We have used something of a similar nature on our bench for some years. We have one panel on which are mounted a Jewell 0-150 a.c. voltmeter and a Jewell 0-2 a.c. ammeter. The figuring of set wattages is simple—just volts times amperes. Of course a regular wattmeter would be somewhat quicker, but we prefer our layout which gives us a voltmeter, indicating the line voltage at all times. Have found this arrangement of

(*Turn to page* 38)



CHECKING SET WITH AN OSCILLOSCOPE
FIGURE 3

The layout for oscilloscopic servicing of home and auto radios.

Taking The "Guess" Out Of

Auto-Radio SERVICING

(using an oscilloscope)

By **Edward M. Scribner**

THIS time of year is marked by the annual overhauling of auto radios preparatory to a summer of motoring reception. Many servicemen take full advantage of this seasonal opportunity through special literature and advertising calling attention to the desirability of a complete auto-radio check-over. The cathode-ray oscilloscope is an especially useful tool in auto radio servicing.

THE oscilloscope can, naturally, be employed for alignment, distortion checks, etc., in auto sets as well as in home-type receivers. But it is in vibrator action analysis that the oscilloscope performs a distinctive function, and only by its use can the serviceman effect adjustments equal in efficiency to those attained at the factory.

The possible variety of vibrator troubles is numerous; some of them so subtle in nature that they can be shown up only through oscilloscope investigation. Vibrators are often erratic in operation. Occasionally they blow out altogether—along with a few fuses. A light jar in removing the set from the car, or tapping, may return the vibrator to apparently normal operation. The points make and break so quickly that it is impossible to make an effective visual inspection, and the inertia of ordinary meters often makes voltage readings unreliable. Points may burn over a very small area no larger than the head of a pin. They may operate normally during partial disintegration—so far as ordinary tests are concerned—only to cause grief later on. Some vibrators will not start at the agreed low potential rating of four volts, but will operate satisfactorily at from six to eight volts. Some points will burn out as the potential approaches 8 volts. Such conditions are due to vibrator maladjustments, the exact nature of which can be determined only on the oscilloscope.

Reveals Troubles

However, the vibrator is not alone guilty in the matter of power supply troubles in auto radio receivers. The buffer condensers across the secondary of the transformer often cause trouble, particularly when permanently or intermittently open. (A shorted buffer condenser is, of course, readily located.) Replacement of a buffer capacitor with a condenser of the wrong value will result in reduced life and incorrect operation that is best demonstrated on the oscilloscope.

The cathode-ray oscilloscope will detect not only vibrator and contact trouble (with both synchronous and non-synchronous vibrators) and abnormal conditions in the buffer circuit, but will also disclose the presence of "hash" in the r.f. system.

Experimental Tests

To familiarize oneself with the oscilloscopic portrayal of vibrator circuit conditions, the serviceman should produce known troubles in an otherwise perfect vibrating system and note the effects on the oscilloscopic screen. These should be sketched or photographed for future reference. (Photos, or oscillographs, are easily made with an exposure of 1/5 to ½ second at f-4.5 on fast, color-sensitive film or plates. Figure 1 is such a photo. A slightly more contrasty image will be secured by dimming the room light, Figure 2 being an example of this technique. The oscilloscopic image can even be discerned in Figure 3, which shows the layout and the author at work on an auto radio. (This was made with a time exposure, followed with a flash-bulb shot of the ensemble.)

As the images vary with different conditions in different receivers, it is hardly practical (*Continued on page* 57)

FIGURE 4

This oscillogram shows a synchronous vibrator with the rectifying contacts out of adjustment with resulting voltage (vertical deflection) fluctuations.

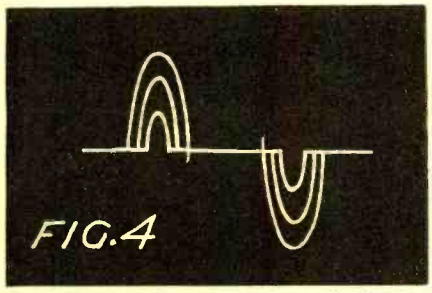


FIGURE 1

Oscillograph of a perfect vibrator on an Arvin 17A auto radio.

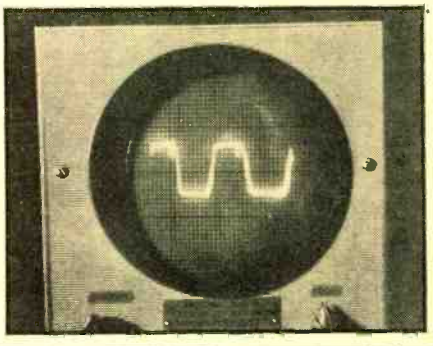
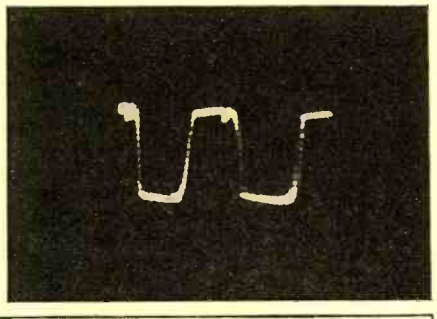
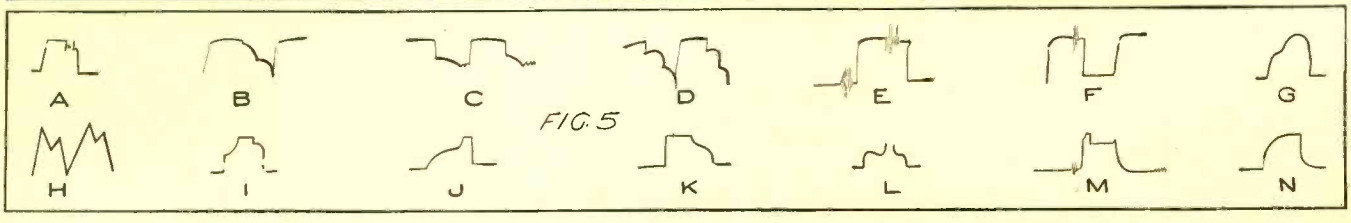
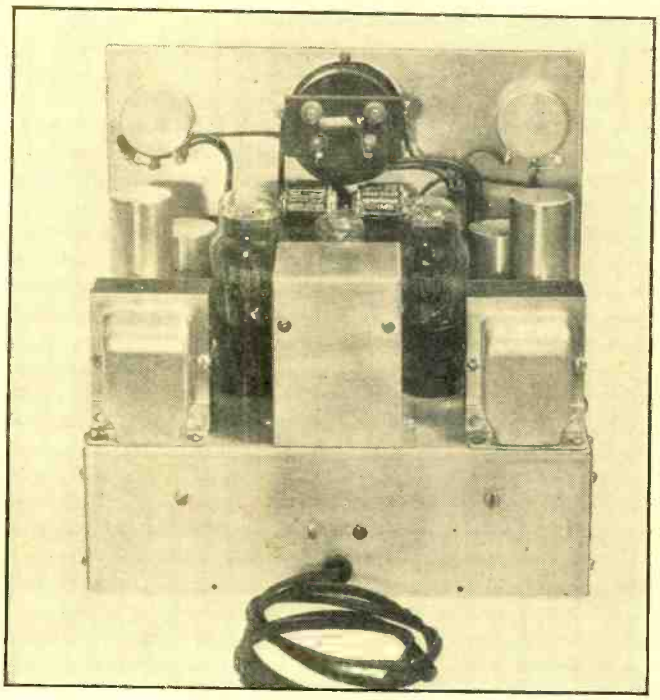


FIGURE 2

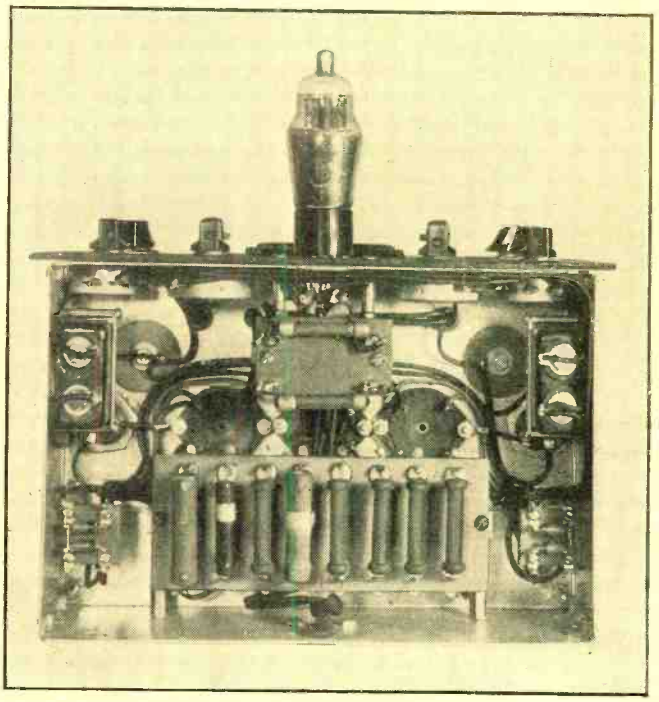
The same oscillograph as that shown in Figure 1, but made more contrasty by reducing the room light.







THE AUTHOR'S MODEL—



RUGGED AND COMPACT

How to Build and Use a
V. T. VOLTMETER

By R. M. Ellis

(Part One)

THE vacuum-tube voltmeter to be described will provide the laboratory technician or advanced serviceman with a versatile instrument for the direct reading of many voltages which are not indicated, or at best only approximated with an ordinary meter. This voltmeter will accurately measure direct or alternating peak voltages up to 500 volts, with an a.c. frequency range from 20 cycles to 20 megacycles. With the original laboratory model, the actual measured error at 15 megacycles was only 2%. This device will save hours of time in locating trouble in receivers which apparently check satisfactorily but still do not perform properly. Mysterious cases of distortion, lack of sensitivity, and broad tuning unfold their secrets with ease.

Solves Mystery

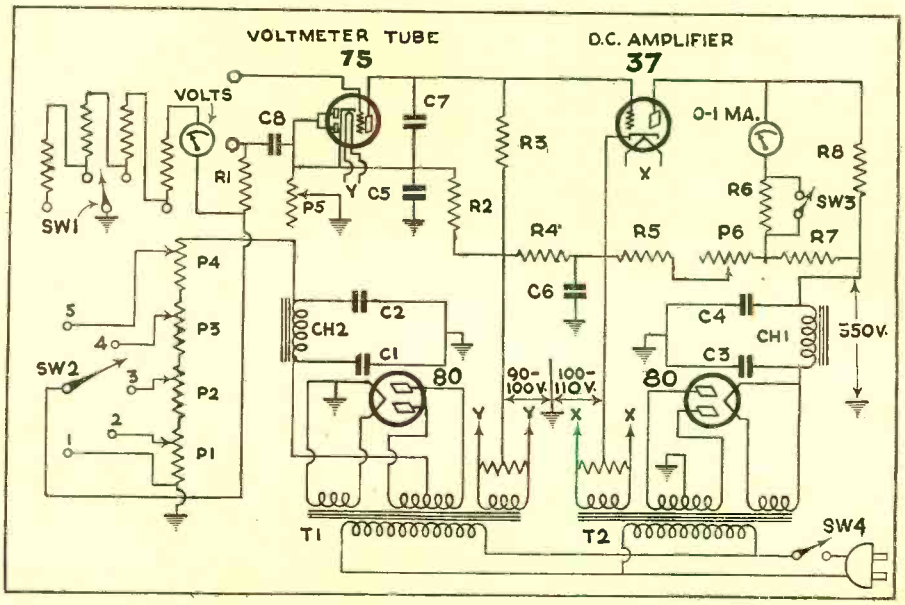
As an example we cite the instance of a certain radio receiver which was a "hoodoo" for several competent servicemen. Although checking perfect in every way, this set distorted badly on local stations during periods of high modulation. A test with the v.t. voltmeter indicated that there was a fairly strong audio component on the grids of the r.f. and i.f. tubes. Since the by-pass condensers in the a.v.c. line were known to be perfect, the cause could only be that insufficient a.v.c. filtering had been incorporated in the original design. When the a.v.c. filtering was increased by using larger condensers and higher value resistors, the distortion was entirely eliminated.

Here are a few of the measurements that can be made with ease and accuracy:

1. Peak voltages—r.f., i.f. and a.f.
2. Diode detector peak voltage.
3. Automatic volume control voltage.
4. Audio, r.f. and i.f. gain.
5. Detector efficiency.
6. Amplifier power output.
7. Phase inverter output.
8. Superheterodyne oscillator voltage.

THE SCHEMATIC CIRCUIT

Two power supplies are used, one for the "slide-back" or balancing voltage; the other for the tube-operating voltages.



9. Transformer and choke impedance.
10. Capacities.
11. Peak voltage requirements for vibrator buffer condensers.

The fact that this vacuum-tube voltmeter reads peak voltages is an advantage, since the maximum input to a vacuum tube is governed by the maximum permissible grid excursion, rather than the r.m.s. value. If desired, the r.m.s. value of any sine wave may be determined by multiplying the peak voltage reading by .707.

D.C. Amplifier

The vacuum-tube voltmeter shown here is somewhat unusual in design. Fundamentally, this is a combination slide-back tube voltmeter, plus a d.c. amplifier to give added sensitivity. The reference meter reading slide-back (bias) voltage is permanently connected in the circuit so that when balance is obtained the value of the unknown voltage may be read directly on this meter, eliminating confusing and time-wasting calculations.

The plate circuit of the d.c. amplifier operates into a bridge to permit the plate current to be balanced back to zero or any convenient reading, and also to prevent meter overload.

The merit of any voltmeter is mainly dependent on two factors. accuracy of calibration, and internal resistance (ohms per volt). Assuming that the reference meter is correct, the accuracy of this voltmeter is practically perfect up to high frequencies, except for potentials of less than 2 volts where an error of approximately 5% may be encountered owing to the difficulty of obtaining exact balance in this extremely low range.

High Impedance

The internal resistance of the meter (ohms per volt) startlingly shows the special merit of the voltmeter. Since the type 75 tube is operated at practically "cut-off," and since no connection is made across the voltmeter input except through the voltage sources, the impedance is practically infinite to a d.c. source. The a.c. impedance is inversely proportional to the frequency and is dependent on the inter-electrode capacity of the type 75 tube. At very high frequencies, there is also some effect from the inductance and capacity of the tube leads.

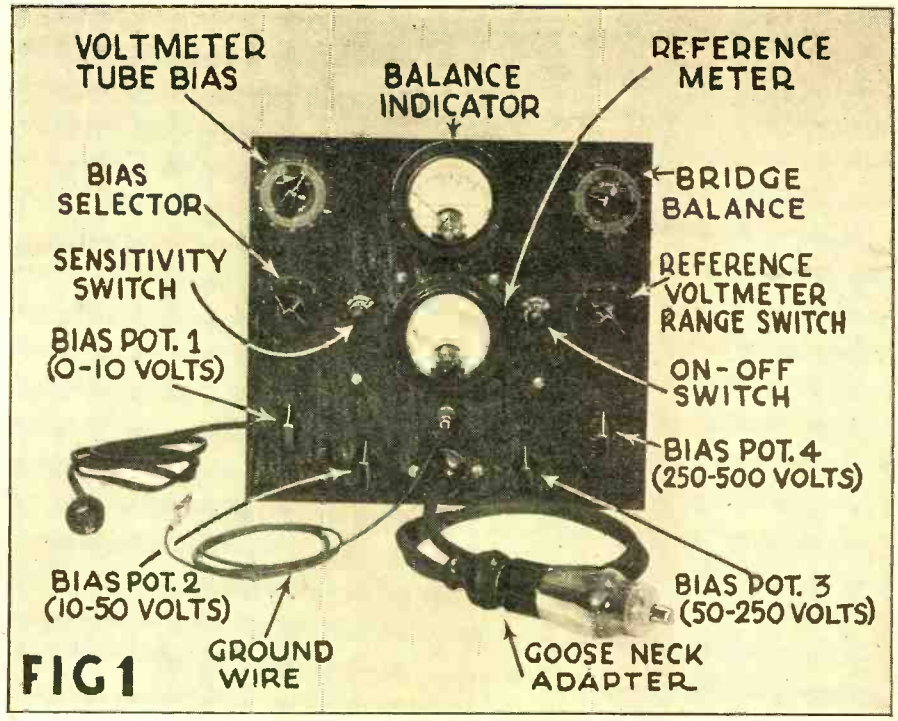
Two power supplies are employed, one to furnish variable bias to the type 75 tube, the other to provide operating voltages for the 75 and 37 tubes. The drain on these power supplies is substantially only the power required to maintain the voltage across the bleeders; therefore, the smallest size midget power transformers will be adequate. It is possible to employ only a single power transformer, *but this practice is not recommended* because voltage regulation effects will cause considerable interaction between the controls which will affect the accuracy and ease of operation of the instrument.

Power Supply

The bias power supply should furnish about 500 volts negative bias. The plate power supply should deliver about 350 volts. If it is in excess of this, a small resistor may be inserted between the rectifier tube filament and the filter choke to drop the voltage to this value.

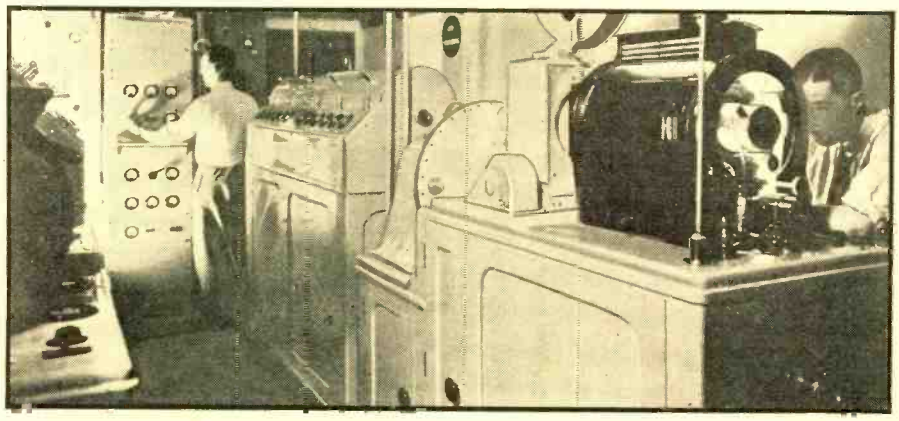
The heaters of the 75 and 37 tubes must be operated from separate filament windings because of the wide difference between the cathode voltages of the two tubes, as is the case in any direct-coupled amplifier.

The sensitivity switch (SW3) functions by inserting a 30,000-ohm current-limiting resistor in series with the 0-1 milliammeter used as the balance indicator. This protects the meter during the setting-up process, since otherwise the current might (*Turn to page* 58)



THE FRONT-PANEL VIEW

The type 75 tube may be plugged into the panel socket direct—or may be plugged into the extension cable as shown and its grid cap touched directly to circuit to be measured.



Television Operators Wanted

NOW is the time to prepare if you want to make television your life work. The author offers some suggestions which should help you.

By Thomas E. Gooteé

ALTHOUGH television has not been commercialized in this country as yet, it has developed into a highly specialized branch of the radio industry. There will be many future opportunities for trained television operators, technicians, and engineers who, by their own foresight, have studied and trained along this specialized line. The television operator of tomorrow must be a trained, skilled worker with knowledge far exceeding that necessary for radio or electricity alone. This is not a technical discussion of television, but a practical analysis of what future television engineers and operators will be expected to know.

A thorough understanding of television is not complete unless the definite relation between the human eye and television is fully realized. Television, in part, is actually duplicating imperfectly the process of the eye. For this reason a study of (*Turn to page* 59)

Designing Resistance-Coupled AMPLIFIERS

(*Amplifiers with Triodes*)

By J. van Lienden

(*Part Two*)

RESISTANCE-COUPLED amplifiers employing triodes have a frequency characteristic which is determined by the capacitance values across the plate and grid resistances and the coupling condenser as well as the cathode by-pass condenser.

Referring to Figure 1, which shows a typical resistance-coupled stage, the condenser C is in series with R_g. The reactance X_c varies with frequency, being the largest at low frequencies with the result that the lower frequencies will be attenuated unless the condenser has a reactance which is small compared with R_g, even at the lowest frequency to be transmitted.

High Frequencies

The plate-cathode capacitance of the tube is across R_L and the *effective* grid-filament capacitance is across R_g. These two capacitances by-pass the higher frequencies, the amount of attenuation depending on the size of the resistors and the tube capacitances. For a fixed tube capacitance, the lower the resistance values, the better the high-frequency response. The effective grid-cathode capacity of a tube is not equal to the static capacity, measured when the tube is disconnected from the plate supply. The grid-plate capacity is reflected back and adds capacity across the grid leak. The total effective capacity becomes

$$C_{eff} = C_{gc} + C_{gp}(1 + A)$$

Where A is the gain in the tube, C_{gc} is the grid-cathode capacity and C_{gp} is the grid-plate capacity. It will be seen that this effective capacity may become large when high-mu tubes are used. Therefore, in resistance-coupled amplifiers containing several high-mu triodes, the high frequencies will be attenuated too much. Low-mu triodes will have to be used for a flat characteristic or otherwise the pentode will solve the problem.

Effect of Self-Bias

The bias resistor and by-pass condenser also influence the frequency characteristic. The combination of the two will have a voltage drop across them which is re-applied to the grid in reverse phase. Therefore, when the impedance of the combination rises, the reversed feedback increases and the output becomes less. The lower the reactance of the by-pass condenser, the better the low-frequency response.

The accompanying chart, which was prepared by RCA engineers, specifies the values of condensers and resistors which will result in a frequency characteristic as in Figure 2. At the low-frequency end, the output at $f_1 = 100$ cycles is .8 of the output at 420 cycles, while the high-frequency cut-off point, f_2, is generally very high unless several stages of high-mu tubes are used. If a different value of f_1 is desired, the capacity values of C and C_c given in the table should be multiplied by $100/f_1$. When n similar stages are used in cascade, the voltage output at f_1 will be n (.8) times the output at 420 cycles.

The Hum Problem

The values of the cathode by-pass condenser C_c are given for a d.c. filament supply. When a.c. is used to heat the filament, it may be found necessary to increase C_c to minimize hum distortion. The proper size then depends on the gain, the nature of the associated circuits and the value of f_1. It may also be desirable to have a potential difference of 10 volts d.c. between heater and cathode.

When the amplifier contains more than two resistance-coupled stages, decoupling filters will be required. For two stages or less, these will not be necessary.

The employment of self-bias has the advantage that the circuit compensates automatically for variations in plate voltage or slight differences in tube characteristics. For this reason self-bias is more convenient than fixed bias.

A variation of 10 percent in the values of resistors or condensers will have only little effect on performance.

Phase Inverters

The data on double triodes refer to the use of the tube as an amplifier-phase inverter according to the diagram of Figure 3. The first section of the tube serves as an ordinary resistance-coupled amplifier while the second section is the phase inverter. The input to this section must be regulated by the tap P so that its output is equal to the output of the first section. The correct ratio of the two resistors making up R_g can be found from the table. For instance, if the gain of a single section is 20, P should be located so that the resistance from P to ground is 1/20 of R_g or 1/19. of the resistance between P and condenser C. For phase-inverter service it is better not to by-pass the bias resistor R_c; this helps to balance the two sections.

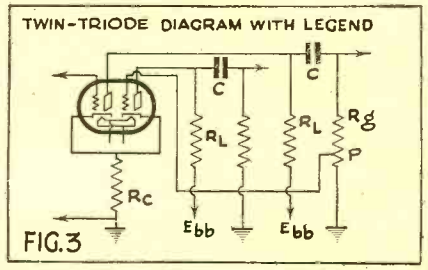


FIG.3

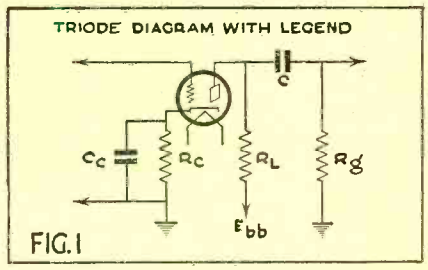


FIG.1

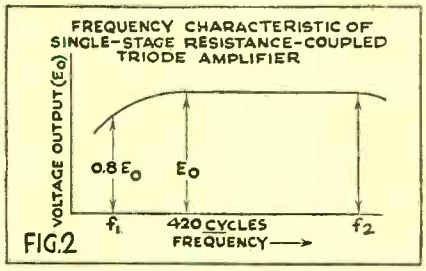


FIG.2

The 5T4

NEW YORK, N. Y.—The 5T4 is a new metal rectifier tube, similar in characteristics to the 5Z3. The maximum ratings with a condenser input filter are: maximum a.c. voltage per plate, 450 volts r.m.s.; maximum peak inverse voltage, 1250 volts; maximum output, 250 ma.

With a choke-input filter, the choke inductance being at least 10 henries, the maximum ratings are: maximum a.c. voltage per plate, 550 volts r.m.s.; maximum peak inverse voltage, 1550 volts.

Octal Base Tubes

New York, N. Y.—The new tubes, types 25A7G, 6Y7G, and 1G5G are announced by Raytheon. These are octal base tubes with glass envelopes. The 25A7G is a rectifier and a pentode for use in a.c.-d.c. receivers. The maximum output of the pentode section is 0.77 watt with 9 percent total harmonies when plate and screen supply is 100 volts. The maximum ratings of the rectifier are 125 volts r.m.s. and 75 ma. The 6Y7G is a twin triode, similar in characteristics to type 79. The 1G5G is a 2 volt power pentode, delivering a maximum of 300 milliwatts output with a 90 volt plate supply. The filament current is 120 ma.

Treated Papers, Fabrics and Tapes

Westinghouse has issued a catalog section listing treated papers, fabrics and tapes for use as insulating material. The publication includes the characteristics, applications and list prices for the various insulating materials. For treated papers are listed express, rope, kraft, fish and fullerboard. Under fabrics are cotton drill, heavy duck, asbestos cloth, combination fishpaper and fabric. Copies are available from Westinghouse district offices, or from Department 5-N at the main office in East Pittsburgh, Pa.

RESISTANCE-COUPLED AMPLIFIER CHART FOR TRIODES

C = BLOCKING CONDENSER (μf) Cd = SCREEN BY-PASS CONDENSER (μf) Eo = VOLTAGE OUTPUT (Peak Volts) Rg = SCREEN RESISTOR (megohms) RL = PLATE RESISTOR (megohms)
Cc = CATHODE BY-PASS CONDENSER (μf) Ebb = PLATE-SUPPLY VOLTAGE (volts) Rc = CATHODE RESISTOR (ohms) Rg = GRID RESISTOR (megohms) V.G. = VOLTAGE GAIN

TRIODE TYPES: 2A6, 75

Ebb [1]	90									180									300									Ebb [1]
RL	0.1			0.25			0.5			0.1			0.25			0.5			0.1			0.25			0.5			RL
Rg [2]	0.1	0.25	0.5	0.25	0.5	1	0.5	1	2	0.1	0.25	0.5	0.25	0.5	1	0.5	1	2	0.1	0.25	0.5	0.25	0.5	1	0.5	1	2	Rg
Rc	6300	6600	6700	10000	11000	11500	16200	16600	17400	2600	2900	3000	4500	4800	5300	7000	8000	8800	1900	2200	2300	3300	3900	4200	5300	6100	7000	Rc
Cc	2.2	1.7	1.7	1.24	1.07	0.9	0.75	0.7	0.65	3.3	2.9	2.7	2.1	1.8	1.5	1.3	1.1	0.9	4	3.5	3	2.7	2	1.8	1.6	1.3	1.2	Cc
C	0.02	0.01	0.006	0.01	0.006	0.003	0.005	0.003	0.0015	0.025	0.015	0.007	0.015	0.007	0.004	0.007	0.004	0.002	0.03	0.015	0.007	0.015	0.007	0.004	0.007	0.004	0.002	C
Eo [3]	3	5	6	5	7	10	7	10	13	16	22	23	21	28	33	25	33	38	31	41	45	42	51	60	47	62	67	Eo [3]
V.G. [4]	23 [d]	29 [b]	31 [c]	34 [b]	40 [c]	40 [c]	39	44	48	29	36	37	43	50	53	52	57	58	31	39	42	48	53	56	58	60	63	V.G. [4]

TRIODE TYPE 6F5

Ebb [1]	90									180									300									Ebb [1]
RL	0.1			0.25			0.5			0.1			0.25			0.5			0.1			0.25			0.5			RL
Rg [2]	0.1	0.25	0.5	0.25	0.5	1	0.5	1	2	0.1	0.25	0.5	0.25	0.5	1	0.5	1	2	0.1	0.25	0.5	0.25	0.5	1	0.5	1	2	Rg
Rc	4400	4800	5000	8000	8800	9000	12200	13500	14700	1800	2000	2200	3500	4100	4500	6100	6900	7700	1800	1600	1700	2600	3200	3500	4500	5400	6100	Rc
Cc	2.5	2.1	1.8	1.53	1.18	0.9	0.76	0.67	0.58	4.4	3.3	2.9	2.3	1.8	1.7	1.3	0.9	0.83	5	3.7	3.2	2.5	2.1	2	1.5	1.2	0.93	Cc
C	0.02	0.01	0.005	0.01	0.005	0.003	0.005	0.003	0.0015	0.025	0.015	0.006	0.01	0.006	0.004	0.006	0.003	0.0015	0.025	0.01	0.006	0.01	0.007	0.004	0.006	0.004	0.002	C
Eo [3]	4	5	6	6	7	10	8	10	12	16	23	25	21	26	32	24	33	37	33	43	48	41	54	63	50	62	70	Eo [3]
V.G. [4]	28 [d]	34 [b]	35 [c]	39 [b]	43 [c]	44	43	46	48	37	44	46	48	53	57	53	63	66	42	49	52	56	63	67	65	70	70	V.G. [4]

TWIN-TRIODE TYPES: 6A6, 6N7, 53 (ONE TRIODE UNIT)

Ebb [1]	90									180									300									Ebb [1]
RL	0.1			0.25			0.5			0.1			0.25			0.5			0.1			0.25			0.5			RL
Rg [2]	0.1	0.25	0.5	0.25	0.5	1	0.5	1	2	0.1	0.25	0.5	0.25	0.5	1	0.5	1	2	0.1	0.25	0.5	0.25	0.5	1	0.5	1	2	Rg
Rc	1900	2250	2500	4050	4950	5400	7000	8500	9650	1300	1700	1950	2950	3800	4300	5250	6600	7650	1150	1500	1750	2650	3400	4000	4850	6100	7150	Rc
C	0.025	0.01	0.006	0.01	0.006	0.003	0.006	0.003	0.0015	0.03	0.015	0.007	0.015	0.007	0.0035	0.007	0.0035	0.002	0.03	0.015	0.007	0.015	0.0055	0.003	0.0055	0.003	0.0015	C
Eo [3]	13	19	20	16	20	24	18	23	26	35	46	50	40	50	57	44	54	61	60	83	86	75	87	100	76	94	104	Eo [3]
V.G. [4]	16	19	20	20	22	23	22	23	23	19	21	22	23	24	24	24	25	25	20	22	23	23	24	24	23	24	24	V.G. [4]

TWIN-TRIODE TYPE 79 (ONE TRIODE UNIT)

Ebb [1]	90									180									300									Ebb [1]
RL	0.1			0.25			0.5			0.1			0.25			0.5			0.1			0.25			0.5			RL
Rg [2]	0.1	0.25	0.5	0.25	0.5	1	0.5	1	2	0.1	0.25	0.5	0.25	0.5	1	0.5	1	2	0.1	0.25	0.5	0.25	0.5	1	0.5	1	2	Rg
Rc	2050	2200	2350	4000	4250	4650	6150	6850	7500	1050	1250	1350	2050	2450	2750	3450	4100	4650	800	1000	1100	1650	2050	2350	2850	3600	4450	Rc
C	0.04	0.015	0.009	0.015	0.006	0.004	0.006	0.004	0.002	0.04	0.02	0.009	0.02	0.01	0.005	0.009	0.0035	0.002	0.025	0.01	0.006	0.01	0.0055	0.003	0.0055	0.003	0.0015	C
Eo [3]	5.8	8.4	9.5	7.1	9.7	12	8.8	12	15	21	27	31	26	34	40	30	39	44	40	57	60	56	66	77	61	75	82	Eo [3]
V.G. [4]	23 [b]	29 [c]	29	31 [c]	33	35	34	38	40	27	31	34	37	41	42	42	44	45	29	34	36	39	42	43	44	46	46	V.G. [4]

TRIODE TYPES: 56, 76

Ebb [1]	90									180									300									Ebb [1]
RL	0.05			0.1			0.25			0.05			0.1			0.25			0.05			0.1			0.25			RL
Rg [2]	0.05	0.1	0.25	0.1	0.25	0.5	0.25	0.5	1	0.05	0.1	0.25	0.1	0.25	0.5	0.25	0.5	1	0.05	0.1	0.25	0.1	0.25	0.5	0.25	0.5	1	Rg
Rc	2500	3200	3800	4500	6500	7500	11100	15100	18300	2400	3000	3700	4500	6500	7600	10700	14700	17700	2400	3100	3800	4500	6400	7500	11100	15200	18300	Rc
Cc	2	1.6	1.25	1.05	0.82	0.68	0.48	0.36	0.32	2.5	1.9	1.65	1.45	0.97	0.8	0.6	0.45	0.4	2.8	2.2	1.8	1.6	1.2	0.98	0.69	0.5	0.4	Cc
C	0.06	0.03	0.015	0.03	0.015	0.007	0.015	0.007	0.0035	0.06	0.035	0.015	0.035	0.015	0.008	0.015	0.007	0.0045	0.08	0.045	0.02	0.04	0.02	0.009	0.02	0.009	0.005	C
Eo [3]	16	21	23	19	23	25	21	24	28	36	48	55	45	55	57	49	59	64	65	80	95	74	95	104	82	96	108	Eo [3]
V.G. [4]	7	7.7	8.1	8.1	8.9	9.3	9.4	9.7	9.8	7.7	8.2	9	9.3	9.5	9.8	9.7	10	10	8.3	8.9	9.4	9.5	10	10	10	10	10	V.G. [4]

TYPES: 6C5 (TRIODE), AND 6C6, 6J7, 57 (AS TRIODES)

Ebb [1]	90									180									300									Ebb [1]
RL	0.05			0.1			0.25			0.05			0.1			0.25			0.05			0.1			0.25			RL
Rg [2]	0.05	0.1	0.25	0.1	0.25	0.5	0.25	0.5	1	0.05	0.1	0.25	0.1	0.25	0.5	0.25	0.5	1	0.05	0.1	0.25	0.1	0.25	0.5	0.25	0.5	1	Rg
Rc	2800	3400	3800	4800	6400	7500	11400	14500	17300	2200	2700	3100	3900	5300	6200	9500	12300	14700	2100	2600	3100	3800	5300	6000	9600	12300	14000	Rc
Cc	2	1.62	1.3	1.12	0.84	0.66	0.52	0.4	0.33	2.2	2.1	1.85	1.7	1.25	1.2	0.74	0.55	0.47	3.16	2.3	2.2	1.7	1.3	1.17	0.9	0.59	0.37	Cc
C	0.05	0.025	0.01	0.025	0.01	0.005	0.01	0.006	0.004	0.055	0.03	0.015	0.035	0.015	0.008	0.015	0.008	0.004	0.075	0.04	0.015	0.035	0.015	0.008	0.015	0.008	0.003	C
Eo [3]	14	17	20	16	22	25	18	23	26	34	45	54	41	54	55	44	52	59	57	70	83	65	84	88	73	85	97	Eo [3]
V.G. [4]	9	9	10	10	11	12	12	12	13	10	11	11	12	12	13	13	13	13	11	11	12	12	13	13	13	14	14	V.G. [4]

DUPLEX-DIODE TRIODE TYPE 6Q7

Ebb [1]	90									180									300									Ebb [1]
RL	0.1			0.25			0.5			0.1			0.25			0.5			0.1			0.25			0.5			RL
Rg [2]	0.1	0.25	0.5	0.25	0.5	1	0.5	1	2	0.1	0.25	0.5	0.25	0.5	1	0.5	1	2	0.1	0.25	0.5	0.25	0.5	1	0.5	1	2	Rg
Rc	4000	4200	4300	7200	7600	8000	11500	12300	13700	1600	1900	2100	3400	4000	4500	6000	7100	7900	1200	1500	1700	2600	3000	3600	4600	5500	6200	Rc
Cc	2.07	1.7	1.5	1.17	1.2	0.9	0.72	0.6	0.45	3	2.5	2.3	1.6	1.3	1.05	0.86	0.76	0.63	4.4	3.6	3.05	2.4	1.66	1.45	1.2	0.9	0.9	Cc
C	0.02	0.01	0.005	0.01	0.006	0.003	0.006	0.003	0.0015	0.02	0.01	0.005	0.01	0.005	0.003	0.006	0.003	0.002	0.03	0.015	0.007	0.015	0.007	0.004	0.007	0.004	0.002	C
Eo [3]	5	8	9	8	11	13	9	13	17	19	26	29	25	31	37	30	36	41	35	52	53	43	52	62	47	60	66	Eo [3]
V.G. [4]	23 [a]	28 [b]	29 [c]	31 [b]	32	33	31	33	37	28	33	35	36	38	40	39	40	41	34	39	40	42	45	45	45	46	47	V.G. [4]

DUPLEX-DIODE TRIODE TYPE 6R7

Ebb [1]	90									180									300									Ebb [1]
RL	0.05			0.1			0.25			0.05			0.1			0.25			0.05			0.1			0.25			RL
Rg [2]	0.05	0.1	0.25	0.1	0.25	0.5	0.25	0.5	1	0.05	0.1	0.25	0.1	0.25	0.5	0.25	0.5	1	0.05	0.1	0.25	0.1	0.25	0.5	0.25	0.5	1	Rg
Rc	2300	2600	2900	3500	4400	5000	7600	9800	11300	1700	2100	2500	3000	4100	4600	6700	8800	10000	1600	2000	2400	2900	3800	4400	6300	8400	10600	Rc
Cc	2	1.7	1.27	1.2	0.9	0.77	0.54	0.42	0.38	2.3	1.9	1.5	1.3	0.9	0.8	0.54	0.4	0.33	2.6	2	1.6	1.4	1.1	1	0.7	0.5	0.44	Cc
C	0.05	0.03	0.01	0.03	0.01	0.006	0.015	0.007	0.003	0.05	0.03	0.01	0.03	0.01	0.006	0.01	0.006	0.003	0.055	0.03	0.015	0.03	0.015	0.007	0.015	0.007	0.004	C
Eo [3]	14	18	20	15	19	21	15	18	21	31	40	45	35	43	46	33	40	47	50	62	71	52	68	71	54	62	74	Eo [3]
V.G. [4]	8	9	10	10	10	11	10	11	11	9	9	10	10	10	10	10	10	11	9	9	10	10	10	10	10	11	11	V.G. [4]

DUPLEX-DIODE TRIODE TYPES: 55, 85

Ebb [1]	90									180									300									Ebb [1]
RL	0.05			0.1			0.25			0.05			0.1			0.25			0.05			0.1			0.25			RL
Rg [2]	0.05	0.1	0.25	0.1	0.25	0.5	0.25	0.5	1	0.05	0.1	0.25	0.1	0.25	0.5	0.25	0.5	1	0.05	0.1	0.25	0.1	0.25	0.5	0.25	0.5	1	Rg
Rc	3800	4600	5400	6620	9000	10300	15100	20500	24400	3200	4100	5000	6200	8700	10000	14500	20000	24000	3200	4100	5100	5900	8300	9600	14300	19400	23600	Rc
Cc	1.4	1.1	0.86	0.7	0.55	0.5	0.31	0.25	0.2	1.8	1.6	1.2	0.9	0.7	0.57	0.43	0.29	0.24	1.9	1.5	1.2	0.8	0.54	0.43	0.3	0.22	0.2	Cc
C	0.06	0.03	0.015	0.04	0.015	0.007	0.015	0.007	0.004	0.06	0.045	0.02	0.04	0.015	0.008	0.015	0.008	0.004	0.08	0.045	0.015	0.03	0.015	0.006	0.01	0.006	0.003	C
Eo [3]	16	19	23	17	22	25	18	25	26	33	44	49	37	47	50	40	48	53	50	74	85	64	82	88	71	84	94	Eo [3]
V.G. [4]	4.5	4.9	5.1	5.1	5.4	5.5	5.3	5.5	5.6	4.9	5.2	5.3	5.3	5.5	5.5	5.6	5.7	5.7	5.2	5.5	5.6	5.5	5.7	5.8	5.7	5.7	5.8	V.G. [4]

[1] Voltage at plate equals Plate-Supply voltage minus voltage drop in RL and Rc. For other supply voltages differing by as much as 50% from those listed, the values of resistors, condensers, and gain are approximately correct. The value of voltage output, however, for any of these other supply voltages equals the listed voltage output multiplied by the new plate-supply voltage divided by the plate-supply voltage corresponding to the listed voltage output.

[2] For following stage (see Circuit Diagrams).

[3] Voltage across Rg at grid-current point.

[4] Voltage Gain at 5 volts (RMS) output unless indicated otherwise.

[a] At 2 volts (RMS) output.

[b] At 3 volts (RMS) output.

[c] At 4 volts (RMS) output.

[d] At 2.2 volts (RMS) output.

Low-Cost PRE-AMPLIFIER *of* Wide Utility

(for P. A. and "Ham" Work)

By M. N. Beitman

MANY P. A. amplifiers now in use have insufficient gain to give their rated power output from modern high-quality crystal and velocity microphones, though such amplifiers may give full output when carbon microphones are employed.

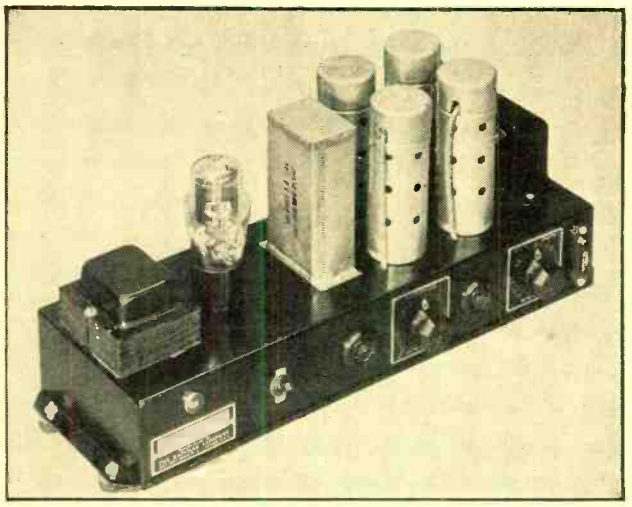
TO obtain satisfactory performance from P.A. amplifiers with modern, low-level microphones, a pre-amplifier must be used. The Radolek instrument shown in the illustration has features of considerable value in this application. This modern pre-amplifier is compact, light and completely a.c. operated. It has excellent performance characteristics over the audio range from 50 to 9000 cycles, and adequate gain with negligible hum. Individual input circuits for two microphones and a phonograph pickup provide for mixing or blending the input sources to any desired degree. Speeches or announcements may be superimposed on a background of music picked up from a phonograph record or any other source, just as is done in modern broadcasting studios.

3-Channel Circuit

The complete schematic circuit is shown in Figure 1. The two low-level microphone inputs connect to separate high-gain triode input stages each employing a type 75 high-mu tube. The diode sections are grounded since they are not used. The output of each 75 is individually coupled to a type 6D6, triode-connected. The phono-microphone volume control in the upper channel section is rather unique. A center-tapped 1-megohm control is employed, one half of which controls the "phono" input while the other half regulates the volume of the microphone channel. The extra arm is provided to short out the phono input when the microphone alone is employed. Mixing is accomplished by joining together the output sections of the 6D6 tubes.

Impedance Matching

The output transformer secondary is tapped to match either a 200 or 500 ohm line and a separate high impedance output is also taken from the primary side of the transformer. Thus the pre-amplifier may be either direct-connected or line-coupled to practically any type of amplifier on the market. All input and output connections are made with polarized plugs and sockets which simplify installation and eliminate possibility of error. The pilot light is a minor but very useful refinement which contributes to its professional appearance as well as providing visual assurance of proper line power connection.



THE 3-CHANNEL PRE-AMPLIFIER

The 2 "Mic" sockets provide for 2 separate, low-level inputs such as crystal microphones; the twin tip jack is for high-level phonograph or radio input. The right-hand knob is a dual volume control and fader for the high-level and one low-level channels while the left-hand knob controls the volume of the other low-level input.

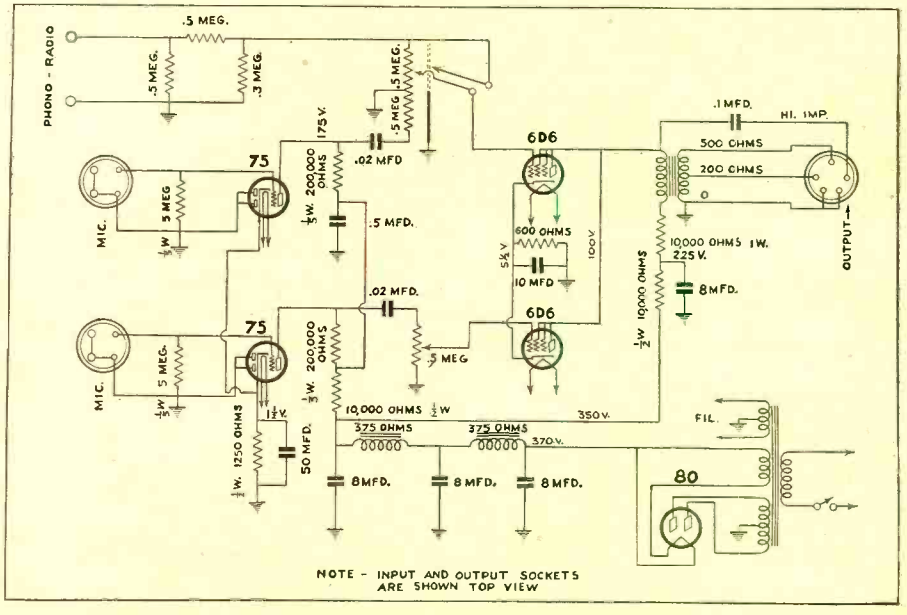
The pre-amplifier described above by Mr. Beitman was submitted to the RADIO NEWS laboratories for test. After it was found to perform satisfactorily for P. A. work, it was decided to investigate its adaptability to "ham" transmitter applications.

Tested at W2JCR

The instrument was accordingly taken to amateur station W2JCR and hooked up ahead of the speech amplifier of a transmitter, operating on 5 meters. This speech amplifier was designed for use with carbon microphones of average gain or better and did not provide sufficient amplification for low-level crystal mikes. With the pre-amplifier, however, the output was stepped up so that full modulation could be obtained, using a crystal mike, with plenty of reserve gain. There was no noticeable increase in hum nor was any trouble from r.f. pickup encountered.

Several stunts were tried with complete success. The crystal mike was connected to one input circuit while 20-meter "ham" signals were picked up on a communications receiver and fed into the other pre-amplifier channel. Mixing could be accomplished to any desired degree. In the same way, a phonograph pick-up connected into one channel was employed in making modulation tests of short duration, with comments by voice indicating the level, etc., for the benefit of the other station operating in the tests. Also, an audio oscillator and key were tried in one of the pre-amplifier channels. This was employed for CQ'ing, breaking in with voice in the other channel from time to time.

Properly used, many unique and striking effects can be secured in P. A. application, in addition to the manifest value of greater amplification.

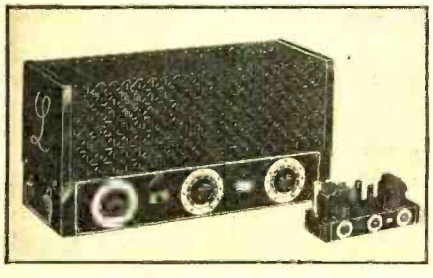


FOR PORTABLE USE

FOR OFFICES

Above: Phone Pickup

Below: Lafayette Portable Amplifier



P. A. EQUIPMENT *for the* Summer Market

By **H. W. Paro**

A RECENT survey of the summer market for public-address requirements emphasizes that amusement parks, beaches and athletic stadiums offer the most fruitful fields for medium and high-power sound equipment. While athletic fields, ball parks, etc., require powerful, elaborate installations, the amusement centers can use to real advantage, many small sound systems. Each concessionaire is a potential customer for a portable, compact, medium power unit; the barker who has no helpful sound distributing system is plainly at a disadvantage.

THE opening of summer camps and resort hotels is another exceptionally fine market for P.A. apparatus. These places generally use fairly elaborate systems which serve several functions—entertaining, paging, sound reinforcement and so on. However, where the sound coverage is not so large, there is increasing use for the new small P.A. amplifiers equipped with photo-cell input. Parks and civic centers of all kinds obviously need P.A. equipment for the summer season. Power requirements of course will vary from ten to twenty watts, for a small village green to a hundred watts or more for a large municipal civic center, or a city park.

Small Installations

However, a single large system seldom exhausts the requirements of a city. There are always the neighborhood parks with celebrations on any public holiday, that can use the new smaller inexpensive installations.

Boat clubs are finding a distinctive use for address equipment. A loud speaker at the wharf directing the docking of multitudes of small vessels, prevents confusion. Sound systems operating from shore are also used, in connection with water sports, for announcements and instructions, associated with swimming and boat races, and all kinds of water carnivals. Summer also is the season of outdoor restaurants, beer gardens and so on, all of which use and need P.A. systems.

Other Uses

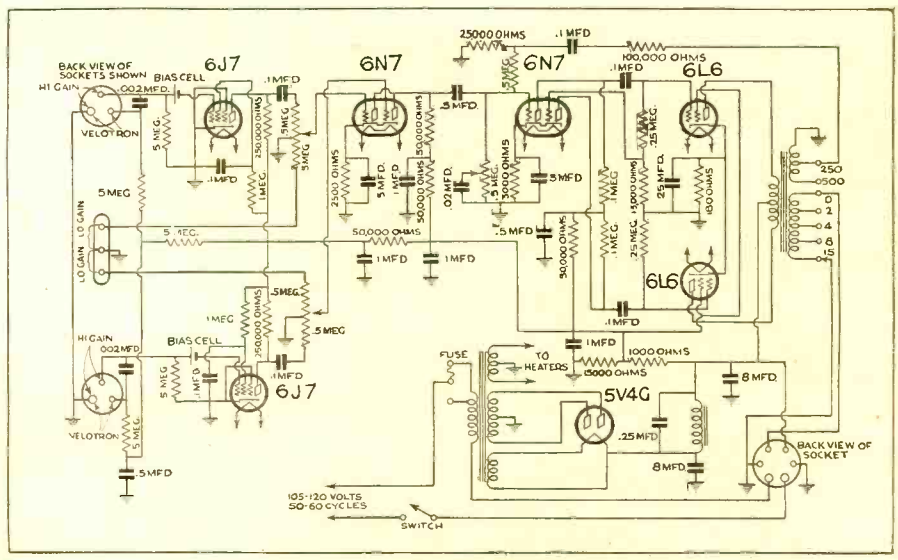
Still another field for the new P.A. amplifiers, is the temporary, summer theatres, which have proven so popular in the last few years. These small community theatres, like the summer camp or hotel, are glad to take advantage of the new P.A. amplifiers that operate from photo-cell input and supply photo-cell bias. In addition to the foregoing P.A. requirements each new summer season presents numerous new applications for all kinds of sound devices.

The use of P.A. equipment for the summer season can be logically offered for either rental or direct sale. It will be noted, however, that practically all of the rentals are of such nature that they can readily be converted into sales after the user has tried the installation and has found himself satisfied with it.

7-Tube Amplifier

The Lafayette model 131A, seven-tube amplifier herewith illustrated, is a typical portable, self-contained unit of modern design that successfully meets many of the above sound reproducing requirements. (*Turn to page* 59)

FIGURE 1



W9VXZ

Amateur station of the National Institute of Technology Radio Club at Minneapolis, Minn.

The "HAM" Shack

Conducted by

Everett M. Walker

Editor for Amateur Activities

The Problem of Antenna MASTS

PROPERLY supporting a transmitting antenna is a problem that frequently confronts the amateur. Now all of us are not fortunate in having tall trees available. Yet, a good antenna is important to the successful operation of a station, and it cannot be had without an adequate support.

USUALLY the Amateur's house may be used for one support for his antenna, but it is the far end that presents the problem. Here it often is necessary to erect some kind of mast. The writer recently made a survey of types of supports most commonly used. Out of a large number of stations questioned, it was found a majority are fortunate in having trees or good-natured neighbors who have consented to the use of their houses for the far end support of the sky-wire.

Worth While Ideas

But those who use masts have devised many construction ideas that are worth passing on. They range from flagpoles to elaborate lattice construction affairs. Some are inexpensive to build and others costly. By-and-large, the majority use wooden masts of some kind. Those who use steel usually have them put up by construction companies, although there are many home-made pipe masts in use. A few will be discussed here.

The average height of the amateur masts we have investigated is about fifty feet, although this varies somewhat, depending on the frequency most used. Operators using 20 meters consistently use poles about 30 feet high. On the 40-meter band the average height is between 40 and 50 feet, and on 80 meters it runs closer to 60 feet, although there are many fine signals being radiated on this band from antennas about 40 feet high. One-hundred-foot masts are rare.

Building a support for the house end of the transmitting antenna does not present a big problem. Usually only a small pole is required and consequently few guy wires are needed. The house mast, itself, should be high enough to match the height of the mast or tree support used. This is because it is desirable to have a half-wave antenna horizontal, although a slight tilt will not materially influence the radiation pattern. Most single-family dwellings are between 30 and 35 feet high. Therefore, the average rooftop mast is about 10 feet.

Antenna Poles Available

There are a number of small antenna poles available that may be used for supporting transmitting aerials. One in particular is a telescope affair made of metal tubing that may be varied in height from 4 to 12 feet. It is equipped with guy wires and a mounting bracket that may be fastened to the roof. While small in diameter, it has sufficient strength and guy wires to support a fairly heavy, half-wave antenna. One station is using this type of roof support for a half wavelength 75 meter antenna fed by a twisted-pair line, which, if course, is quite heavy. The mast has supported this antenna for three years and shows no signs of strain.

A similar roof support may be constructed of wood. An ordinary piece of 2 by 2 inch stock is used. A mast step similar to the support of a mainmast of a small sailboat forms the base support. A piece of 2 by 6 inch stock one foot long will serve this purpose. A square hole is chiseled out so the 2 by 2 inch mast fits snugly. When such a mast is mounted on the roof peak the step should be made to straddle the peak. If the mast itself is more than 5 feet high, two sets of guy wires will be needed. It is more convenient to use four sets of guy wires on such a mast, although three will provide sufficient strength. As a matter of fact only two guys are necessary at the top of the mast, the pull of the antenna serving as the front guy.

Using Chimneys

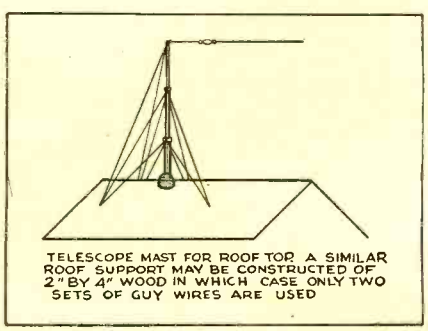
Many amateurs use a chimney to support a small pole. This is all right if the chimney is strong. It is not advisable to use this idea if it is an old one, as cement has a way of weakening with age, and the leverage of a pole pulled by an aerial might cause some damage.

A device used by one amateur for such a "stick" is made of a 16-foot, 2 by 3 inch timber. Brackets of wood are mounted 4 feet apart and are equipped with eyebolts separated a distance equal to the width of the chimney. A heavy cable is attached to these and run around the chimney. A turnbuckle in each facilitates drawing the pole tight up to the chimney. No guy wires were used on the one the writer saw and it was effectively supporting a 75-meter antenna. Its owner said it had been up four years.

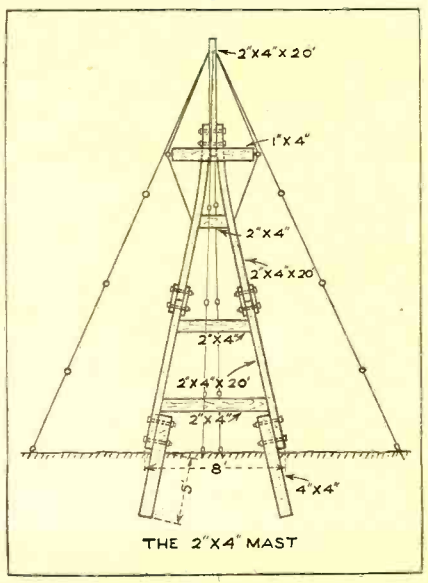
So much for rooftop antenna supports. An excellent design for a medium-height antenna pole recently was brought to the attention of the writer. It is 48 feet high and is constructed of timbers available in practically all lumber yards. It is strong and at the same time does not require much space for guying. Also, it is not difficult to erect.

Mast Construction

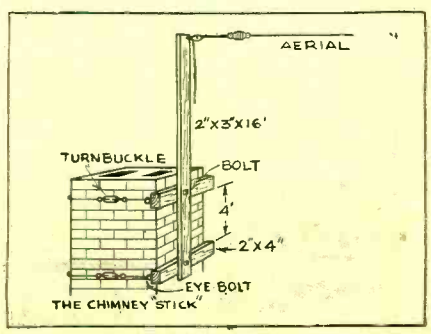
The base section of this mast consists of a 30-foot section of 4 by 4 inch timber. Atop of this is mounted two 18-foot lengths of 1 by 4 inch stick. The top section is bolted together at the top and spread out so that it fits over the top of



TELESCOPE MAST FOR ROOF TOP. A SIMILAR ROOF SUPPORT MAY BE CONSTRUCTED OF 2"BY 4" WOOD IN WHICH CASE ONLY TWO SETS OF GUY WIRES ARE USED



THE 2"X4" MAST



THE CHIMNEY "STICK"

¶ A Department for the amateur operator to help him keep up-to-date

the 4 by 4 inch section, overlapping it 2 feet, thus forming a narrow "V." At 3-foot intervals in this crotch pieces of 2 by 4 inch cut to fit snugly, are nailed securely. This forms a light but strong top section.

A sling similar to those used for flagpoles is used at the base. This consists of a 7-foot piece of 4 by 4 inch stock and two 11-foot sections of 3 by 4 inch stock clamped securely on each side of the 4 by 4 inch section. The base section is painted with asphalt paint and it is set 5 feet deep in the ground. While, in the particular mast described here, concrete was not used to fix it in the ground, it is suggested as good practice.

Proper Guying

Guying of such a mast is important. Two sets of guy wires are used: one being entirely fixed to the mast and the other attached to buried anchors. The guys fixed to the mast are brought down over cross arms stretching out 4 feet in each direction at the middle of the mast. These are made of 8-foot lengths of 1 by 4 inch stock clamped on each side of the 4 by 4 inch section at the midpoint.

These, like the top section, are bolted together at the ends. The guys are attached to eye-bolts 3 feet down from the top and brought down over the ends of these "yard-arms" and attached to eye-bolts about 8 feet off the ground. Turnbuckles are inserted in each near the bottom of the guywire, facilitating tightening. This method of guying makes the whole unit rigid.

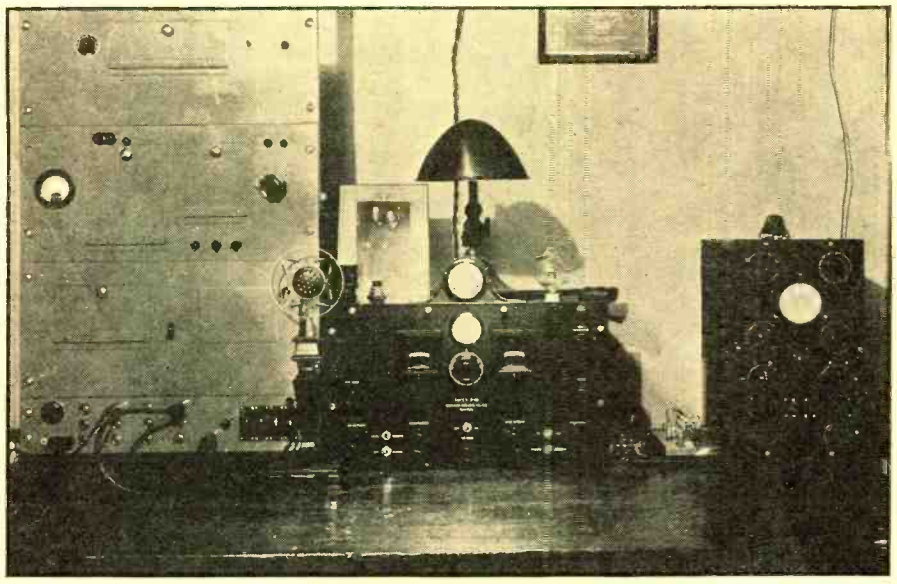
The second set of guy wires are attached to the top of the 4 by 4 inch section and brought down to the ground anchors. The anchors used were 3-foot eye-bolts with old rail plates attached to provide greater ground pull. Each of these anchors was set in concrete, and mounted 5 feet from the base of the mast. No. 10 heavy galvanized wire was used for all the guy wires. It is not advisable to use stranded wire for mast guying, as once this starts rusting, it loses its strength.

A 58-ft. Mast

Another mast encountered was somewhat similar to this but uses 2 by 4 inch timbers exclusively. It is 58 feet high. Five pieces of 20-foot 2 by 4 inch stock are required. Two pairs of these 2 by 4's are mounted end-to-end with a clamp made of 5-foot lengths of 1 by 4 inch stock. The 2 by 4's are mounted end-to-end and 1 by 4's are bolted on each side, thus making two continuous 40-foot sections. The fifth 2 by 4 inch piece is inserted between the top end of these two sections with an overlap 3 feet long. Here again it is securely bolted. Then the two 40-foot sections are spread out to about 8 feet at the base, and cross-section pieces are mounted between the two sides in a manner similar to the top section of the mast previously described.

5-METER STATION

This is a set-up at W2JQX of New Rochelle, N. Y. At left is a 65-watt, 5-meter, crystal-control rig.. At right: The 6-tube acorn superhet. In the upper right corner is a rig-checker and monitor. Ken Stevens, owner of the station, has recently moved to Pelham and has installed a 400-watt final on 5 and 10 meters.



LOOKING IN AT W2BFB

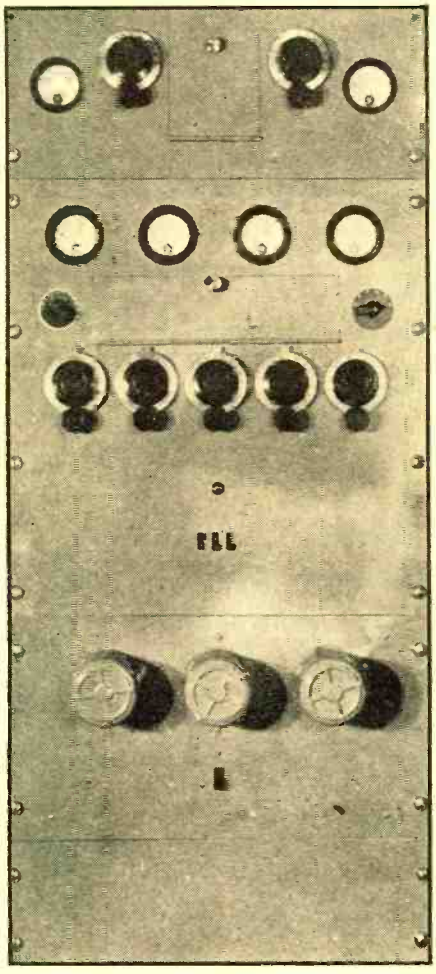
Above: The operating table of W2BFB, Bronxville, N. Y., showing, center: The receiver; at right: The oscilloscope; at left: The speech amplifier. In the right-hand photograph is seen the power, rectifier and final amplifier stages. The latter two racks are finished in a dull green enamel, giving the station a unique appearance.

In view of the fact the top section is only 2 inches across, it is necessary to use the yard-arm method of guying this section to give sufficient strength. Two sets of guy wires were used, although an additional set would provide added security. The base is fastened with bolts to two 4 by 4's, each sunk 5 feet in the ground.

Bolted Sections

Another mast used at a second district station consists of three sections of 4 by 5 inch timber, each 28 feet long. The base of this mast is bolted to a section of a discarded telephone pole. A novel method of guying is used for this mast. The guying requirement is to have the space to permit running the wires at 45 degrees in relation to the ground. Only one guy wire goes all the way to the top—the back one. The two others attach just above the midpoint of the mast, and each is anchored at a point 120 degrees apart. The antenna wire provides additional support in the front and the whole affair is quite rigid.

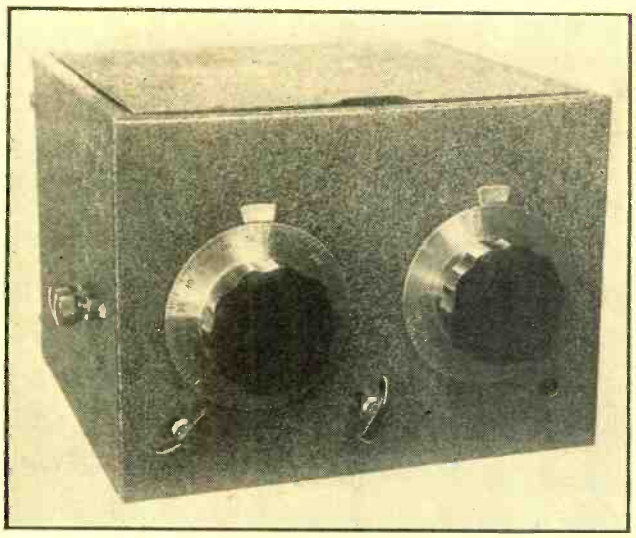
Amateurs who have a garage in the yard that is conveniently located frequently erect a mast atop of it. Several such arrangements were suggested. One uses a 30-foot section of 4 by 4 inch timber mounted on a step at the middle of the garage. Four guy wires are used. They are attached to the corners of the garage. In this case the peak of the garage is 18 feet high, thus the antenna support is 48 feet above ground.



Higher masts may be erected atop garages, providing ample space is available for guy wires. Several amateurs are using arrangements somewhat similar to the 2 by 4 inch mast that spreads out at the base previously described. However, there is one problem in erecting a garage-top mast—that is, the mast has to be lifted vertically into place. Therefore, it is advisable to keep down the weight of this type of support.

A number of other mast designs were suggested by amateurs questioned, but these types represent the average amateur's antenna mast. For instance, several said they were using tower types of construction. Masts of this type may be somewhat

(*Turn to page* 41)



NEAT AND COMPACT

Two-dial tuning is employed, the left-hand dial tunes the r.f. stage; the right-hand dial, the ganged mixer and oscillator. The lower left-hand pointer tunes the antenna.

"Acorn" Tubes Used 5-METER

The author presents constructional some pertinent observations on

By Nathaniel

TO Major Armstrong the amateur fraternity owes a debt of gratitude for simple, inexpensive and extremely effective receivers employing the super-regenerative principle, which have allowed a great many amateurs with limited finances to explore the relatively unknown ultra-high frequencies. The exploration is now practically completed, however, so far as ranges up to 60 megacycles are concerned, and amateurs are studying various ways and means of getting the most out of their 56-60 megacycle band.

IF we are to profit by experience, we should make up our minds at the start not to waste the natural resources of the new and fruitful territory from 56-60 megacycles. The 5-meter band represents a band over four times as wide as the present standard broadcast band. A speech channel of excellent intelligibility should require no more than seven kilocycles—and this 56-60 m.c. band provides 571 such channels. With modulated oscillators and super-regenerative receivers this figure may be divided roughly by *100*. The answer is obvious. If we want to realize the full benefits of the 5-meter band, stable transmitters and selective receivers are in order.

Already the amateur fraternity is swinging toward better equipment. Crystal control and M.O.P.A. rigs are coming on the air daily, displacing outmoded oscillators. The cost of a good M.O.P.A. is only slightly higher than a straight oscillator, and watt for watt and dollar for dollar, it is capable of a better job. Remember, a stable 10-watt carrier will put through a better signal on a selective receiver than a 1,000-watt "wobbulated" carrier. In order to understand a "wobbulated" signal, an operator is forced to penalize his receiver and broaden it out, thereby increasing noise, QRM and all the evils of radio reception. Many excellent articles have appeared of late on stabilized transmitters and the amateur will have no trouble in choosing an arrangement which best suits his requirements.

Tuned I.F. Amplifier

Improving 5-meter reception is really a tougher job than stabilizing transmitters. The first step from the super-regenerative circuit has been the widely popular resistance-coupled i.f. superhets. These receivers do an excellent job and are in general quieter and more selective than the super-regenerative set but they are definitely what we might term a temporary expedient because their selectivity is limited, their "image rejection" is nil and their i.f. is so close to the audio spectrum that a.f. noise in the first detector often rides through.

The next logical step is a tuned i.f. superheterodyne. All the disadvantages of the resistance-coupled i.f. superheterodyne can be removed by the use of this type.

Converter Application

Now a superheterodyne should be broken into its two major sections when considering the design of such a set; namely, the r.f. and converter section, and the i.f. and audio section. Many amateurs have available, however, a regular communication type receiver, a broadcast receiver, or can obtain a second hand one which will fill the bill as the second section. Work by the author to date has therefore been confined to building the first or r.f. and converter section and studying its application to various standard receivers used as the i.f. and a.f. sections.

Important Requirements

The result of this work is the four-tube (including rectifier) converter which will be described, and which was designed with the following requirements in mind:

Power Supply—110-120 volts, 60 cycles.

Frequency Coverage—61-54 megacycles (for maximum electrical band spread and ease of tuning).

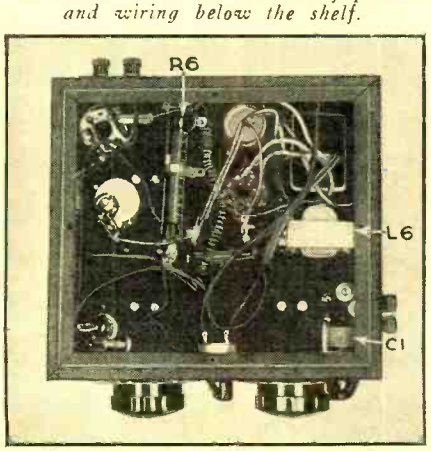
Useful Sensitivity—Maximum signal to "hiss" ratio with available tubes.

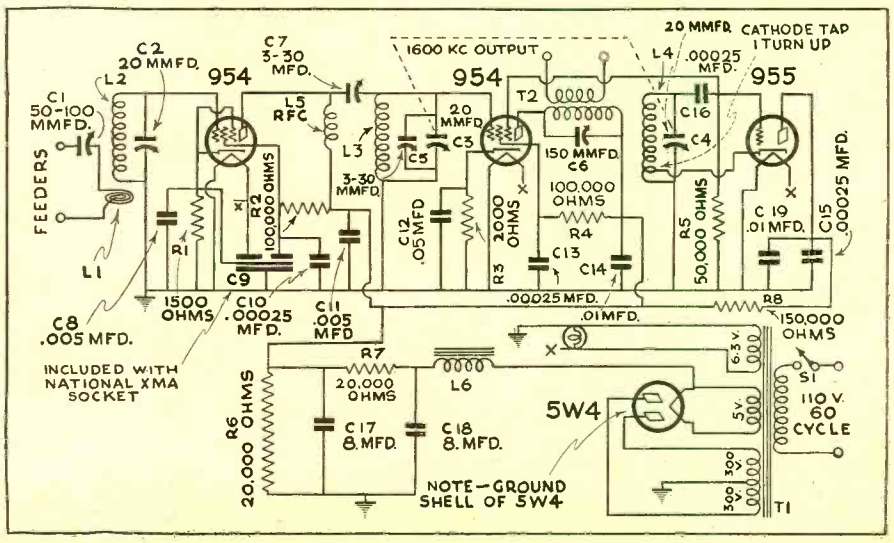
Imput Circuit—Adjustable coupling for maximum signal input at all frequencies.

Output Circuit—Primarily designed to couple through twisted pair to low impedance input circuits on communication receivers which are pre-

BELOW DECK

Here the cabinet bottom has been removed to show the location of parts and wiring below the shelf.





in Home-Built

Converter

details on his 5-meter converter and receiver requirements for this band.

Bishop (W1EYM)

tuned to 1,600 kilocycles.

Controls—Antenna coupling, r.f. tuning, detector and oscillator (ganged), on-off switch with indicator lamp.

Stability—Best possible.

Uses "Acorn" Tubes

From the start, with the above conditions in mind, it was decided to use acorn tubes throughout. There is no reason to believe that standard tubes cannot be built into an acceptable converter, but if one is interested in maximum results, the acorn tube is a foregone conclusion.

The circuit used in this converter is conventional, but at the same time every precaution was taken to assure maximum r.f. and conversion gain. Starting from the feeders, the antenna coupling coil is a "pie" wound affair which is made of solid hook-up wire with fabric insulation. This type of primary seems to give the maximum ratio of inductive to capacitive coupling to the grid coil. This fact helps in the reduction of noise voltages picked up by the feeders. The condenser C1 is provided to allow variable coupling without moving the pickup coil; and it is set at maximum capacity except where the antenna stage will not peak. The r.f. input circuit is not ganged to the oscillator and detector for the reason that with the antenna coupling which will give the best signal transfer, it is impossible to make the antenna circuit track, without using a special condenser in the r.f. circuit.

Effective by-passing of the r.f. stage is simplified by the use of the National type XMA socket for the 954. Each terminal except the plate and control grid is equipped in effect with a small, built-in mica capacitor direct to r.f. ground. C9 on the schematic indicates these capacitors. C8 and C10 are necessary additions for complete stability probably due to the use of the 2.5 millhenry choke in the plate circuit.

Coupling Methods

The type of coupling used from the r.f. plate to the first detector grid was chosen for the sake of simplicity of construction and the results obtained indicate that it works effectively.

The oscillator is coupled to the first detector by connecting the suppressor grid of the 954 directly to the control grid of the oscillator. In effect this amounts to suppressor grid modulating so widely used in phone transmitters. Suppressor grid bias is obtained from the drop across the oscillator grid leak.

The trimmer is used on the detector input circuit. This works out to best advantage as it simplifies the alignment procedure and simplifies the design as the detector is peaked on the low frequency side of the oscillator.

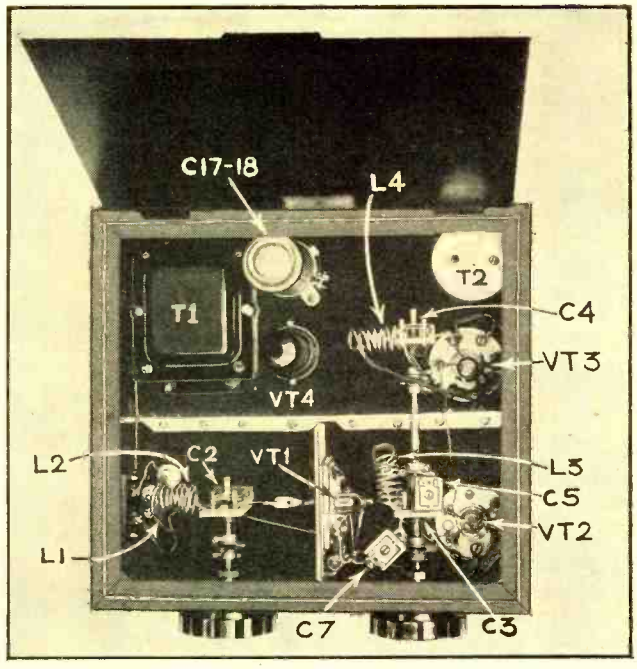
A good size condenser to start out with for the three main tuning capacitors is 25 micro-microfarads. Plates may be removed for the desired band spread after the unit is completed.

The output transformer consists of a conventional 465 kc. i.f. transformer. One tuned circuit is removed and a ten-turn pickup coil is wound in its place about ½ inch from the remaining section. Turns are then removed from the remaining coil until it will tune to 1,600 kc.

The Power Supply

The power supply unit is conventional. The filter circuit shown was used in the case of the original unit as the transformer voltage was too high. R7 then served the double purpose of dropping the d.c. plate voltage to 250 and acting as a filter section. A conventional "pi" filter may be used if the terminal voltage is not greater than 250 under load. Filter design will depend on the transformer used.

The mechanical layout of the converter is evident from the illustrations. Considerable leeway is permissible in actual layout if r.f. leads and by-passing connections are short. Partition shielding as illustrated seems ample for complete stability. A National SW-3 cabinet and shelf were used for the housing of the original unit. Any (*Turn to page* 56)



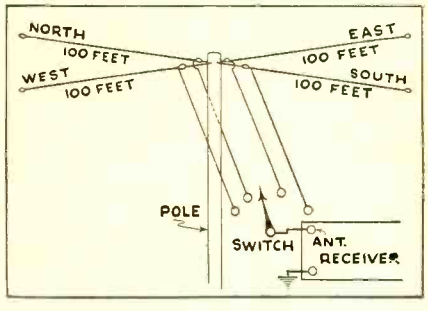
THE CHASSIS LAYOUT

The r.f. and mixer stages are each shielded from each other and from the oscillator by partitions. On one of these the r.f. tube (Vt-1) and socket are mounted.

Antennas *are* Important

WILBERT T. GOLSON, Official RADIO NEWS Broadcast-Band Listening Post Observer for Louisiana, located at Baton Rouge, has installed an antenna for DX reception as illustrated herewith. The information on this system is herewith passed along to other DX'ers who may have plenty of space in which to erect their "sky-wires."

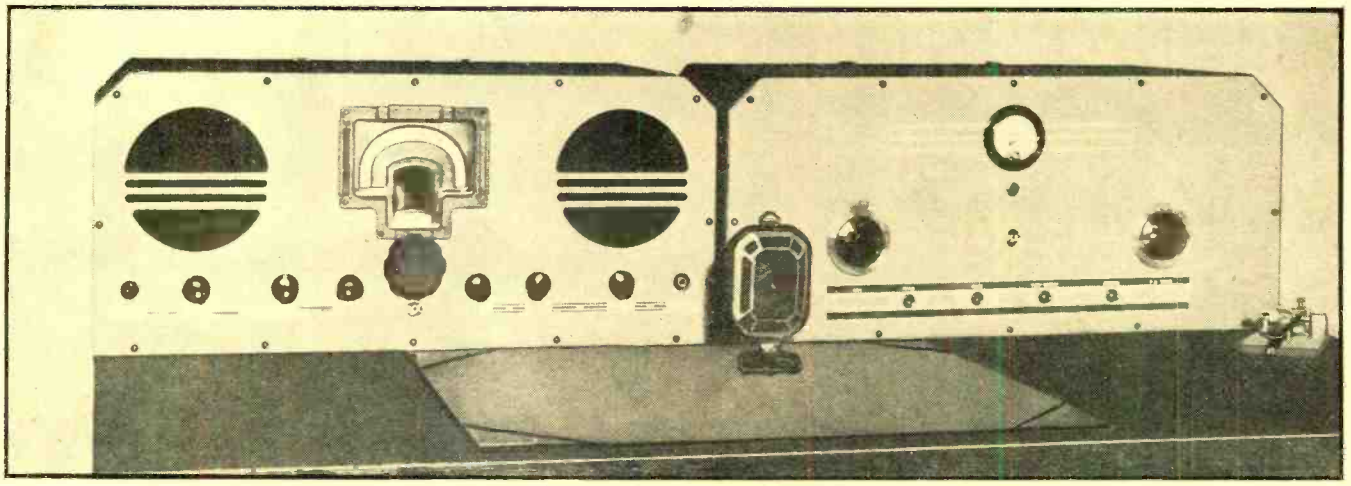
As shown in the illustration, the system consists of four separate antennas, each 100 feet long, supported from a center pole 50 feet high. The far ends may be supported from buildings, trees or additional poles. The four wires extend to the four points of the compass. Separate down leads are brought off the inside end of each wire and these leads terminate at a four-pole switch the arm of which is connected to the antenna post of the receiver.



When any station is tuned in, the switch is rotated to connect the antenna that provides the best signal from this particular station, thus taking advantage of the best directional effect.

It may be that in some instances greater signal strength may be obtained by using a combination of two of the four wires. In fact, this system lends itself to various experiments in an effort to obtain maximum signal strength from any given station.

Observer Golson has found this system highly effective and has adopted it for permanent use in his DX activities.



THE TEST SET-UP AT W2MW

The new RCA companion units, the ACR-155 receiver at the left, and the ACT-20 transmitter at the right, as they were used at the author's "ham" station, W2MW, during the tests described in this article.

Testing a Multi-Band

"Ham" Transmitter

(The RCA Model ACT-20)

By Everett M. Walker

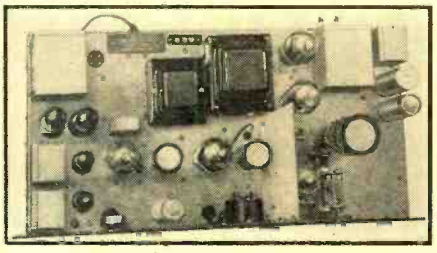
READY-BUILT transmitters are becoming more popular with amateurs. A few years ago there were practically none available to the amateur who wanted to buy his equipment, but the last few years have witnessed the inception of many ready-built units.

IT cannot be denied that a factory built job from an appearance standpoint can be made much neater than most amateurs can turn out due in most cases to the lack of the necessary tools for handling the modern type of construction of rack and panel, metal cabinets and metal chassis.

One thing an amateur gets when he buys a transmitter is the assurance that the design is right—that each tube will receive its proper voltages and each piece of apparatus will have been either designed or selected to go with the circuit and tubes employed. Further, if it is a c.w. transmitter, it will be designed to give a good d.c. signal; if it is a 'phone transmitter, a good quality voice signal.

One of the most recent transmitters offered the amateur is the ACT-20 made by the RCA Manufacturing Company, Inc., of Camden, N. J. This is a low powered 'phone c.w. transmitter that incorporates many interesting features. It is capable of operating on any of the amateur bands from 1,715 to 30,000 kilocycles and will deliver 20 watts on c.w. and 16 watts on 'phone (normal) to the antenna.

One of its interesting features is that it employs the latest types of tubes in both the radio-frequency and audio circuits. It, of course, is crystal controlled, and uses an RCA-807 oscillator, an 802 buffer or doubler and another 807 in the radio-frequency amplifier. The 807 is the new beam power tube designed for transmitting circuits and when used in a properly designed circuit is capable of high outputs with small amounts of excitation.



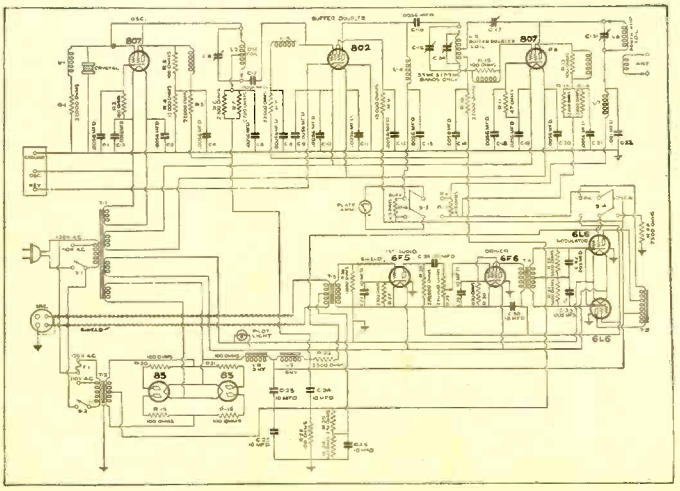


Plate-Screen Modulation

The audio circuit consists of a high gain speech amplifier using a 6F5 and 6F6 which in turn drives a pair of 6L6s in a push-pull modulator stage that is transformer coupled to the r.f. amplifier and modulates both the plate and screen.

Mounted in a two-tone gray wrinkle cabinet, the transmitter is extremely compact. It is 24¾ inches long, 11½ inches high and 12½ inches deep. All necessary controls are on the front panel. These include a gain control for the speech amplifier, a tuning control for the tank circuit of the r.f. amplifier, a power switch, plate switch, an O-150 milliampere ammeter and switch for measuring either the plate current of the buffer-doubler or the r.f. amplifier and a "Phone-C.W." switch.

The transmitter is designed to operate either from 110 or 120 volt a.c. mains, provision being made for adjustment for either voltage. Provision is made for using a double button

(*Turn to page* 50)

SHORT-WAVE STATION LIST

Arranged by Countries and Cities

NORTH AMERICA

Canada

Location	Call	Kc.	Meters	Class
Calgary, Alberta	VE9CA	6030	49.75	B
Rossland, B. C.	CFU	5705	52.59	P, B
Vancouver, B. C.	VE9BK	4795	62.56	B
Vancouver, B. C.	VE9CS	6070	49.43	B
Winnipeg, Manitoba,	CJRO	6150	48.70	B
Winnipeg, Manitoba	CJRX	11730	25.57	B
Winnipeg, Manitoba	VE9CL	6150	48.78	B
Halifax, N. S.	VE9HX	6110	49.10	B
Drummondville, Quebec	CGA3	13285	22.58	P
Drummondville, Quebec	CFA2	4465	67.19	P
Montreal, Quebec	CFCX	6005	49.96	B
Montreal, Quebec	VE9DN	6005	49.96	B
Toronto, Ontario	CFRX	6070	49.42	B
Toronto, Ontario	CRCX	11810	25.40	B
Toronto, Ontario	CRCX	6090	49.26	B

Mexico

Guadalajara, Jalisco	XECU	6115	49.06	B
Guadalajara, Jalisco	XEDQ	9480	31.65	B
Hermosillo, Sonora	XEBR	11830	25.36	B
Mazatlan, Sinaloa	XEBM	15420	19.45	B
Mazatlan, Sinaloa	XEBQ	6030	49.75	B
Merida, Yucatan	XEME	9520	31.51	B
Mexico, D. F.	XEBT	6003	49.97	B
Mexico, D. F.	XECR	7380	40.65	B
Mexico, D. F.	XEPW	6120	49.02	B
Mexico, D. F.	XETW	6045	49.62	B
Mexico, D. F.	XEUZ	6117	49.04	B
Mexico, D. F.	XEWI	11900	25.21	B
Mexico, D. F.	XEWI	6015	49.88	B
Mexico, D. F.	XEXA	11880	25.25	B
Mexico, D. F.	XEXA	6133	48.91	B
Mexico, D. F.	XEXF	6050	49.59	B
Mexico, D. F.	XEXR	11895	25.22	B
Mexico, D. F.	XEXR	6065	49.46	B
Mexico, D. F.	XEXS	6200	48.39	B
Veracruz, Ver.	XEFT	9493	31.60	B
Veracruz, Ver.	XEFT	6120	49.02	B
Veracruz, Ver.	XEUW	6020	49.83	B

United States

Bolinas, Calif.	KEC	5105	58.76	P
Bolinas, Calif.	KEF	6710	44.71	P
Bolinas, Calif.	KEI	9490	31.61	P
Bolinas, Calif.	KEL	6860	43.73	P
Bolinas, Calif.	KEM	15490	19.37	P
Bolinas, Calif.	KES	10410	28.82	P
Bolinas, Calif.	KET	9480	31.65	P
Bolinas, Calif.	KIKB	5110	58.71	P
Bolinas, Calif.	KKL	15475	19.39	P
Bolinas, Calif.	KKQ	11950	25.11	P
Bolinas, Calif.	KKZ	13690	21.91	P
Bolinas, Calif.	KMM	20780	14.44	P
Bolinas, Calif.	KQJ	18020	16.65	P
Bolinas, Calif.	KQR	18040	16.63	P
Bolinas, Calif.	KQZ	17980	16.69	P
Bolinas, Calif.	KSS	20820	14.41	P
Dixon, Calif.	KEZ	10400	28.85	P
Dixon, Calif.	KWN	21060	14.25	P
Dixon, Calif.	KWO	15420	19.45	P
Dixon, Calif.	KWU	15355	19.54	P
Dixon, Calif.	KWV	10840	27.68	P
San Francisco, Calif.	NPG	12885	23.28	T
Storrs, Conn.	W1XEG	400.000	0.75	E
Hialeah, Fla.	WND	4097	73.23	P
Miami Beach, Fla.	W4XB	6040	49.67	B
Chicago, Ill.	W9XAA	17780	16.87	E
Chicago, Ill.	W9XAA	11830	25.36	B
Chicago, Ill.	W9XAA	6080	49.34	B
Chicago, Ill.	W9XF	11880	25.25	B
Chicago, Ill.	W9XF	6100	49.18	B
Beltsville, Md.	WWV	15000	20.00	F
Beltsville, Md.	WWV	10000	30.00	F
Beltsville, Md.	WWV	5000	60.00	F
Boston, Mass.	W1XAL	21460	13.98	B
Boston, Mass.	W1XAL	15250	19.67	B
Boston, Mass.	W1XAL	11790	25.45	B
Boston, Mass.	W1XAL	6040	49.67	B
Chicopee Falls, Mass.	W1XKA	31600	9.50	E
Millis, Mass.	W1XK	9570	31.35	B
Detroit, Mich.	W8XWJ	31600	9.49	E
St. Louis, Mo.	W9XPD	31600	9.49	E
Bound Brook, N. J.	W3XAL	17780	16.87	B
Bound Brook, N. J.	W3XAL	6100	49.18	B
Bound Brook, N. J.	W3XL	17310	17.33	E
Bound Brook, N. J.	W3XL	6425	46.69	E
Lawrenceville, N. J.	WKA	21060	14.25	P
Lawrenceville, N. J.	WKF	19220	15.61	P
Lawrenceville, N. J.	WKK	21420	14.01	P
Lawrenceville, N. J.	WKN	19820	15.14	P
Lawrenceville, N. J.	WLA	18340	16.36	P
Lawrenceville, N. J.	WLK	16270	18.44	P
Lawrenceville, N. J.	WMN	14590	20.56	P
Lawrenceville, N. J.	WOY	4753	63.11	P
Ocean Gate, N. J.	WOO	4753	63.11	P
Wayne, N. J.	W2XE	21520	13.94	B
Wayne, N. J.	W2XE	17760	16.89	B
Wayne, N. J.	W2XE	15270	19.65	B
Wayne, N. J.	W2XE	11830	25.36	B
Wayne, N. J.	W2XE	6120	49.02	B
New York, N. Y.	W2XG	41000	7.32	E
Rochester, N. Y.	W8XAI	31600	9.49	E
Rocky Point, N. Y.	WEA	10610	28.28	E
Rocky Point, N. Y.	WEF	10620	28.25	P
Rocky Point, N. Y.	WEF	9490	31.61	P
Rocky Point, N. Y.	WEG	7415	40.45	P
Rocky Point, N. Y.	WKM	18860	15.91	P
Rocky Point, N. Y.	WQB-W2XBJ	17940	16.72	P
Rocky Point, N. Y.	WQF	17920	16.74	P
Schenectady, N. Y.	W2XAD	15330	19.57	B
Schenectady, N. Y.	W2XAF	9530	31.48	B
Cincinnati, Ohio	W8XAL	6060	49.50	B
Philadelphia, Pa.	W3XAU	9590	31.28	B
Philadelphia, Pa.	W3XAU	6060	49.50	B
Philadelphia, Pa.	W3XKA	31600	9.49	E
Pittsburgh, Pa.	W8XK	21540	13.93	B
Pittsburgh, Pa.	W8XK	17780	16.87	B
Pittsburgh, Pa.	W8XK	15210	19.72	B
Pittsburgh, Pa.	W8XK	11870	25.27	B
Pittsburgh, Pa.	W8XK	6140	48.86	B
Pittsburgh, Pa.	W8XKA	60500	4.96	E
Pittsburgh, Pa.	W8XKA	55500	5.41	E
Pittsburgh, Pa.	W8XKA	31600	9.49	E
Arlington, Va.	NAA	16820	17.84	T
Arlington, Va.	NAA	12630	23.75	T
Arlington, Va.	NAA	9425	31.83	T
Arlington, Va.	NAA	9250	32.43	T
Arlington, Va.	NAA	4390	68.34	T
Milwaukee, Wis.	W9XAZ	26400	11.36	E

CENTRAL AMERICA

Costa Rica

Heredia	TI4NRH	9670	31.02	B
Puntarenas	TI8WS	7550	39.74	B
San Jose	TIEP	6687	44.86	B
San Jose	TIFA	6360	47.17	B
San Jose	TIGPH	5830	51.46	B
San Jose	TIPG	6410	46.80	B
San Jose	TIRCC	6550	45.80	B
San Jose	TIX2	5830	51.46	B
San Ramon	TI5HH	5500	54.55	B

Guatemala

Guatemala City	TGS	5713	52.51	B
Guatemala City	TGWA	9450	31.75	E
Guatemala City	TGWA	6000	50.00	B
Guatemala City	TG2X	5940	50.50	B

Honduras

La Ceiba	HRD	6235	48.11	B
La Ceiba	HRW-HRY	11040	27.17	P
La Ceiba	HRW-HRY	8290	36.19	P
La Ceiba	HRW-HRY	6520	46.01	P
La Ceiba	HRW-HRY	6375	47.10	P
La Ceiba	HRW-HRY	5170	58.03	P
La Ceiba	HRW-HRY	4605	65.16	P
San Pedro Sula	HRPI	6357	47.20	B
Tegucigalpa	HRN	5875	51.06	B

Nicaragua

Boom	YNH6	6350	47.24	P
Boom	YNH6	4610	65.08	P
Boom	YNH6	3175	94.48	P
Granada	YNLAT	7315	41.01	B
Managua	YNA	14480	20.72	P
Managua	YNAM	7200	41.67	A, B
Managua	YNGU	9300	32.26	B
Managua	YNLF	7560	39.68	B
Managua	YNLG	8505	35.27	B
Managua	YNOP	5758	52.10	B
Managua	YN1GG	6540	45.87	B
Puerto Cabezas	YNE	12680	23.66	P
Puerto Cabezas	YNE	11430	26.25	P
Puerto Cabezas	YNE	9220	32.54	P
Puerto Cabezas	YNE	7810	38.41	P
Puerto Cabezas	YNE	6340	47.32	P
Puerto Cabezas	YNE	5555	54.00	P
Puerto Cabezas	YNE	4610	65.08	P
Puerto Cabezas	YNE	3170	94.48	P
Wapam	YNJ7	6350	47.24	P
Wapam	YNJ7	4610	65.08	P
Wapam	YNJ7	3175	94.48	P
Waspook	YNJ5	6350	47.24	P
Waspook	YNJ5	4610	65.08	P
Waspook	YNJ5	3175	94.48	P

Panama

Aguadulce	HP5I	11895	25.22	B
Colon	HP5F	6075	49.38	B
Colon	HP5K	5990	50.08	B
David	HP5L	11740	25.55	B
Panama	HP5B	6030	49.75	B
Panama	HP5J	9605	31.23	B
Panama	HP5Z	6120	49.02	B
.....	HP5S	9565	31.36	B

El Salvador

San Salvador	YSL	14985	20.02	P
San Salvador	YSL	14960	20.05	P

SOUTH AMERICA

Argentina

Buenos Aires	LRU1	15280	19.63	B
Buenos Aires	LRX	9660	31.06	B
Hurlingham	LSK3	10250	29.27	P
Hurlingham	LSL1	7901	37.98	P
Hurlingham	LSL2	10300	29.13	P
Hurlingham	LSL3	15810	18.97	P
Hurlingham	LSL4	21160	14.19	P

Location	Call	Kc.	Meters	Class
Hurlingham	LSM2	14500	20.69	P
Hurlingham	LSM3	19140	15.68	P
Hurlingham	LSN1	14530	20.65	P
Hurlingham	LSN2	9890	30.32	P
Hurlingham	LSN6	21020	14.27	P
Monte Grande	LSF	19600	15.31	P
Monte Grande	LSH	5435	55.19	P
Monte Grande	LSX	10350	28.98	P, B
Monte Grande	LSY	10410	28.82	P
Bolivia				
La Paz	CP5	6080	49.34	B
La Paz	CP7	15300	19.60	P
Brazil				
Marapicu	PSA	21080	14.23	P, B
Marapicu	PSB	20910	14.35	P
Marapicu	PSD	15070	19.91	P
Marapicu	PSE	14935	20.09	P, B
Marapicu	PSF	14690	20.42	P, B
Marapicu	PSH	10220	29.35	P, B
Marapicu	PSJ	9660	31.06	P
Marapicu	PSK	8185	36.65	P, B
Rio de Janeiro	PRF5	9500	31.58	B
Sepetiba	PPM	10310	29.10	P
Sepetiba	PPQ	11670	25.71	P
Sepetiba	PPU	19260	15.58	P
Sepetiba	PPZ	18165	16.51	P
Chile				
Antofagasta	CED	10230	29.33	P,B
Antofagasta	CED	8035	37.34	P
La Granja	CEC	15865	18.91	P
La Granja	CEC	10670	28.12	P
La Granja	CEC	7740	38.76	P
Santiago	CB615	6150	48.78	B
Santiago	CB960	9600	31.25	B
Colombia				
Armenia	HJ4ABH	9520	31.51	B
Barranquilla	HJA3	3376	88.83	P
Barranquilla	HJ1ABB	9559	31.38	B
Barranquilla	HJ1ABB	6115	49.06	B
Barranquilla	HJ1ABG	6042	49.65	B
Bogota	HKV	8795	34.11	B
Bogota	HJN	5955	50.38	B
Bogota	HJ3ABD	6050	49.59	B
Bogota	HJ3ABF	6070	49.42	B
Bogota	HJ3ABH	6012	49.90	B
Bogota	HJ3ABX	6122	49.01	B
Bucaramanga	HJ2ABD	5990	50.08	B
Buenaventura	HJU	9510	31.58	B
Cali	HJ5ABD	6085	49.30	B
Cartagena	HJ1ABE	9500	31.58	B
Cartagena	HJ1ABP	9618	31.18	B
Cucuta	HJ2ABC	9575	31.34	B
Ibague	HJ4ABC	6451	49.26	B
Manizales	HJ4ABB	6108	49.11	B
Medellin	HJ4ABD	5780	51.90	B
Medellin	HJ4ABE	6097	49.20	B
Medellin	HJ4ABP	6033	49.72	B
Pereira	HJ4ABU	6150	48.78	B
Quibdo	HJ1ABC	6000	50.00	B
Santa Marta	HJ1ABJ	6025	49.79	B
British Guiana				
Georgetown	VP3BG	6130	48.94	B
Georgetown	VP3MR	6010	49.92	A, B
Dutch Guiana				
Paramaribo	PZH	7000	42.86	B
Ecuador				
Ambato	HCVT	6578	45.60	B
Guayaquil	HC2CW	8400	35.71	B
Guayaquil	HC2EBA	9441	31.78	B
Guayaquil	HC2ET	4600	65.22	B
Guayaquil	HC2JSB	7854	38.20	B
Guayaquil	HC2RL	6635	45.22	B
Quito	HCETC	6970	43.04	B
Quito	HCJB	8948	33.53	B
Quito	HCJB	4107	73.05	B
Quito	HC1PM	5735	52.31	B
Riobamba	PRADO	6620	45.32	B
Paraguay				
Asuncion	ZP10	8300	36.14	B
Asuncion	ZP11	3800	78.95	B
Peru				
Arequipa	OAX6A	6122	49.01	B
Chiclayo	OAX1B	6164	48.67	B
Cuzco	OAX7A	6128	48.96	B
Huancayo	OAX4P	6122	49.01	B
Ica	OAX5A	1804	25.42	B
Lima	OAX4D	5780	51.90	B
Lima	OAX4G	6260	47.92	B
Lima	OAX4I	9330	32.15	B
Lima	OAX4K	6425	46.67	B
Lima	OCI	18670	16.08	P
Uruguay				
Cerrito	CWH	13140	22.83	P
Montevideo	CWD	5830	51.46	P
Montevideo	CXA4	6125	48.98	B
Venezuela				
Barquisimeto	YV3RA	5899	50.84	B
Caracas	YV5RC	5800	51.72	B
Caracas	YV5RD	6156	48.73	B
Caracas	YV5RF	6380	47.02	B
Caracas	YV5RH	6400	46.88	B
Caracas	YV5RJ	6250	48.00	B
Caracas	YV5RP	6270	47.84	B
Ciudad Bolivar	YV6RB	6545	45.84	B
Coro	YV1RI	6205	48.35	B
Maracaibo	YV1RM	6500	46.15	B
Maracaibo	YV1RB	5850	51.28	B
Maracaibo	YV1RD	6075	49.38	B
Maracaibo	YV1RH	6365	47.14	B
Maracay	YVQ	13337	22.47	P
Maracay	YVQ	6672	44.96	P
Maracay	YV4RD	6300	47.62	B
Maracay	YV15RV	5917	50.71	B
San Cristobal	YV2RA	5710	52.54	B
Valencia	YV4RB	6520	46.01	B
Valencia	YV4RH	5917	50.71	B
Valera	YV1RG	6230	48.15	B

WEST INDIES

Bermuda				
Hamilton	ZFA	5025	59.70	P
St. George	ZFB	10055	29.84	P
St. George	ZFD	10335	29.03	P
Cuba				
Camaguey	CO9JQ	8665	34.62	B
Havana	CMA3	15505	19.35	E
Havana	COCD	6130	48.94	B
Havana	COCH	9428	31.82	B
Havana	COCO	6010	49.92	B
Havana	COCQ	9740	30.80	B
Havana	COCX	11435	26.24	B
Sancti Spiritus	COHB	6280	47.77	B
Santiago	COKG	6200	48.39	B
Dominican Republic				
La Romana	HI3C	6730	43.48	B
San Pedro de Macoris	HIH	6775	44.38	B
San Pedro de Macoris	HI1J	5865	51.15	B
Santiago de los Caballeros	HI1A	6190	48.47	B
Santiago de los Caballeros	HI1S	6420	46.73	B
Santiago de los Caballeros	HI5N	6150	48.78	B
Santiago de los Caballeros	HI9B	6040	49.57	B
Ciudad Trujillo	HIG	6280	47.77	B
Ciudad Trujillo	HIL	6500	46.15	B
Ciudad Trujillo	HIN	11280	26.50	B
Ciudad Trujillo	HIN	6243	48.05	B
Ciudad Trujillo	HIT	6630	45.25	B
Ciudad Trujillo	HIX	6340	47.32	B
Ciudad Trujillo	HIX	5980	50.17	B
Ciudad Trujillo	HIZ	6310	47.54	B
Ciudad Trujillo	HI2D	6900	43.48	B
Ciudad Trujillo	HI4D	6555	45.76	B
Ciudad Trujillo	HI4V	6477	46.33	B
Ciudad Trujillo	HI7P	6805	44.07	B
Ciudad Trujillo	HI8A	6479	46.31	B
Ciudad Trujillo	HI8Q	6198	48.08	B
French West Indies				
Fort de France, Martinique		9360	32.05	B
Haiti				
Port-au-Prince	HH2S	5925	50.64	B
Port-au-Prince	HH2V	9551	31.41	B
Port-au-Prince	HH3W	9645	31.10	B
Jamaica				
Stony Hill	VRR4	11595	25.88	P

EUROPE

Austria				
Vienna	OER2	11801	25.42	B
Azores				
San Miguel	CT2AJ	4002	74.77	A, B
Belgium				
Ruysselede	ORG	19200	15.62	P
Ruysselede	ORK	10330	29.03	B
Bulgaria				
Sofia	LZA	14970	20.04	B
Czechoslovakia				
Podebrady	OLR2A	6010	49.92	B
Podebrady	OLR2B	6030	49.75	B
Podebrady	OLR2C	6115	49.06	B
Podebrady	OLR3A	9550	31.41	B
Podebrady	OLR3B	9504	31.57	B
Podebrady	OLR4A	11840	25.34	B
Podebrady	OLR4B	11760	25.51	B
Podebrady	OLR4C	11875	25.26	B
Podebrady	OLR4D	11900	25.21	B
Podebrady	OLR5A	15230	19.70	B
Podebrady	OLR5B	15320	19.58	B
Podebrady	OLR5C	15160	19.79	B
Podebrady	OLR6A	21450	13.99	B
Denmark				
Skamlebaek	OXY	6060	49.50	B
France				
Paris	FYB	10578	28.36	T
Pontoise	TPA2	15243	19.68	B
Pontoise	TPA3	11880	25.25	B
Pontoise	TPA4	11720	25.60	B
Pontoise	TYA	12215	24.56	P
Pontoise	TYA2	9040	33.19	P
Pontoise	TYB	12250	24.49	P
Pontoise	TYE	18090	16.58	P
Pontoise	TYE2	13760	21.80	P
Pontoise	TYE3	10430	28.76	P
St. Assise	FTK	15880	18.89	P
S.S. Ile de France	FNTQ	8830	33.96	P
S.S. Normandie	FNSK	8830	33.96	P
S.S. Paris	FNSM	8830	33.96	P
Germany				
Koenigs Wusterhausen	DOT	14410	20.82	P
Koenigs Wusterhausen	DON	10128	29.62	P
Koenigs Wusterhausen	DOF	5255	57.09	P
Koenigs Wusterhausen	DOG	5335	56.23	P
Nauen	DFT	7812	38.40	P
Nauen	DGU	9650	31.09	P
Nauen	DGM	9920	30.24	P
Nauen	DGD	10210	29.38	P
Nauen	DGH	10440	28.74	P

Location	Call	Kc.	Meters	Class
Nauen	DFL	10850	27.65	P
Nauen	DGL	12035	24.93	P
Nauen	DFC	12985	23.10	P
Nauen	DGG	13180	22.76	P
Nauen	DGZ	14605	20.54	P
Nauen	DFD	14665	20.46	P
Nauen	DGR	17341	17.30	P
Nauen	DFB	17520	17.12	P
Nauen	DFQ	18700	16.04	P
Nauen	DFM	19460	15.42	P
Nauen	DFJ	19700	15.23	P
Nauen	DFZ	20020	14.99	P
Nauen	DGW	20140	14.90	P
Nauen	DGQ	20500	14.63	P
Nauen	DGS	22800	13.16	P
Nauen	DGT	23350	12.85	P
Nauen	DGV	24300	12.35	P
Nauen	DGX	26800	11.19	P
Nauen	DGE	27400	10.95	P
Nauen	DGF	27800	10.79	P
Norddeich	DAF	4400	68.18	P
Norddeich	DAF	5670	52.91	P
Norddeich	DAF	6600	45.45	P
Norddeich	DAF	8765	34.23	P
Norddeich	DAF	11340	26.46	P
Norddeich	DAF	13100	22.90	P
Norddeich	DAF	13275	22.60	P
Norddeich	DAF	17265	17.30	P
Rehmate	DLC	7332	40.92	P
Rehmate	DLO	19947	15.04	P
Ruegen	DAS	4500	66.67	P
Ruegen	DAS	5635	53.24	P
Ruegen	DAS	8330	36.01	P
Zeesen	DJA	9560	31.38	B
Zeesen	DJB	15200	19.74	B
Zeesen	DJC	6020	49.83	B
Zeesen	DJD	11770	25.49	B
Zeesen	DJE	17760	16.89	B
Zeesen	DJL	15110	19.85	B
Zeesen	DJM	6079	49.35	B
Zeesen	DJN	9540	31.45	B
Zeesen	DJO	11795	25.43	B
Zeesen	DJP	11855	25.31	B
Zeesen	DJQ	15280	19.63	B
Zeesen	DJR	15340	19.56	B
Zeesen	DZA	9675	31.01	P
Zeesen	DZB	10042	29.87	P
Zeesen	DZC	10290	29.16	P
Zeesen	DZE	12130	24.73	P
Zeesen	DZG	15360	19.53	P
Zeesen	DZH	14460	20.75	P
S.S. Adolph Woermann	DHAK			
S.S. Bremen/DOAH	DOAH			
S.S. Cap Arcona	DHDL			
S.S. Columbus	DOBX			
S.S. Deutschland/DJNB	DJNB			
S.S. Europa/DOAI	DOAI			
S.S. Gneisenau	DOQY			
S.S. Hamburg/DHJZ	DHJZ			
S.S. Hansa/DHAO	DHAO			
S.S. Jan Wellem	DIAE			
S.S. Milwaukee/DIDP	DIDP	All ships on all of the following frequencies:		
S.S. New York/DJNY	DJNY			
S.S. Njassa	DHRR			
S.S. Ostmark	DORM	4050	74.07	P
S.S. Potsdam	DOQS	4285	40.01	P
S.S. Pretoria	DJSG	8470	35.42	P
S.S. Reliance/DHTV	DHTV	11140	26.93	P
S.S. Scharnhorst	DOQO	12325	24.34	P
S.S. Schwabenland	DOFW	12600	23.81	P
S.S. St. Louis/DIFG	DIFG	16665	18.00	P
S.S. Tanganjika	DHXE			
S.S. Ubena	DHYE			
S.S. Usambara	DHYM			
S.S. Usaramo	DHYN			
S.S. Ussukuma	DHYO			
S.S. Wadai	DHYZ			
S.S. Wahehe	DHYD			
S.S. Wangoni	DHZM			
S.S. Watussi	DHZP			
S.S. Westfalen	DODB			
Hungary				
Szekesfehervar	HAS3	15370	19.52	B
Szekesfehervar	HAS5	17130	17.51	B
Szekesfehervar	HAT4	9125	32.87	B
Iceland				
Reykjavik	TFJ	12235	24.52	B
Italy				
Coltano	IAC	17750	16.90	P
Coltano	IAC	12795	23.44	P
Coltano	IAC	4355	68.89	P
Rome	IRW	19520	15.37	P
Rome	IRY	16120	18.61	P
Rome	I2RO3	9635	31.14	B
Rome	I2RO4	11810	25.40	B
S.S. Rex	ICEJ	13050	22.99	P
S.S. Conte di Savoia	IBLI	13050	22.99	P
S.S. Conte Rosso	IBEJ	13050	22.99	P
S.S. Conte Verde	IBGI	13050	22.99	P
Madeira				
Funchal	CT3AQ	4000	75.00	B, E
Netherlands				
Dordrecht	PI1J	7082	42.36	A, B
Huizen	PCJ	15220	19.71	E
Huizen	PCJ	9590	31.28	E, B
Huizen	PHI	17770	16.88	B
Huizen	PHI	11730	25.57	B
Kootwijk	PCK	18405	16.30	P
Kootwijk	PCL	16305	18.40	P
Kootwijk	PCM	18545	16.18	P
Kootwijk	PDK	10410	28.82	P
Kootwijk	PDM	18600	16.13	P
Kootwijk	PDV	12060	24.88	P
Kootwijk	PGA	7830	38.31	P

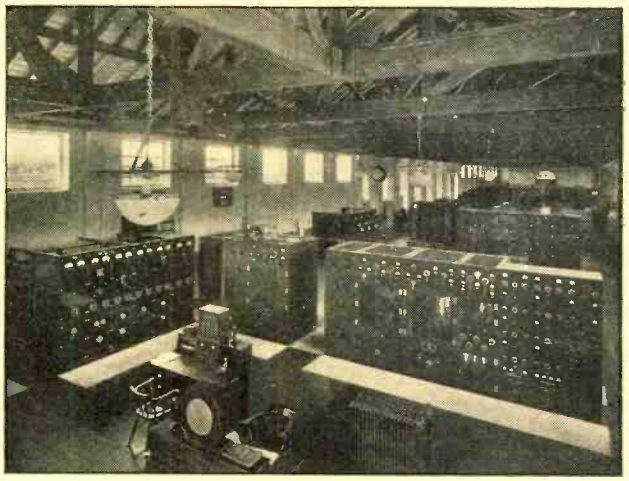
Location	Call	Kc.	Meters	Class
Norway				
Jeloy	LKJ1	9530	31.48	B
Jeloy	LKJ1	6130	48.94	B
Jeloy	LKJ1	4100	7317	E
Poland				
Warsaw	SPW	13635	22.00	B
Portugal				
Lisbon	CSW	11040	27.17	B
Lisbon	CSW	9940	30.18	B
Lisbon	CT1AA	9665	31.04	B
Parede	CT1GO	11900	25.21	B
Parede	CT1GO	6132	48.92	B
Rumania				
Bucharest	YOI	6000	50.00	B
Spain				
Barcelona	ECN1	7220	41.55	B
Barcelona	EGP1	7020	42.73	B
Caramaca	EAJ33	10350	28.98	B
Madrid	EAQ	19720	15.21	P
Madrid	EAQ	9860	30.43	B
Madrid	EAR	9480	31.65	B
Madrid	EDN	10070	29.79	E
Madrid	EHY	20860	14.37	P
San Sebastian	.....	7200	41.67	B
Valencia	.....	7165	41.87	B
Sweden				
Motala	SBG	11705	25.63	E
Motala	SBG	6060	49.50	E
Stockholm	SM5SD	7281	41.20	B
Stockholm	SM5SX	11705	25.63	B
Switzerland				
Basle	HB9B	3770	79.56	B
Lausanne	HB9AQ	3525	85.11	B
Prangins	HBH	18480	16.23	P
Prangins	HBJ	14535	20.64	P
Prangins	HBO	11385	26.35	B
Prangins	HBL	9595	31.27	B
Prangins	HBP	7797	38.47	B
United Kingdom				
Daventry	GSA	6050	49.59	B
Daventry	GSB	9510	31.55	B
Daventry	GSC	9580	31.32	B
Daventry	GSD	11750	25.53	B
Daventry	GSE	11860	25.30	B
Daventry	GSF	15140	19.81	B
Daventry	GSG	17790	16.86	B
Daventry	GSH	21470	13.97	B
Daventry	GSI	15260	19.66	B
Daventry	GSJ	21530	13.93	B
Daventry	GSK	26100	11.49	B
Daventry	GSL	6110	49.10	B
Daventry	GSN	11820	25.38	B
Daventry	GSO	15180	19.76	B
Daventry	GSP	15310	19.60	B
Rugby	GAU	18620	16.11	P
Rugby	GBB	13585	22.08	P
Rugby	GBC	4975	60.30	P
Rugby	GBS	12150	24.69	P
Rugby	GBU	12290	24.41	P
Rugby	GBW	14440	20.78	P
Rugby	GCP	10770	27.86	P
Rugby	GDW	4820	62.24	P
S.S. Queen Mary	GBTT	All ships on all of the following frequencies:		
S.S. Berengaria	GBZW			
S.S. Homeric	GDLJ	17640	17.00	P
S.S. Majestic	CFWV	13320	22.70	P
S.S. Aquitania	GLRZ	8830	33.96	P
U. S. S. R.				
Baku	RIO	10170	29.48	P
Moscow	RAN	9600	31.25	B
Moscow	RKI	15040	19.95	P
Moscow	RV59	12000	25.00	B, P
Moscow	RV59	6000	50.00	B
Tiflis	RIR	10080	29.76	P
Vatican City				
Vatican City	HVJ	15123	19.84	B
Vatican City	HVJ	5969	50.26	B
Yugoslavia				
Belgrade	YTC	6100	49.20	B

Abbreviations for Class Column

A—*Amateur*
B—*Broadcast*
E—*Experimental*
F—*Frequency*
P—*Phone*
T—*Time Signals*

CZECH OBSERVER

This is the Listening Post of Short-Wave Observer Ferry Friedle, who states (and we believe him) he gets a lot of fun out of short-wave DX'ing.



THE RUGBY STATION

Listening post observers from all over the world have reported hearing the Rugby transmissions and this photograph shows the layout of the transmitters in the telephony building.

The DX Corner for the

Conducted by

Laurence

THE fifty-second installment of the DX Corner for Short Waves contains the World Short-Wave Time-Table for 24-hour use all over the world and Official Observers' reports of stations heard this month. Consult these two items regularly and make your all-wave set pay big dividends!

Credit Where It Is Due

In carrying out our policy of giving credit for extra fine reports from Listening Posts, our commendations go out to the following Observers: Alfred, Howald, Ralat, Geneve, Partner, Shamleffer, Dressler, Gallagher and Doyle. We are glad to see that there are some new ones on the list this month. Congratulations! Also, we are glad to acknowledge the source of all of the verification cards that appeared on last month's attractive cover. They were sent in by Observer Hugo Richter of Zurich, Switzerland. This cover has been mentioned favorably in many of the letters from readers.

DX Corner Membership

Reporting progress for the year 1937, it is noted that our Listening Post Observer membership has increased during the past six months by leaps and bounds. In a quick check-up of Listening Posts, the figures indicate in rough numbers 800 members in good standing. This list will be published complete in the August issue. Our members will be happy to know that we now have Official Observers in 43 States in our own country and in 58 foreign countries scattered all over the earth. The information received in short-wave reports from these Observers is doing much to make the Short-Wave DX Corner a general headquarters for short-wave information for listeners all over the world.

Reports of Listening Post Observers and Other Short-Wave Readers of the DX Corner

LISTED in the following columns is this month's consolidated reports of short-wave stations heard by our wide-world listening posts. Each item is credited with the Observer's surname. This allows our readers to note who obtained the information. If any of our readers can supply Actual Time Schedules, Correct Wavelengths, Correct Frequencies and any other Important Information (in paragraphs as recommended), the DX Editor, as well as our readers, will be grateful for the information. On the other hand, readers seeing these reports can try their skill in pulling in the stations logged and in trying to get complete information on these transmissions. The report for this month, containing the best information available to date, follows:

Europe

OLR, Prague, Czechoslovakia, 11,840 kc., Sunday 11 p.m.-12:05 a.m., (Lopez, Jensen), 9550 kc., Monday and Thursday 8-10 p.m., (Augustine, Harris), 11,760 kc., (Carton, Fallon, Geneve, Coover, Wittig.)

OLR3A, Prague, Czechoslovakia, 9550 kc., 8-10 p.m. (from ann.), (Partner), Monday and Thursday 8-10 p.m. (from ann.), (Dressler, Shamleffer), 9560 kc. (Alfred, Law), 8640 kc., 9:30-10 p.m. (Wittig, Ralat, Hedgeland).

OLR2A, Prague, Czechoslovakia, 6010 kc., 10-11 p.m., (from ann.), (Partner).

OLR4A, Prague, Czechoslovakia, 11,840 kc., (from ann.), (Partner), Monday and Thursday 10-11 p.m., (Dressler, Alfred), 9560 kc. sing with church bells, (Howald), wants reports (Wittig), 15,230 kc., daily 2-2:15 p.m., (Herzog, Hedgeland, Hare, Staley, Beckemeyer, DeLaet).

OLR5A, Prague, Czechoslovakia, 15,230 k., (from ann.), (Partner), Monday and Thursday 8-10 p.m., daily 7:55-9:50 a.m., 11,840 kc., (Herzog, Hare), daily 1-2:15 p.m., (De Laet).

OLR4C, Prague, Czechoslovakia, 11,875 kc. (from ann.), (Partner), 9:15 p.m., (Ralat).

DJG, Zeesen, Germany, 15,200 kc., (Jaime), 15,280 kc., (Alfred, Shamleffer), 7-11 a.m., (Herzog), 9540 kc., (Cartin), 9 a.m.-11 p.m., (Howald).

DJN, Zeesen, Germany, 9540 kc., 12:05-4 a.m., (Alfred), 9480 kc., (Wittig), daily 7-9 p.m., (Wollenschlager, Shamleffer).

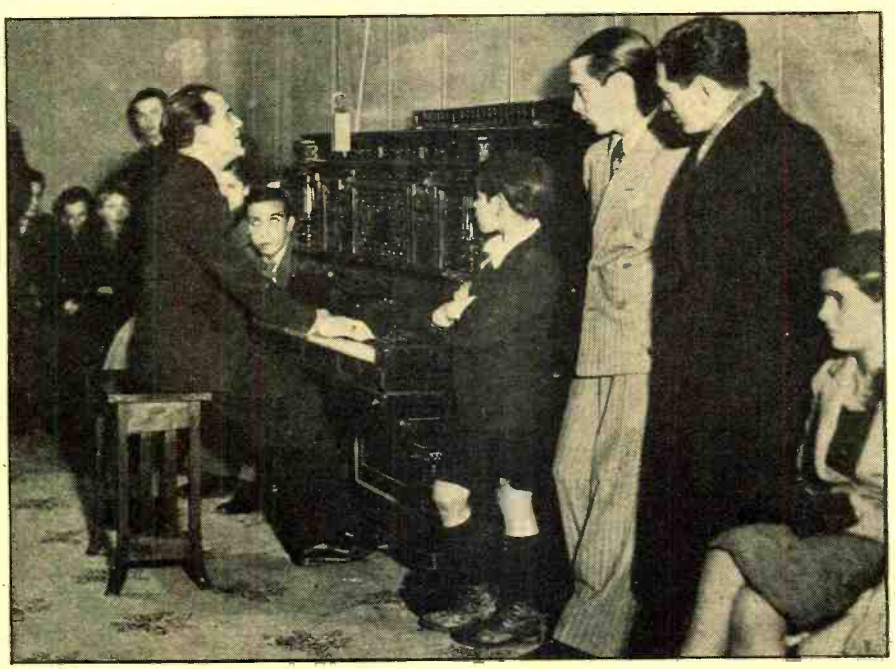
DJL, Zeesen, Germany, 15,110 kc., 4:50-10:45 p.m., (Alfred, Hartman), from noon on, (Howald), daily 8-9 a.m. (Sigundson).

DJA, Zeesen, Germany, 9560 kc., (Jaime), 12:05-4 a.m., (Alfred, Cartin, Herzog, Shamleffer).

DJB, Zeesen, Germany, 15,200 kc., (Jaime, Alfred), 2-2:30 p.m., (Herzog, Shamleffer, Cartin), 9 a.m.-11 p.m., (Howald), daily 7-9 p.m., (Wollenschlager, Herzog, Ryan, Sigundson, Coover).

DJC, Zeesen, Germany, 6020 kc., 4:50-10:45 p.m., (Alfred, Cartin).

DJD, Zeesen, Germany, 17,770 kc., 7 p.m., (Coover), 4:50-10:45 p.m., (Alfred, Law, Shamleffer, Eramo, Sutker), 11 p.m.-3 p.m., (Cartin, Sprague), daily from noon, (Howald,



STUDIO SCENE AT HJ3ABD

Jose Bohr enthralls guests at this popular South American station, which operates on 6050 kc.

Corner SHORT WAVES

M. Cockaday

EAJ 43

TARJETA POSTAL

RADIO CLUB TENERIFE

Apartado de Correos, 225. SANTA CRUZ DE TENERIFE (Islas Canarias)

Acusamos recibo, de su estimada comunicación, dándonos cuenta de la recepción de nuestro programa en onda de 28 90 metros el día 8/1/37

Le agradecemos sinceramente este control, y somos de Ud. muy atentamente

RADIO CLUB TENERIFE

John F. Borst

New York

Fecha

A PRIZE VERIFICATION

Not many listeners have been fortunate enough to receive this "veri" from the Radio Club Tenerife. Suppose you try for it.

Sprague), daily 7-9 p.m., (Wollenschlager, Wacker, Herzog, Ryan, Sigundson, Wittig, Pylate).

DJR, Zeesen, Germany, 15,340 kc., 8-9 a.m., (Doyle, Kemp).

DJP, Zeesen, Germany, 11,885 kc., (Law), 11,795 kc., Thursday 2:30-2:50 p.m., (Shamleffer), daily 9 p.m., 12:30 a.m., (Pylate).

DZH, Zeesen, Germany, 14,460 kc., daily relaying DJD and DJO, (Herzog).

DJM, Zeesen, Germany, 6079 kc., 5:30 p.m., (Ralat, Hedgeland).

DZA, Zeesen, Germany, 9675 kc., irregular, (Doyle).

DJE, Zeesen, Germany, 17,760 kc., 12 a.m., and on, (Howald, Doyle, Kemp).

DFL, Nauen, Germany, 10,850 kc., 8:30 p.m., relaying DJB and DJD, (Herzog).

TPA4, Paris, France, 25.6 meters, 11:30 p.m., (Weikal), "Radio Colonial," (Fallon), 19.6 meters, daily 7 a.m., (Hendry), 11,720 kc., 4:45 a.m.-2:30 p.m., (Cartin, Howald, Kemp, Ryan, Wittig, Ralat).

TPA2, Paris, France, 15,245 kc., 6 a.m., (Alfred, Randle, Kemp).

TPA3, Pontoise, France, 11,885 kc., 6:35 p.m., (Eramo, Kemp), 11:15 p.m., (Ryan).

Pontoise, France, no call letters given, 9040 kc., 2:30 a.m., (from veri.), (Gallagher).

I2RO, Rome, Italy, 9635 kc., 6 p. m., (Coover), 5-7 p.m., (Lopez), 11,810 kc., (Eramo), Sunday 10 a.m.-12:15 p.m., (Cartin, Sprague), Wednesday 7-9 p.m. (Wollenschlager, Ralat, Ruppert, Black, Ryan).

I2RO3, Rome, Italy, 9635 kc., 12:30-7:30 p.m., daily (Alfred), 9610 kc., (Ryan, Stillman).

I2RO4, Rome, Italy, 11,810 kc., 7-11:20 a.m., (Alfred, Stillman).

"Radio Milan," Milan, Italy, 28 meters, irregular, (Ralat).

HVJ, Vatican City, 15,121 kc., 10:30-10:45 a.m., 5969 kc., 2-2:15 p.m., Sunday and Holidays, 5969 kc., 5 a.m., (from veri), (Foshay, Cartin).

GSA, Daventry, England, 6059 kc., 6-11 p.m., (Cartin), 6-9 p.m., (Pylate, Doyle, Kemp).

GSB, Daventry, England, 9510 kc., daily 4-5:45 p.m., 6-8 p.m., (Alfred, Fallon, Shamleffer, Weiss, Dressler, Ryan).

GSC, Daventry, England, 9580 kc., 5 p.m., (Coover), daily 9-11 p.m., (Dressler, Cartin, Howald, Wollenschlager).

GSF, Daventry, England, 15,140 kc., 6-8:30 a.m., 9-12 a.m., (Dressler), daily 4-5:45 p.m., (Alfred, Law, Shamleffer), 6-8 p.m., (Herzog, Fallon), 9-12 p.m., (Howald, Doyle).

GSG, Daventry, England, 17,790 kc., 6-8:30 a.m., 9-12 a.m., (Dressler), 4-5 p.m., (Herzog, Doyle, Beck).

GSH, Daventry, England, 21,470 kc., 6-8:30 a.m., 9-12 a.m., (Dressler, Howald).

GSD, Daventry, England, 11,750 kc., daily 9-11 p.m., (Dressler), daily 4-5:45 p.m., 6-8 p.m., (Alfred, Law, Cartin, Fallon, Howald, Wollenschlager, Kemp, Ryan, Coover, Pylate).

GSN, Daventry, England, 11,820 kc., daily 7-9 p.m., (Wollenschlager, Doyle).

GSO, Daventry, England, 15,180 kc., daily 7-9 p.m., (Wollenschlager), daily 6:20-8:30 p.m., 4-6 p.m., (Dressler).

GSK, London, England, 26,100 kc., new station, (Partner).

GSI, London, England, 15,260 kc., 12:15-3:45 p.m., (Doyle).

GSP, London, England, 15,310 kc., (Doyle), daily 6:20-8:30 p.m., (Dressler), 9:45 p.m., (Pylute).

GSW, Daventry, England, 9790 kc., testing 8:15 p.m., new station, (Ryan).

SPW, Warsaw, Poland, 13,630 kc., 8 p.m., (Coover, Herzog, Partner), 13,050 kc., Friday 12:30-1:30 p.m., (Doyle).

PCJ, Hilversum, Holland, 9590 kc., 7 p.m., (Coover), Sunday 7-8 p.m., (Dressler), 31,280 kc., (Jaime), requests reports, (Randle), 15,220 kc., Tuesday, 4:30-6 a.m., Wednesday 8-11 a.m., (Piorko, Herzog, Shamleffer, DeMent, Cartin, Ralat, Foshay, Howald, DeLaet, Black, Doyle, Kemp), Slogan: "Philips Radio," Address: Hilversum, Holland.

PI1J, Dordrecht, Holland, 7088 kc., 14,164 kc., 11:10-11:50 a.m., 12:00-12:30 p.m., Saturdays, (from ann.), (Hamilton).

PHI, Huizen, Holland, 17,775 and 11,730 kc., (Herzog), 7 a.m.-2 p.m., Monday, Tuesday and Friday 8-9:30 a.m., Saturday, 8-10 a.m., (Bower, Doyle, Kemp, Atherton, Beck), rebroadcasted a Jugoslavian program, (Shamleffer).

LKJ1, Jeloy, Norway, 9530 kc., Wednesday 7-8 p.m., (Weiss, Partner, Beck).

SM5SX, Stockholm, Sweden, 17,710 kc., Saturday and Sunday, 11 a.m.-5 p.m., (Doyle).

"Radio Beograd," Belgrade, Jugoslavia, 6100 kc., daily 1 a.m.-5 p.m., (Foshay), Wednesday 7-9 p.m., 9590 kc., (Shamleffer).

TFJ, Reykjavik, Iceland, 12.235 kc., Sunday 1:40-2 p.m., (Alfred, Law, Hare, Sprague), Sunday 2-2:30 p.m., (Geneve, Kemp, Sigundson), Address: State Broadcasting Service, Box 547.

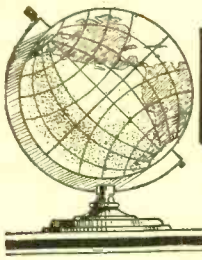
LZA, Sofia, Bulgaria, 14,915 kc., Sunday 1:30-2 a.m., 3:30-4 a.m., (Alfred), 1-3 a.m., 6:30-8:30 a.m., noon-2 p.m., 2:40-5 p.m., except Saturday and Sunday. (Geneve)

ON4VR, Namur, Belgium, 6690 kc., testing 10:15-11 a.m., Sunday (From-

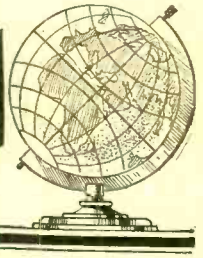
(*Turn to page 32*)

THE TENERIFE STUDIO

This is the broadcasting studio of EAJ43, whose verification card is shown elsewhere on this page.



WORLD SHORT WAVE TIME-TABLE

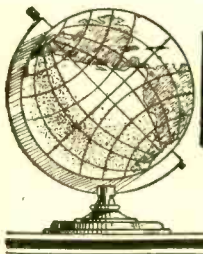


Compiled by LAURENCE M. COCKADAY

Hours of transmission for the World's Short Wave Broadcast Stations

8	9	10	11	M	1	2	3	4	5	6	7	FILL IN LOCAL TIME	8	9	10	11	N	1	2	3	4	5	6	7
01	02	03	04	05	06	07	08	09	10	11	12	GREENWICH MEAN TIME	13	14	15	16	17	18	19	20	21	22	23	00

Wave-length Meters	Call Letters	Frequency Kc.	City Country	HOURS OF TRANSMISSION	HOURS OF TRANSMISSION
13.93	W8XK	21540	Pittsburgh, Pa.	D	D
13.93	GSJ	21530	Daventry, England	D D D D D D D	D D D D
13.94	W2XE	21520	New York, N. Y.	D D D	D D D
13.97	GSH	21470	Daventry, England	D D D D	D D D D
16.86	GSG	17790	Daventry, England	D D D D D D D D D D D D	D D D D D D D D D D D D
16.87	W3XAL	17780	Bound Brook, N. J.	D D D D D D D D D D D D	D D D D D D D D D D D
16.88	PHI	17770	Huizen, Holland	XW XW	XW XW
16.89	W2XE	17760	New York, N. Y.	D	D
16.89	DJE	17760	Zeesen, Germany	D D D S S	D D D D D
19.56	DJR	15340	Zeesen, Germany	D D D D	D D D D D
19.57	W2XAD	15330	Schenectady, N. Y.	D D D D D D D D D D D D	D D D D D D D D D D D D
19.60	GSP	15310	Daventry, England	D D D S S D D D D D D D	D D D D D D D D D D D D
19.63	DJQ	15280	Zeesen, Germany	D D D S S D D D D D D D	D D D D D D D D D D D D
19.65	W2XE	15270	New York, N. Y.	D D D D D D D D D D D D	D D D D D D D D D D D D
19.66	GSI	15260	Daventry, England	D D D D D D D D D D D D	D D D D D D D D D D D D
19.67	W1XAL	15250	Boston, Mass.	Sa Sa	Sa Sa
19.68	TPA2	15243	Pontoise, France	D D D	D D D
19.70	OLR5A	15230	Podebrady, Czech.	D D D	D D D
19.71	PCJ	15220	Huizen, Holland	W W W	W W W
19.72	W8XK	15210	Pittsburgh, Pa.	D D D D D D D D D D D D	D D D D D D D D D D D D
19.74	DJB	15200	Zeesen, Germany	D D D S S D D D D D D D	D D D D D D D D D D D D
19.75	ZBW4	15190	Hong Kong, China	D D Sa	D D Sa
19.76	GSO	15180	Daventry, England	D D D D D D D D D D D D	D D D D D D D D D D D D
19.82	GSF	15140	Daventry, England	D D D D D D D D D D D D	D D D D D D D D D D D D
19.84	HVJ	15121	Vatican City	I	I
19.85	DJL	15110	Zeesen, Germany	D D D D D D D D D D D D	D D D D D D D D D D D D
20.04	LZA	14970	Sofia, Bulgaria	S S S U U S S S S S S S	S S S S S S S S S S S S
20.55	JVH	14600	Nazaki, Japan	D	D
22.16	SPW	13653	Warsaw, Poland	C C C S S	C C C S S
24.52	TFJ	12235	Reykjavik, Iceland	S S	S S
25.00	RV59 (RNE)	12000	Moscow, U.S.S.R.	S	S
25.24	TPA3	11885	Portoise, France	D D D D D D D D D D D D	D D D D D D D D D D D D
25.27	W8XK	11870	Pittsburgh, Pa.	D	D
25.34	OLR4A	11840	Podebrady, Czech.	D D I	D D I
25.36	W2XE	11830	New York, N. Y.	D D	D D
25.36	W9XAA	11830	Chicago, Ill.	D D D D I I I I I I I I	D D I D D I
25.40	12RO	11810	Rome, Italy	D D D D D I I I I I I I	D D I I I I
25.42	JZJ	11800	Nazaki, Japan	AM	AM
25.45	W1XAL	11790	Boston, Mass.	S B S	S B S
25.49	DJD	11770	Zeesen, Germany	D D D D D D D D D D D D	D D D D D D D D D D D D
25.53	GSD	11750	Daventry England	D D D D D D D D D D D D	D D D D D D D D D D D D
25.58	CJRX	11730	Winnipeg, Canada	D D	D D
25.60	TPA4	11720	Pontoise, France	D D	D D
25.62	HJ4ABA	11710	Medellin, Colombia	D D I D D	D D I D D
26.24	COCX	11435	Havana, Cuba	D D D D XS XS	S S XS S S
26.60	HIN	11280	Trujillo, D. R.	XS	XS
27.35	HS8PJ	10955	Bangkok, Siam	M M D I	M M D
27.93	JVM	10740	Nazaki, Japan	D D D D	D D D
28.14	JVN	10660	Nazaki, Japan	D I	D
29.04	ORK	10330	Ruysselede, Belgium	D D I I	D D I I
30.43	EAQ	9860	Madrid, Spain	S S D D	S S D D
30.75	COCQ	9750	Havana, Cuba	D D D D D D D D D D D D	D D D D D D D D D D D D
31.00	CQN	9677	Macao, Asia	K	K
31.06	LRX	9660	Buenos Aires, Argentina	D D D D D D D D D D D D	D D D D D D D D D D D D
31.09	YNLF	9650	Managua, Nicaragua	D	D
31.09	CT1AA	9650	Lisbon, Portugal	C G G I	C G G I
31.10	HH3W	9645	Port-au-Prince, Haiti	D D	D D
31.14	I2RO	9635	Rome, Italy	I I I I I I I I I I I I	I I I I I I I I I I I I
31.25	RAN	9600	Moscow, U.S.S.R.	D	D
31.25	HJ1ABP	9600	Cartagena, Colombia	D D D D D D D D D D D D	D D D D D D D D D D D D
31.27	HBL	9595	Geneva, Switzerland	Sa Sa	Sa Sa
31.28	W3XAU	9590	Philadelphia, Pa.	D D D D D D D D D D D D	D D D D D D D D D D D D
31.28	VK2ME	9590	Sydney, Australia	S S S S S S S S S S S S	S S S S S S S S S S S S
31.28	PCJ	9590	Huizen, Holland	T AG	V
31.28	HP5J	9590	Panama City, Pana.	S S D S D	D
31.32	VK3LR	9580	Lyndhurst, Australia	XS	XS
31.32	GSC	9580	Daventry, England	D D D D D D D D D D D D	D D D D D D D D D D D D
31.33	HJ2ABC	9575	Cucuta, Colombia	D D D D	D D D D
31.35	W1XK	9570	Millis, Mass.	D D D D D D D D D D D D	D D D D D D D D D D D D
31.38	DJA	9560	Zeesen, Germany	D D D D D D D D D D D D	D D D D D D D D D D D D
31.40	TIPG	9559	San Jose, C. R.	D D D D D D D D D D D D	D D D D D D D D D D D D
31.45	DJN	9540	Zeesen, Germany	D D D D D D D D D D D D	D D D D D D D D D D D D
31.48	W2XAF	9530	Schenectady, N. Y.	D D D D D D D D D D D D	D D D D D D D D D D D D
31.48	LKJ1	9530	Jeloy, Norway	D D D	D D D
31.49	ZBW3	9525	Hong Kong, China	D D Sa	D D Sa
31.55	GSB	9510	Daventry, England	D D D D D D D D D D D D	D D D D D D D D D D D D
31.55	HJU	9510	Buenaventura, Colom.	C C	C C
31.55	VK3ME	9510	Melbourne, Australia	XS XS XS	XS XS XS
31.56	XEFT	9505	Veracruz, Mex.	D D D D D D D D D D D D	D D D D D D D D D D D D
31.58	PRF5	9500	Rio de Janeiro, Brazil	D D XS XS	D D XS XS
31.58	HJ1ABE	9500	Cartagena, Colombia	D X X S S S S D XS XS	D X X S S S S D XS XS
31.82	COCH	9428	Havana, Cuba	D D D D D D D D D D D D	D D D D D D D D D D D D
31.35	HS8PJ	9350	Bangkok, Siam	M M	M M
32.88	HAT4	9125	Budapest, Hungary	S	S
33.53	HCJB	8948	Quito, Ecuador	I I I I	I I I I
34.62	CO9JQ	8665	Camaguey, Cuba	X X X	X X X
38.48	HBP	7797	Geneva, Switzerland	Sa Sa	Sa Sa
39.95	JVP	7510	Nazaki, Japan	D I	D I
42.80	EA8AD	7010	Tenerife, Canary Is.	C C	C C
43.48	HI3C	6900	La Romana, D. R.	D D D	D D D
43.99	XGOX	6820	Nanking, China	D D XS XS	D D XS XS
44.14	HIH	6796	San Pedro, D. R.	AC AC S	AC AC S
44.71	TIEP	6710	San Jose, Costa Rica	D D D I D D D D D I D D	D D D I D D D D D I D D
45.22	HC2RL	6635	Guayaquil, Ecuador	T T T S S S	T T T S S S



WORLD SHORT WAVE TIME-TABLE

(Continued from the Previous Page)

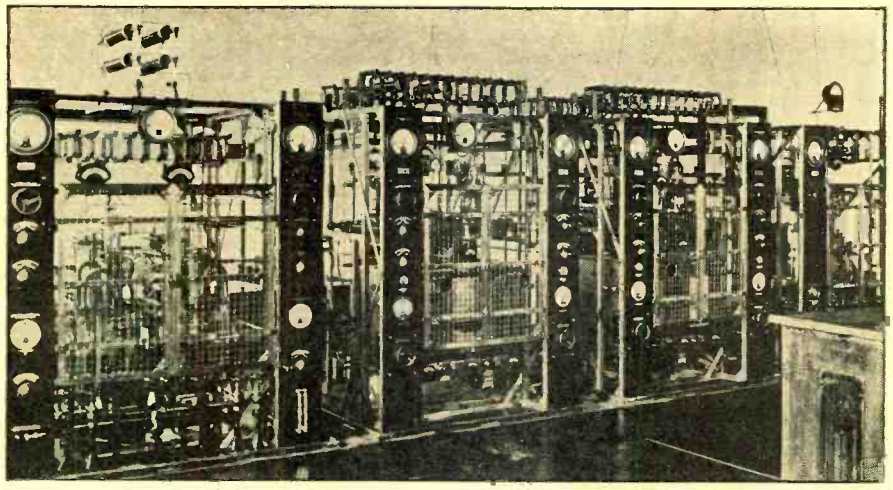
Hours of transmission for the World's Short Wave Broadcast Stations

												FILL IN LOCAL TIME												
8	9	10	11	M	1	2	3	4	5	6	7	EASTERN STANDARD TIME	8	9	10	11	N	1	2	3	4	5	6	7
01	02	03	04	05	06	07	08	09	10	11	12	GREENWICH MEAN TIME	13	14	15	16	17	18	19	20	21	22	23	00

HOURS OF TRANSMISSION												*Wave-length Meters*	*Call Letters*	*Frequency Kc.*	*City Country*	HOURS OF TRANSMISSION											
			Sa	Sa								45.25	HIT	6630	Trujillo, D. R.					XS	XS					D	D
	Th	Th	Th									45.34	PRADO	6618	Riobamba, Ecuador		T	T									
D	D											45.80	H14D	6550	Trujillo, D. R.				XS	XS	XS			XS	XS	XS	XS
D	I											46.01	YV4RA	6520	Valencia, Venezuela				D	D	D				D	D	D
												46.08	HIL	6510	Trujillo, D. R.											D	D
D	D	D	I	I	I							46.66	HI1S	6430	Puerto Plata, D. R.					D	D					D	D
												46.85	YV5RH	6400	Caracas, Venezuela										D	D	D
D	D	D	D									46.91	HI8Q	6395	Trujillo, D. R.				D	D	D				D	D	D
D	D										D	47.12	YV1RH	6360	Maracaibo, Ven.												D
I	I	Sa	Sa									47.24	HRP1	6350	San Pedro Sula, Honduras					D	D					D	D
I	I	I										47.54	HIZ	6310	Trujillo, D. R.					S	S	S		I	I	I	I
XS	XS											47.62	YV4RD	6300	Maracay, Venezuela												
	D	D										47.77	HIG	6280	Trujillo, D. R.												XS
D	D											47.77	COHB	6280	Sancti Spiritus, Cuba		D			D				D	D		
XS	XS	XS										48.05	HIN	6243	Trujillo, D. R.					D	D						D
L	L	L										48.11	HRD	6235	La Ceiba, Honduras									S	S		
AM												48.15	OAX4G	6230	Lima, Peru												L
D	XS	XS		S								48.19	HJ1ABH	6225	Cienaga, Colombia												AM
D	D	I	I	I								48.39	COKG	6200	Santiago, Cuba										D		
D	D	D										48.50	HI1A	6185	Santiago, D. R.				D	D	D						D
										XS	XS	48.70	XEXA	6160	Mexico, D. F.												D
D	D	D	D									48.70	VPB	6160	Colombo, Ceylon	XS	XC	V	V	Sa							
D	D	D										48.70	CJRO	6160	Winnipeg, Canada											D	D
			Sa	Sa								48.72	YV5RD	6158	Caracas, Venezuela				D	D	D			D	D	D	D
D	D											48.78	VE9CL	6150	Winnipeg, Canada												
	D	D	D									48.78	HJ2ABA	6150	Tunja, Colombia					D							D
		D	D	D								48.78	HJ5ABC	6150	Cali, Colombia				D	S	S						
												48.86	W8XK	6140	Pittsburgh, Pa.												
								D	D	D		48.88	CR7AA	6137	Lourenzo Marques, A.					D	D	D	D				
												48.94	LKJ1	6130	Jeloy, Norway				D	D	D	D	D	D			
D	D	D									X	48.94	VE9HX	6130	Halifax, N. S.	X	X	X	X	X	F	F	SF	D	D	D	D
D	D	D	D	D	D							48.94	COCD	6130	Havana, Cuba												D
D	D	D	XS									48.96	HJ3ABX	6122	Bogota, Colombia			XS	XS	D	D				XS	D	D
D	D	D										49.00	HJ1ABB	6120	Barranquilla, Colom.				D	D					D	D	D
	D											49.02	W2XE	6120	New York, N. Y.												
					D	D		S	S	S	D	49.18	YTC	6100	Belgrade, Yugoslavia	XS				D	D	D	D	D			
D	D	XS	XS									49.18	W3XAL	6100	Bound Brook, N. J.												D
			XSa	XS								49.18	W9XF	6100	Chicago, Ill.												
D			XS	XS			XS	D	XS	XS	S	49.20	ZTJ (JB)	6098	Johannesburg, Africa	S	D	D	XS	D	D	D	D				
D	D	D	D									49.20	HJ4ABE	6097	Medellin, Colombia		D	D	D	D					D	D	D
	S	S	D	D	D		AM	D	D	D	D	49.26	ZBW2	6090	Hong Kong, China	D	D	Sa									
			Sa									49.26	CRCX	6090	Toronto, Canada				S	D	D	D	D	D	D	D	D
XS	XS	XS										49.30	HJ5ABD	6085	Cali, Colombia												N
XS	XS	D										49.31	HJ3ABF	6084	Bogota, Colombia				D								XS
									X	X		49.32	VQ7LO	6083	Nairobi, Kenya, Afr.	E	E		V	U	U	XC			XS	XS	
D	D	XS	XS									49.34	HP5F	6080	Colon, Panama					S	D	XS		S	S		D
D	D	D	D							D	D	49.34	W9XAA	6080	Chicago, Ill.	D	D	D	D	D	D	D	D	D	D	D	D
											XS	49.34	ZHJ	6080	Penang, S. S.	XS											
												49.40	OER2	6073	Vienna, Austria		XS	XS	XS	XS	XS	XS	XS	XS	Sa	Sa	
D	D											49.42	YV1RE	6070	Maracaibo, Venez.				D	D					D	D	D
			D	D	D					XS	XS	49.50	W8XAL	6060	Cincinnati, Ohio	D	D	D	D	D	D	D	D	D	D	D	D
D	D											49.50	W3XAU	6060	Philadelphia, Pa.												D
												49.50	OXY	6060	Skamlebaek, Denmark				S	S	D	D	D	D	D		
												49.59	HJ3ABD	6050	Bogota, Colombia												
D	D	D										49.59	HI9B	6050	Trujillo, D. R.					D					D	D	
	D											49.63	HJ3ABI	6045	Bogota, Colombia												
XS	XS	XS		Sa								49.65	HJ1ABG	6042	Barranquilla, Colom.					XS	XS	S				XS	XS
							D	D	D	D		49.67	YDA	6040	Tandjong Priok, Java												
												49.67	W1XAL	6040	Boston, Mass.											I	Z
D	D	D										49.75	HP5B	6030	Panama City, Panama					D				I			D
D	D	D	D		I							49.79	HJ1ABJ	6025	Santa Marta, Colombia					D							D
												49.83	DJC	6020	Zeesen, Germany				D	D	D	D	D	D			
D	D	D	D	D								49.83	XEUW	6020	Veracruz, Mexico	D	D	D	D	D	D	D	D	D	D	D	D
E	XS	XS	XS									49.88	XEWI	6015	Mexico, D. F., Mexico								C		I		E
D	D	D	I									49.90	HJ3ABH	6012	Bogota, Colombia				D	D	D	D		S	S	D	D
			Sa	Sa								49.92	COCO	6010	Havana, Cuba		D	D	D	D				D	D	D	
D											D	49.96	CFCX	6005	Montreal, Can.	D	D	D	D	D	D				Sa		
				Sa								49.96	HP5K	6005	Colon, Panama	D				D						D	D
D	D	D	D	D								49.96	VE9DN	6005	Montreal, Canada						D						
											S	50.00	XEBT	6000	Mexico City, Mexico			D	D	D	D	D	D	D	D	D	D
Z	Z	Z										50.00	RV59	6000	Moscow, U.S.S.R.									H			
D	D	D										50.17	HIX	5980	Trujillo, D. R.	S	S	S		D	D			D	D		
									S			50.25	HJN	5970	Bogota, Colombia				D								
												50.26	HVJ	5969	Vatican City						D						
XSa	D	Sa	Sa									50.50	TG2X	5940	Guatemala City												
XS	XS											50.72	HH2S	5915	Port-au-Prince, Haiti						D						
D	D	S	S									50.76	HRN	5910	Tegucigalpa, Hond.					D		S	S	S	D	D	D
D	D											50.85	YV3RA	5900	Barquisimeto, Venez.					D						D	D
D	D											51.15	HI1J	5865	San Pedro D. R.					D	D	D				D	D
D	D											51.46	TIGPH	5830	Alma Tica, Costa Rica					D	D					D	D
D	D	XS										51.72	YV5RC	5800	Caracas, Venezuela		S	S	D	D	S	S	S	D	D	D	D
	AH	AH	AH									51.90	OAX4D	5780	Lima, Peru		AN	AN	AN								

List of Symbols

A—Thursday, Sunday
B—Saturday, Sunday
C—Monday, Wednesday, Friday
D—Daily
E—Tuesday, Thursday
F—Friday
H—Sunday, Monday, Wednesday, Friday
G—Tuesday, Thursday, Saturday
I—Irregularly
J—Tuesday, Thursday, Friday, Sunday
K—Monday, Friday
L—Wednesday, Saturday
M—Monday
N—Monday, Wednesday, Thursday
O—Monday, Tuesday, Wednesday, Friday
P—Except Tuesday, Wednesday
R—Sunday, Monday, Friday
S—Sunday
T—Tuesday
Th—Thursday
U—Sunday, Monday, Thursday
V—Sunday, Wednesday
W—Wednesday
Z—Tuesday, Friday
AC—Monday, Thursday, Saturday
AG—Tuesday, Sunday
AH—Monday, Wednesday, Saturday
AL—Except Monday, Sunday
AM—Monday, Thursday
AN—Tuesday, Saturday
Sa—Saturday
X—Except Saturday, Sunday
XB—Except Tuesday, Thursday
XC—Except Tuesday, Thursday, Sunday
XM—Except Monday
XS—Except Sunday
XW—Except Wednesday
XY—Except Tuesday, Sunday
XSa—Except Saturday



THE TRANSMITTER AT ROME

Listeners hearing the 12RO transmissions will be interested in this photograph of the Marconi transmitters employed at that station.

The DX Corner (Short Waves)

(*Continued from page* 29)

ann.), (Geneve), Address: 66 Rue Malevey, St. Servais, Namur.

OER2, Vienna, Austria, 11,800 kc., (Ruppert), 11,780 kc., (Hedgeland), daily except Saturday 9 a.m.-5 p.m., Saturday 9 a.m.-6 p.m., (from veri), (Foshay, Geneve, Partner, Doyle, Stevens).

HAT4, Budapest, Hungary, 9125 kc., Sunday 6-8 p.m., (Dressler, Alfred, Cindel, Hartmann, Hartzell, Doyle, Geneve, Ralat).

HAT3, Budapest, Hungary, 9120 kc., 12:30 a.m.-5:30 p.m., (Cartin, Doyle).

HAS3, Budapest, Hungary, 15,370 kc., 9-10 a.m., (Doyle, Partner, Doyle).

OXY, Skamlebaek, Denmark, 6050 kc., testing 4-5 p.m., (Lueth).

ERGU, Barcelona, Spain, 7150 kc., 5 p.m., (Betances), Slogan: "Radio Esquena."

"Radio Nobi," Moroso Column, Milicias Alicante, Spain, 7130 kc., 4:15 p.m., (Betances).

EA4TSD, Madrid, Spain, 7190 kc., 9 p.m., (Ralat), Slogan: "Emisora del Partido Socialista Espanol."

EA1VL, Pontevedea, Spain, 7275 kc., 5 p.m., (Betances), Slogan: "Radio Pontenedra."

EA4CL, Madrid, Spain, 7020 kc., (Betances).

UDD, Dunute, Aragon Front, Spain, 7150 kc., irregular, (Betances).

EAH, Valleras, Spain, 9480 kc., 11:15-11:45 p.m., (Beck).

ECN1, Barcelona, Spain, 6996 kc., daily 5 p.m., (Betances), Slogan: "Radio Esquerra."

"Falange #1," ECE1, Valladolid, Spain, 7010 kc., irregular and 5 p.m., (Betances), rebel station, daily 5-6:30 p.m., (Kober), 7200 kc., Sunday 7 p.m., (Ralat).

EAJ8, Bilbao, Spain, 67.4 meters, 8:25 p.m., desires reports, (Randle).

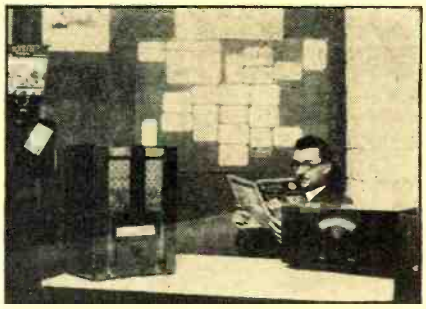
EARR, Madrid, Spain, 14,500 kc., 4-5 p.m., official rebel army station, (Geneve, Stevens).

"Radio Requete," San Sebastian, Guipuzcoa, Spain, 7200 kc., daily 5-8 p.m., (Ralat), 7100 kc., (Betances).

EAQ, Madrid, Spain, 9860 kc., 9 p. m., (Coover), 5:30-7 p.m., (Lopez) 9500 kc., desires reports. (Dressler, Alfred, Harris, Herzog, De Ment, Ralat, Beckemeyer, Shamleffer, Cartin, Fallon, Hays, Chambers, Sprague, Wollenschlager, Atherton, Tate, Hedgeland, Coover, Beckemeyer, Kemp, Doyle, Hare, Ryan, Wittig, Beck, Unger, Gossett), Address: P. O. Box 951.

MEET OBSERVER PIORKO

Poland is now well-represented by Observer P. Piorko, shown below seated in his DX Corner.



HAVE YOU THIS ONE?

Mr. Gustave A. Magnuson of Providence, R. I., is the lucky recipient of this verification from Sweden. We owe Observer Magnuson and his daughter an apology for a recent photograph showing Miss Magnuson as the XYL rather than the daughter.

EAQ2, Madrid, Spain, 9480 kc., 9:30 p.m., (Markuson), daily 6:30-7:30 p.m., (Shamleffer), Tuesday and Friday, 7:45-9:30 p.m., (Cindel, Weikal), requests reports, (Alfred, Schrock, Messer, Ralat, Atkinson, Harris, Hedgeland, De Ment, Fallon, Beckemeyer, Herzog, Wacker, Wilson, Beck, Ortiz, Jensen, Murphy, Tate, Lopez, Hurley, Kernan, Dressler, Black, Kemp, Buchanan, Staley, Kentzel, Coover, Murray), Slogan: "The Voice of Spain.' Address: P. O. Box 951.

"Radio Nacional," Spain, 14,000 kc., 2-2:45 p. m., (Hamilton).

CSW, Lisbon, Portugal, 9940 kc., 7 p.m., (Coover), 11,040 kc.-6 p.m., (from veri.), (Betances), daily 9 a.m.-2 p.m., (Smith, Jaime, Alfred, Hedgeland), noon-6 p.m., (Herzog. Dressler, Shamleffer), 6-8 p.m., 9940 kc..), noon-6 p.m., (11,040 kc.), (Lueth, Ralat, Doyle, Kemp, Ryan, Buchanan, Kernan), Address: Rua do Quelhas, Lisbon.

CT1AA, Lisbon, Portugal, 9650 kc., (Jaime), Tuesday, Thursday and Saturdays 4-7 p.m., Sundays until 8:15 p.m., (Alfred, Randle, Sporn), 9663 kc., (Buchanan).

CSL, Lisbon, Portugal, 6150 kc., 7-9 a.m., (Cartin).

Lisbon, Portugal, 5970 kc., 2-5:30 p.m., Catholic station. (Geneve).

RKI, Moscow, U.S.S.R., 15,080 kc., 2 p.m., (Atherton, Kemp).

RNE, Moscow, U.S.S.R., 12,000 kc., (Gallagher), Sunday and Wednesday, 6-7 a.m., Sunday 10-11 a.m., (Atherton, Alfred), Sunday 4-5 p.m., (from veri.), (Law, Hedgeland, Herzog), Monday, Wednesday and Friday 4-5 p.m., (from veri.), Foshay, Hartzell, Blanchard, Hedgeland). 12,190 kc., wants reports, (Fallon, Kemp, Buchanan).

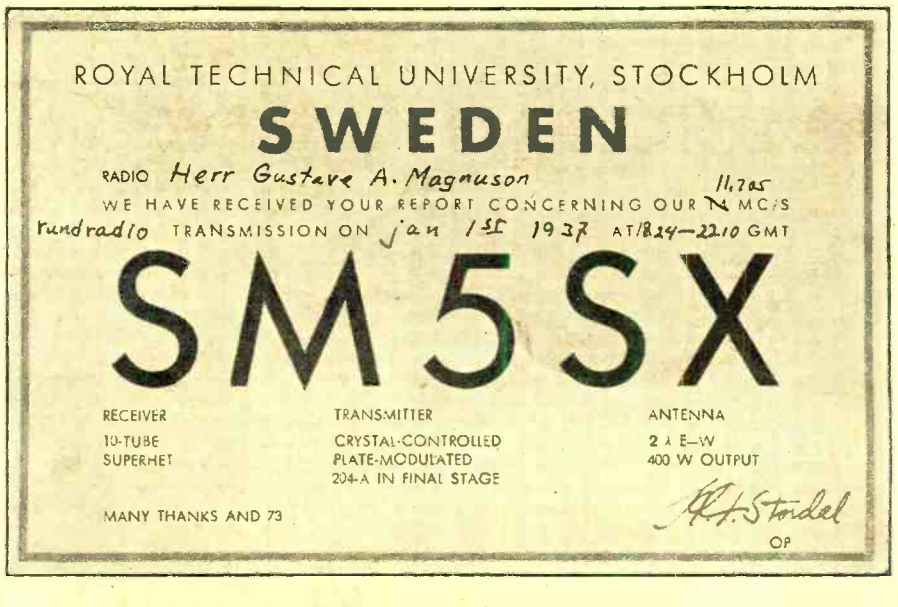
RAN, Moscow, U.S.S.R., 9600 kc., 6-7 p.m., (Lopez), daily 7-9:15 p.m., (Atherton, Fallon, Alfred, Law), 9520 kc., (Wittig, Foshay, Hartzell, Doyle, Blanchard, Dressler, Shamleffer, Ryan, Kentzel, Randle, Howald, Herzog), Address: Radio Centre, Moscow.

RV59, Moscow, U.S.S.R., Sunday, Monday, Wednesday and Friday, 4-5 p.m., (Atherton), 5996 kc., (Alfred), daily 7-9:15 p.m., (from veri.), (Law, Herzog, Blanchard, Spain).

HBO, Geneva, Switzerland, 11,402 kc., (from ann.), (Alfred), until 8:05 p.m., (Shamleffer), Saturday 7:25 p.m., (Dressler, Ralat), 9340 kc., (Beck).

HBJ, Geneva, Switzerland, 14,535

(*Turn to page* 46)



"OPEN"—FOR BUSINESS!

The closet-door work-bench opened up for use, with the extension lamp in place and all tools handy.

A "Closet-Door" RADIO WORK Bench

By Walter L. Linde

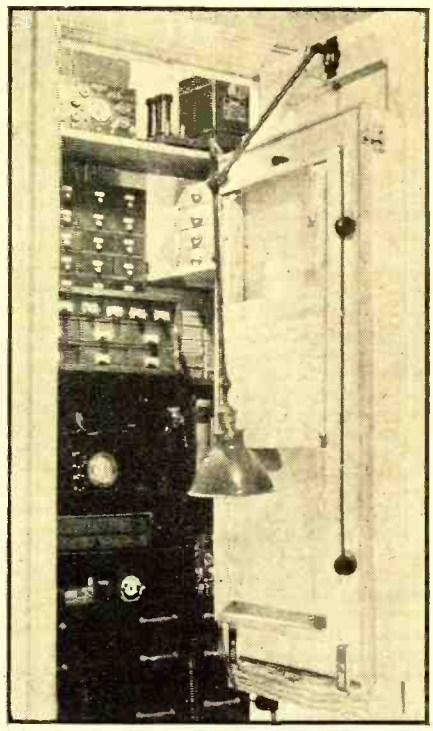
HERE is the ideal Work Bench for the small apartment. Due to the ease with which it can be folded out of sight it meets with the hearty approval of the most critical housewife!

FOR many years it was my fond hope to have a Work Bench for my own exclusive use. In common with many other home experimenters it was my misfortune to have only the kitchen table available to work on. It always seemed to me that the minute my work became most interesting I would have to remove my apparatus and clear the table for some meal. This meant that the apparatus and tools would have to be carried back and forth to the closet which was alloted as a storeroom.

Becoming disgusted with the continual interruptions, it was decided that a permanent Work Bench was needed to keep peace in the home. An agreement was reached with the family to build a bench *provided that it did not destroy the appearance of the room used.*

After a careful survey of the available space it seemed that a bench in the closet used for storage would suit the requirements, but this had the objection of being cramped to work at because it was necessary to sit within the doorway when working at the bench. After several variations the bench had evolved itself into a simple drop-leaf attached to the inside of the closet door which opened into my bedroom. While this was satisfactory to work at the inaccessibility of tools was a stiff problem. The final design brought about a combination tool-rack and drop-leaf work table.

The plans called for a rectangular box, the cover of which was to be used as the drop-leaf, work-table. The size was determined by both the door and the fact that a standard sized 48 by 48 inch 5-ply veneer panel would supply all the main lumber without any waste. The overall size of the cabinet when closed is 48 inches high, 21 inches wide and 6½ inches deep. The back of the cabinet and the drop-lid are both 45 inches by 21 inches. The sides are 3 inches wide by 48 inches long and are mounted on the face of the back (*Turn to page* 60)

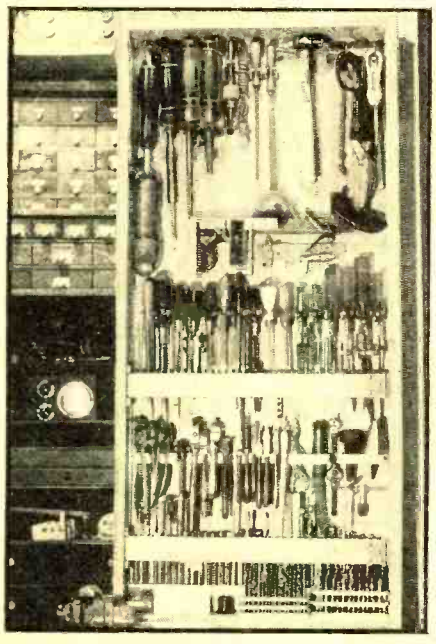


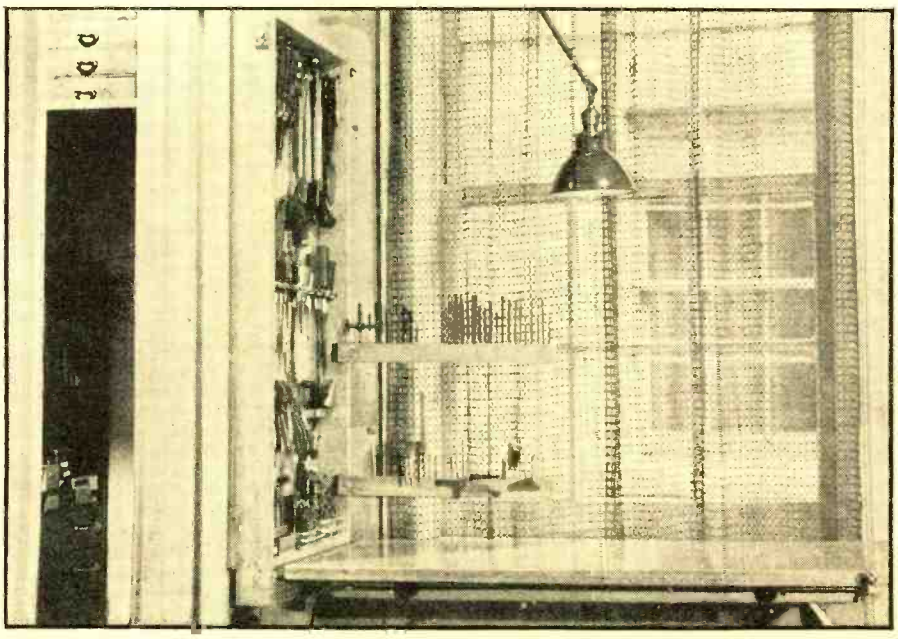
"CLOSED"—FOR LUNCH!

The work-bench is shown here folded up against the door, which, when slammed, cleans up the room.

COMPREHENSIVE TOOL CHEST

Below, at left: View of the tool-box ready for instant use. At right: Close-up of the installation with the drill holders swung out in handy position.





The RADIO WORKSHOP

Items of interest for beginners, experimenters and radio constructors.

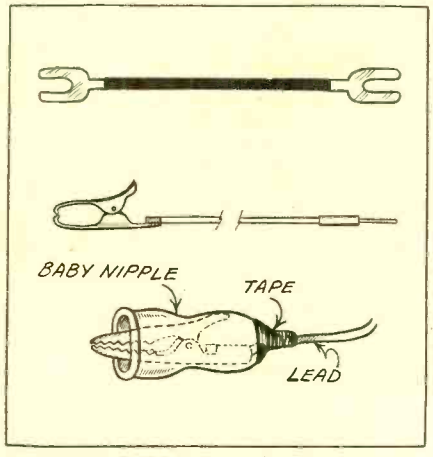
Conducted by The Associate Editor

Kinks For Every Experimenter

The following hints are of use to all radio experimenters and set builders. The devices described are easily made and are time savers in all kinds of radio testing.

The first is a handy connecting lead of No. 18 stranded push-back wire with large spade type lugs at each end. For my use I made a half dozen leads of 6-inch length, and the same number of 12-inch length. The drawing for this kink is self-explanatory.

The second device is also a connecting lead, but it makes use of a Muller or Morse clip and a phone tip. Number 18 stranded rubber and cotton-covered wire is used for



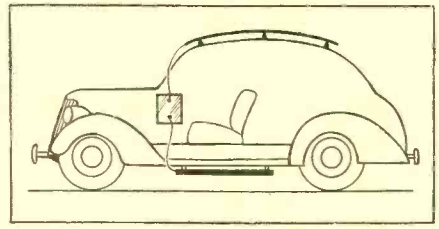
this lead. After the covering has been removed about ¾ of an inch at each end of the lead, clean, twist, and tin the wires. Set the phone tip in a vise and fill with solder, then push the lead into the tip and allow to cool. The other end can be made fast to the clip by pushing the lead through the sleeve and hole at the end of the clip. For a neat and lasting job, it is important that you use electrician's rubber tape for binding the ends.

The third makes use of a baby's nipple and if you are a family man and have such things in the house, you can use discarded nipples to advantage for this idea. Cut a ¼-inch hole at the tip and stretch over the clip, tape as shown, and you have an insulated clip, neat in appearance and safe to use for those "hot" connections.

RICHARD FEENEY,
New York City, N. Y.

Antenna Kink for Motor Car Radios

The signal strength of an automobile set using any type of roof or car top antenna can be increased from 20 to 40 percent by using a counterpoise antenna as shown in the accompanying illustration. The counterpoise can be mounted under the car chassis or under the running board and for this purpose a standard under-car aerial is used

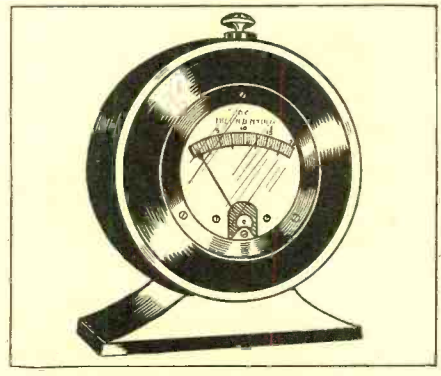


or an improvised antenna can be made from two or three continuous spans of No. 18 insulated wire fastened to any of the projecting bolts on the chassis at the front and rear of the car.

To make this item work, it is first necessary to perform a slight operation on the primary winding of the antenna coil. One end of this winding is connected to the aerial, while the other end, in most receivers, is connected to the ground end of the secondary winding thus completing the ground circuit. Now this end of the primary winding should be disconnected from the secondary and brought out to the counterpoise aerial under the car. Try this kink and you will be surprised at the increased pick-up.

Save Old Alarm Clocks

This little kink uses the case of a broken alarm clock as a mounting for a meter. The alarm clock happened to have a pedestal mounting and fortunately was of the larger size. The glass and works were removed from the clock and a piece of bakelite cut to the size of the glass and inserted in its place. A hole was cut in the middle of the bakelite disc and the meter mounted in the usual way with three machine screws. The metal alarm clock case was then painted a dull black.



CHARLES FELSTEAD,
Los Angeles, Cal.

Saves Time

Fellow experimenters will agree with me, that there are some makes of metal tubes that require a good weather-eye to distinguish the type number. In some cases the number is merely stamped in the metal envelope and in others the white filler employed is inadequate for the purpose.

Tubes of this sort I re-mark with china white as illustrated in the photo. You will find this idea of material assistance for quickly selecting different tubes for the requirements at hand. While you are at this job of marking, put the date on the collar of the tube, it can be the day the

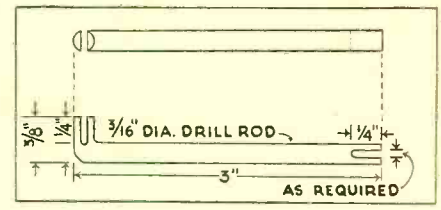
tube went into service or the purchase date.

Before marking the tube, clean the metal with a little ammonia to take off the grease. After marking, coat with shellac or other fixative.

HERMAN GERTZ,
New York, N. Y.

A Contact-Spring Adjusting Tool

This little tool is used for adjusting or tensioning the contact springs of head-set



jacks, radio switches, the spring rotor contact of variable condensers and similar apparatus. The ordinary pliers and tweezers are generally too unhandy for this work. The radio serviceman will find that several "spring benders" of the kind shown in the appended sketch will greatly expedite such adjustments.

The tool (at least two should be made) is made of a piece of 3/16-inch diameter steel rod about 3½ inches long. One end of the rod is bent at a right angle about ⅜ inch from the end. Both ends of the tool are slotted to a depth of ¼ inch by means of a hacksaw. The slots should be slightly wider than the thickness of the contact springs upon which the tool will be used. After the slots are cut, both ends of the tools should be hardened and tem-

Cash for Kinks

EVERY experimenter, from time to time, works out some simple idea or kink that could be profitably passed along to his fellow experimenters through the "Radio Workshop", a department which caters especially to the exchange of such ideas. Send your ideas to the Workshop Editor, and wherever possible include a simple but clear drawing or a photograph. All ideas published will be paid for at regular space-rates.

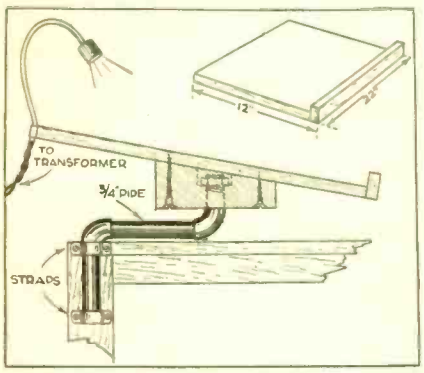
pered, but this is not absolutely essential.

To bend or tension a spring, one of the tools is applied to the spring at the point where the latter is to be bent, with the spring held in the slot at one end of the tool. A second tool is placed upon the spring in like manner, close to the first. By holding one tool in one hand and manipulating the second tool with the other hand, the spring may be readily bent and tensioned as desired.

P. A. STARCK,
Sioux City, Iowa.

Rack for Radio Manuals

It is the general experience of anyone connected with a service shop or laboratory, that after ten minutes work, the bench even though it be a large one, is covered with various parts, test equipment, tools



and whatnot and there is no place for the service manual or text book which one requires for the job at hand.

The accompanying drawing shows a book rack arrangement which I use and have found extremely helpful. It is no job to construct and mount this rack and the builder will find the drawing complete with all dimensions. For the book rest itself I use ¾ inch pine and for its swivel support I employed ¾ inch standard conduit. The most convenient place for mounting the rack is the front corner of the bench.

The light and bracket are made from an auto-fender guide. A coil shield from an old Readrite oscillator, came in handy as a reflector. A regular filament transformer operating from the 110 volt 60 cycle a.c. line, furnishes 6.3 volts for the dial lamp. Painting the inside of the coil shield with a flat white improves the reflection. The rack can be swung clear and away from the bench when it is not in use.

J. HARRY GERRISH,
Watertown, New York.

Simple Laboratory Output Meter

An easily constructed output meter with a very low frequency error can be made with a type 6H6 rectifier tube used in conjunction with either a 1-milliampere or a 200-microampere meter as shown in the accompanying drawing and illustration.

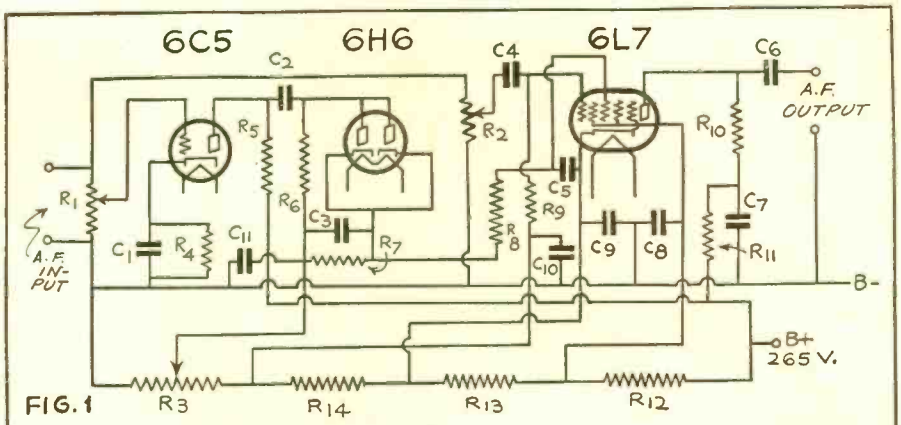


FIG. 1

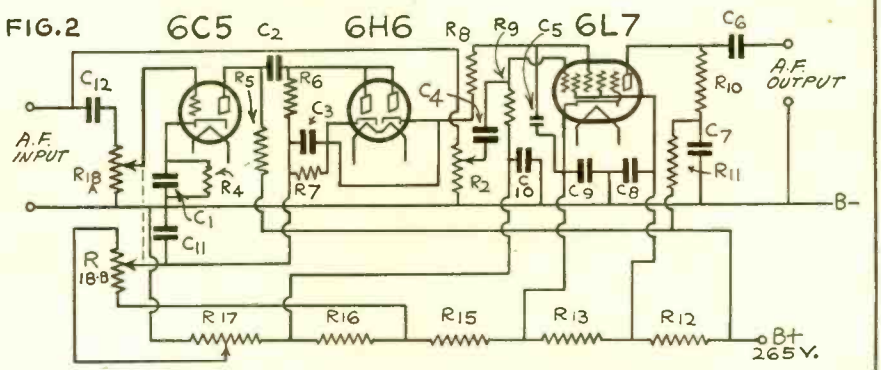
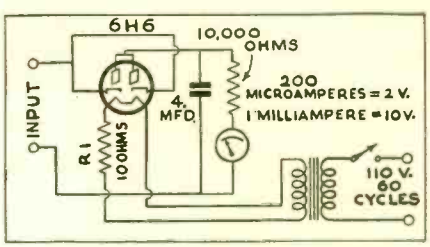
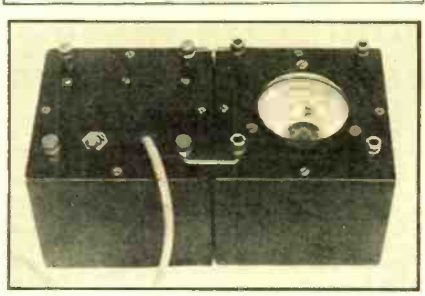


FIG. 2

R1 - 1 MEG. EXP CONT.
R2 - 1 MEG. - VOL. CONT.
R3 - 500 OHMS - BIAS CONT.
R4 - 10,000 OHMS
R5 - 100,000 OHMS
R6 - 100,000 OHMS
R7 - 250,000 OHMS
R8 - 500,000 OHMS
R9 - 1 MEG.
R10 - 100,000 OHMS
R11 - 10,000 OHMS
R12 - 15,000 OHMS - 5W.
R13 - 10,000 OHMS - 5W.
R14 - 1000 OHMS
R15 - 300 OHMS
R16 - 850 OHMS
R17 - 1000 OHMS - BIAS CONT.
R18A, R18B - 500,000 OHMS, 5,000 OHMS } EXP. CONT.
C1 - .5 MFD. - 200 V.
C2 - .1 MFD. 400 V.
C3 - .5 MFD. - 200 V.
C4 - .1 MFD. - 200 V.
C5 - .5 MFD. - 200 V.
C6 - .1 MFD. 400 V.
C7 - 4 MFD. - 300 V.
C8 - 4 MFD. - 300 V.
C9 - 10 MFD. - 50 V.
C10 - 10 MFD. 25 V.
C11 - 10 MFD. - 25 V.
C12 - .01 MFD. 200 V.

The instrument has been tested up to 20,000 cycles with less than 5 percent error. To use it, simply connect the input leads across the voice coil. The 10-ohm resistor, R1, is utilized to reduce the filament voltage, thereby decreasing the contact (no signal) emission to less than 5 microamperes. An inexpensive transformer with a 6-volt wind-





ing is used to furnish the filament voltage.

Referring to the illustration, the box at the left contains the filament transformer, tube, switch, resistors and condenser; the second box, as shown, houses the meter. The boxes are 4 inches square. The experimenter can set up this equipment to suit his individual convenience.

K. A. CONSTANT,
New York City, N. Y.

An Improved Volume Expander

The standard volume expander, Figure 1, operates by increasing the gain from a very low value to maximum, as the i.f. input increases. When the degree of expansion is reduced (by applying a smaller portion of the input voltage to the buffer tube), the available maximum gain is also reduced; at zero expansion the 6L7 third grid is at minus 13 volts and the gain is minimum. The ordinary expansion control acts, in other words, to reduce not only the expansion, but also the average gain. As the degree of expansion is changed, then, it becomes necessary to readjust the volume control in order to maintain a comparable output level.

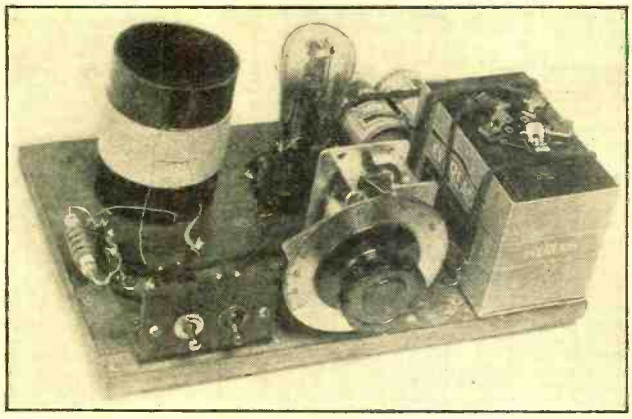
This condition may be materially improved by using a dual potentiometer as compensated expansion control as in Figure 2. The first section (R18a) controls the buffer input as usual. The second section (R18b) makes the return of the 6L7 third grid less negative as expansion is reduced; at full expansion it is —13, as usual, and at zero expansion it is —3, providing full gain. This improvement, while allowing full control of expansion, maintains maximum gain about constant. Some readjustment of the volume control may still be necessary, but in general the effect is to separate the functions of volume control and expansion control, a highly desirable improvement. A dual 500,000-5000-ohm potentiometer is produced by the Yaxley Company. If a 1-megohm, 5000-ohm unit is obtainable, use it and omit C12.

EUGENE WILLIAMS,
New York City, N. Y.

Improved Condenser Tester

My neon condenser tester, as originally connected in Figure A, falsely indicated leak-

(*Turn to page* 63)



THE SIMPLE TEST OSCILLATOR

A 2-band oscillator which covers the range of 176 to 1550 kilocycles and offers the advantages of low cost, simplicity and wide utility.

The RADIO Beginner

Part 12—Test Oscillator

By The Technical Editor

EVERY experimenter and set constructor needs a test oscillator and some form of output meter or indicator. These devices are indispensable in accurately aligning both r.f. and i.f. circuits in receivers, and for calibrating receiver tuning dials, checking such calibrations, etc. The present article is therefore devoted to a description of the simplest possible instruments needed for this work. The next article of this series will be a constructional description of a superheterodyne receiver and those who construct that receiver will find the test equipment described this month invaluable in adjusting the receiver for maximum results.

A TEST oscillator is nothing but a miniature broadcasting station, which can be tuned to any frequency within the desired radio-frequency or intermediate-frequency ranges. The one presented here is of a simpler type which will serve to excellent advantage for alignment work, and for many other test purposes.

There are several possible oscillator circuits to choose from as the reader learned in the previous installment. The one selected here is the "series-feed Hartley" circuit. It has the advantage of requiring only one coil (for each range) and being easier to make oscillate all over the range.

Two Ranges Needed

The oscillator must cover the entire broadcast band and the intermediate frequency region (our super employs 456 kc.). It is not practical to cover these in a single range, therefore two ranges are provided, necessitating the use of two coils and a switch. This circuit is illustrated in Figure 1. A careful study of the diagram should enable the reader to add more ranges if he desires by adding more coils and employing a two-gang multi-point switch.

The instrument was made battery operated for the sake of simplicity, easy portability and avoidance of difficulties due to the inter-connection between receiver and oscillator through the power line.

Modulation

In order that the oscillator shall produce an audible signal which is necessary for certain applications, it has to be modulated. The system of modulation employed here utilizes the grid-blocking method. This is nothing more than a grid leak and condenser combination wherein the condenser or leak or both are higher than normal. A large condenser receives a large charge during the periods when the grid becomes positive. This charge must leak off through the resistor. If the resistance is so high that the charge cannot leak off fast enough, the charge accumulates making the grid more and more negative until oscillation stops, allowing the charge to leak off. As soon as the condenser is sufficiently discharged, oscillations start again and the cycle repeats. The interruption occurs at audio-frequencies and the pitch of the note depends on the sizes of grid leak and condenser. This type of modulation produces a somewhat raucous note, but it is satisfactory as an audible signal.

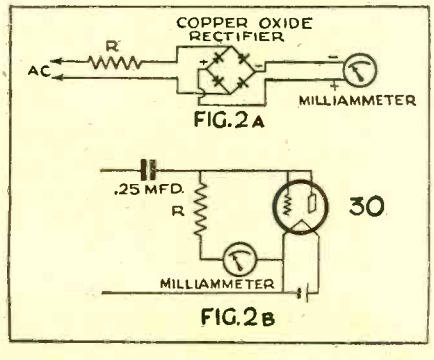
When it is desired to use the oscillator unmodulated, the grid condenser C2 should be changed to .00025 mfd. and the resistance R2, to 50000 ohms. If desired, a switch could be used to change from the one to the other.

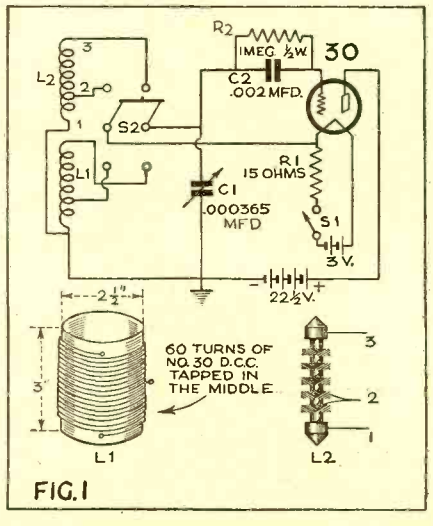
Construction

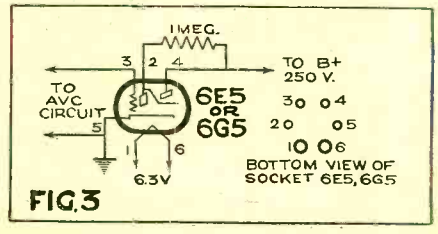
The layout and wiring should be easy for followers of this series. Condenser C1 is a variable condenser, while the dial, together with the socket, tube and batteries, can be salvaged from the first single-tube set.

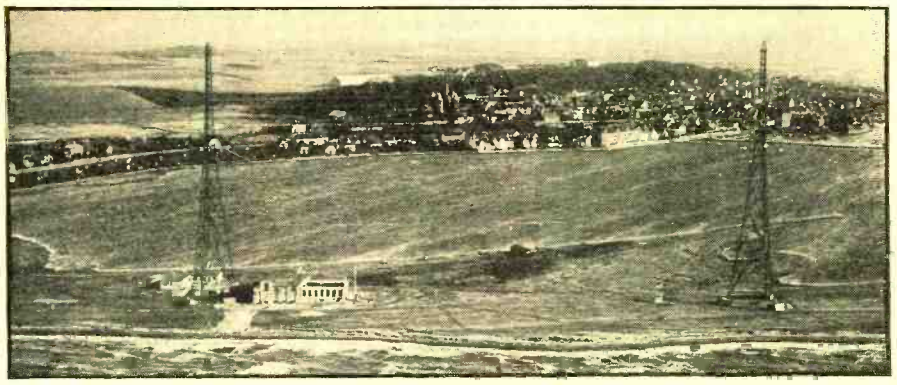
The broadcast band coil is home-made, wound on a 2½-inch bakelite form; 3 inches in length. It requires 60 turns of No. 30 d.c.c. magnet wire, with the tap at the 30th turn. Coil L2 is made from a Hammarlund r.f. choke, type CHX. This choke consists of five sections or "pies"; the tap is taken between the first and second pie. When making this tap, one must proceed carefully so as not to ruin the coil. The connecting wire between the two pies goes from the inside of one to the outside of the next. Unwind the wire, on the outside for several turns without cutting it. Then cut near the outside end, and unwind the short end several turns more so as to provide two leads each about 2 inches in length. Clean the ends by carefully scraping away both the covering and the enamel. The two ends can then be soldered together and to the center terminal of the terminal strip.

The whole unit, batteries and all, has been mounted on a base-board, not employing a panel. A small strip of bakelite supports the switches and an indicator for the dial is made of a piece of wire fastened to C1. Those who have a condenser with a (*Turn to page* 61)









OXP, KALUNDBORG, DENMARK
An airplane view of this famous Danish station which operates on 240 kc. with 60 kw. power. The scenic beauty of the view leaves little to be desired.

THE DX CORNER

(For Broadcast Waves)

S. GORDON TAYLOR

A NOT-TOO-FAVORABLE DX season during which the noise level has remained high almost constantly, has drawn to a conclusion. Much of the DX which has been accomplished has been possible only because of the increased power used this season for the first time by many foreign and domestic stations.

Personal observations and an analysis of Observers' reports for the past three years show that DX has apparently been on a decline. This seems to bear out the theory of the sun-spot cycle and its effect on broadcast-band DX. Other factors are likewise involved, of course, but there can be little question that as the sun-spot area increases the long-distance transmission of signals decreases. Whether this is because noise increases or because signal strength decreases is unimportant because poor DX is the result in either case.

We are approaching the sun-spot peak of the present 11-year cycle. The actual peak is expected during 1938 and after that sun spots will gradually decrease, reaching a minimum in 1943. All of this appears discouraging for the DX'er as it indicates that the next two seasons are likely to be worse than the one just past. Then we will again start on the up-grade, probably reaching the peak of DX in 1943, with reception conditions approximating those of 1933.

It is not the purpose of this discussion to be unduly pessimistic, but on the other hand it is felt that DX'ers in general may as well face the facts. We can use better receivers, and transmitters are constantly increasing their power, but even these can only partially overcome the obstacles which nature is throwing in the path of the DX'er.

Lest we be accused of being a calamity-howler and a "tearer-downer" we hasten to suggest some possibilities of interest to those who have grown discouraged in their DX hobby.

Short-wave broadcast reception has held up beautifully during the years since 1934 when long-wave DX started slipping. Therefore, this suggests itself as one line of activity which the BCB DX'er may select. Another, and one which many listeners are finding of more absorbing interest than short-wave broadcast reception, is that of DX'ing on the amateur phone bands. In many respects the "ham" ranges are among the choicest for DX reception because the average amateur station employs power in the order of a few watts. On 75 meters, for instance, reception of a 25-watt "ham" phone from the opposite coast is a real bit of DX, and reception of such phones from across the Pacific is a feat which will test the perseverance and ability of any listener.

On the 20-meter amateur phone band real DX is again made possible by the low power in common use, although round-the-world reception is not so unusual on this band. The 10-meter band is perhaps of less interest to the DX'er because when this band is "open" there is almost no limit to the distance at which stations can be heard, even those with insignificant power.

The still lower waves extending from 10 meters to 5 meters constitute an entirely new field of activity for DX. Not so long ago these waves were considered to be good only for local transmission and reception but some of the "apex," high-fidelity stations in the U. S. have been authentically heard in Australia and New Zealand, and are commonly heard in Europe. British television transmissions on 6.5 meters have been picked up (and reports verified) in South Africa and U. S. amateur signals on 5 meters have been heard frequently in Europe and vice versa.

It is becoming more apparent that the DX'er who is going to obtain the maximum enjoyment from his hobby is the one who goes in for all-wave activity. During the daytime, in Summer, and during the period of the sun-spot cycle when broadcast-band DX is less attractive, then the short and ultra-short waves offer excellent possibilities for DX. Many veteran BB DX'ers who have felt that DX on the short waves was child's play have learned different during the past few months when they have really given it a fling, with the result that many such are now among the most rabid of the s.w. listeners.

AN ENGLISH DX'ER REPORTS

AN English listener once reported reception on his crystal set of an American broadcast band station. Naturally his claim was not universally believed. But when reception conditions are favorable, it *is* easily possible to hear such stations on a 2-tube receiver. The radio used by the average English DX'er has from 3 to 7 tubes, but it must be remembered that many of these tubes are of the compound types such as the double diode-triode, double diode-pentode, etc.

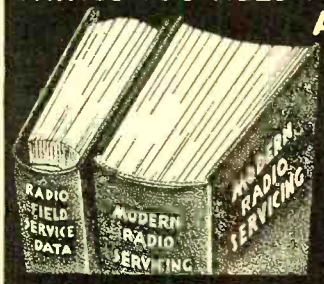
North American signals are strongest during November, December, and January, although good reception, depending upon conditions, is possible from September to May. Reception of sorts is sometimes obtained even in the summer months. Stations have been received as early as 9:30 p. m. (4:30 p. m., E. S. T.) and as late as 9 a. m. (4 a. m., E. S. T.) but the best listening period varies from 11:30 p. m. to 6 a. m. in mid-winter to 2:30 a. m. to 3:30 a. m. in mid-summer.

Among the United States stations

(*Turn to page* 63)

VETERAN L.P.O.'s
Maynard J. Lonis of Hannibal, N. Y. (left) is no stranger to Trans-Pacific reception. He reported 13 such stations during the month of March. At the right is Herman E. Rebensdorf of Harvard, Ill., who likewise reports reception of TP's frequently, although lacking electric light lines he is forced to depend on battery power supply.

They give you the 417 THINGS YOU NEED TO KNOW ABOUT



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1736 Pages 813 Illus.

These two GHIRARDI books explain clearly EVERYTHING about radio servicing—everything there is to know! SUPPLEMENTS supplied for the Data book several times a year keep it up to the minute. Essential equipment for your shop. Get these great books Now!

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● SERVICING METHODS — Every latest test and repair method clearly explained. Receiver analysis. Repairing individual components. Aligning sets (including latest Cathode-Ray Oscilloscope methods), AVC and QAVC circuits, etc.

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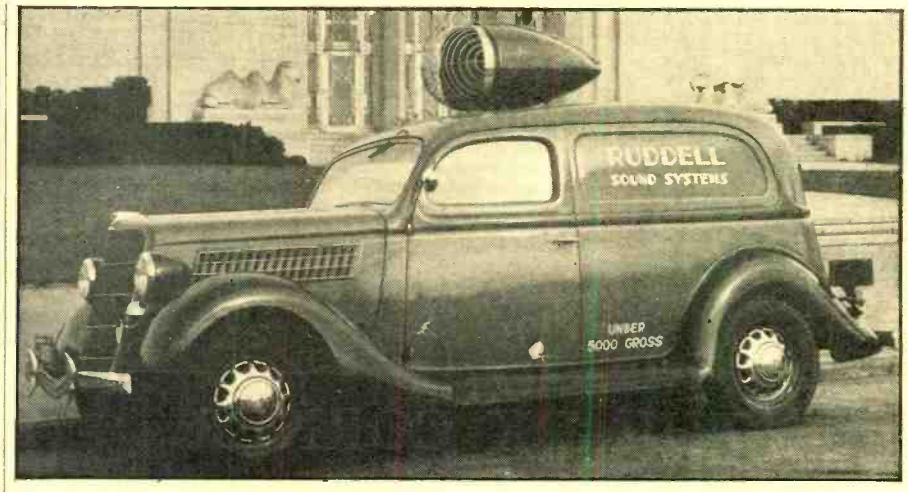


FIGURE 5
A "business card" on wheels, with a sales argument on both sides!

THE SERVICE BENCH

(*Continued from page* 12)

considerable value in routine testing. A slight over-drain usually indicates a short-circuited by-pass in a plate or screen circuit. If the needle swings quickly to full scale, this is practically always an indication of a short-circuited filter. Low wattage indicates an electrolytic that is low in filtering effect. All this takes only a few minutes and often gives a pretty good idea of where to look for trouble."

"Volts times amperes" do not give a.c. watts except in purely resistive circuits. The value of the volt-amperes must be multiplied by the power factor which, in the case of small transformers under full load, is about 90%. That is, the value of volts times amperes will run around 10% higher than the actual wattage, and allowance should be made for this apparent excess. Also, the power factor will vary with the load, and the load will change with different troubles—the lower the load the lower the power factor. Thus a drop in current will indicate a more than proportionately I^2 drop in power. Probably the wattmeter is the best arrangement, although as Mr. Olson points out, the ammeter-voltmeter layout has its advantages.

Stewart-Warner Model R-142-A

"This set was dead—plenty. The 110-volt power switch had failed, short-circuiting to the volume-control case and grounding. Net result, one burned-out power transformer, two filter condensers and a bias resistor in the return lead. A 6X5 rectifier tube was not available, but an extra 5-volt winding on a new Stancor power transformer allowed the change to a 5Z4 with satisfactory results. This repair is obviously of a general nature, and applies to many receivers. However, the specific diagrams tell the general story and A and B of Figure 3 are the 'before-and-after' circuits respectively."—Louis E. Jones, Ace Radio Service, Ohley, West Va.

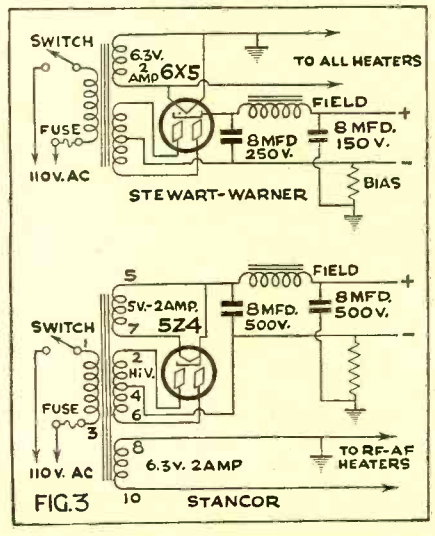


FIG. 3

Dewald 506R

Vernon D. Hobbs, of Vern's Service Bench, West Lafayette, Ind., operating in Purdue University's home town, gets plenty of midgets! "This baby midget came in with the usual complaint—hum and bad distortion. Replaced the complete filter block, although the double 5's were O.K. This chassis is too small for two blocks. This cleaned up the hum, but the distortion persisted. All voltages and the volume control checked correctly. I finally connected a 1000-ohm resistor between the cathode of the 6C6 and the chassis, as shown between Points X and Y in Figure 4. This job employs an antenna-bias, volume-control system, and the mutual conductance of the circuit is not decreased sufficiently when the volume is on 'low.' If a new control is to be used, be sure to replace with one having a minimum-bias control already included. This has an external adjustment and with a little cut-and-try it seems to work out well on all antenna-bias systems."

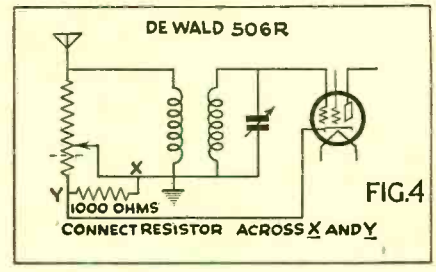


FIG. 4

Selling Sound

The photo of Figure 5 is the *reverse* side of the standard-size business card handed out by the Ruddell Sound Systems, Seattle, Washington. The other side carries the

(*Turn to page* 45)

RCA ALL THE WAY

RCA Radio News

RCA Manufacturing Company, Inc. • Camden, New Jersey
A Service of the Radio Corporation of America

EVERYTHING IN RADIO—MICROPHONE TO LOUDSPEAKER

To the consumer, RCA means high quality performance at low cost...To the radio man, RCA means easier selling, higher profits

ENJOY NEW RADIO THRILL!

Thousands Getting New Pleasure from Radio that's RCA All The Way!

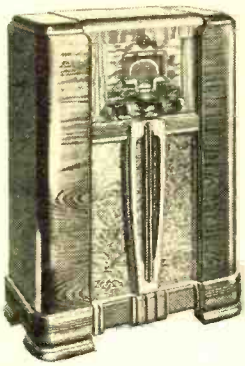
The air is full of thrills! Every hour of every day finds colorful, exciting programs being broadcast for you to hear—to enjoy!

As fine as these programs are—it's up to *you* to get the thrill of radio that's RCA All the Way—perfect performance beginning with the RCA microphone in the studio and coming to you with equal perfection from your RCA Victor receiver. Only by owning an RCA Victor radio can you get this thrill.

They Cost as Little as $20

You can enjoy radio that's RCA All the Way at low cost with one of RCA Victor's new 1937 models! They are now on display at your RCA Victor dealer's store. Designed for every purse they cost as little as $20. Among the many models priced below $100 are several with RCA Victor's Magic Brain, Magic Eye, Metal Tubes. Every chassis is housed in a beautiful cabinet — and there is a large variety of cabinet styles—one of which is sure to catch your eye. At slightly higher prices are the fine models which feature RCA Victor's latest triumph—the Magic Voice.

But visit your dealer. See and hear these superb radios. Take particular notice of their thrilling performance. Then match them against any other radios of equal price—and RCA will win you!



RCA Victor Console Model 9K3 . . . with Magic Voice. Magic Brain, Magic Eye, Metal Tubes. 530 to 22,000 kcs. Beam Power Amplification. Selector Dial. 9 tubes, $134.95.

New Tube Manual!

The RC-13 Manual on RCA Radio Tubes gives service men complete information on all receiving tube types including Metal and G-Series tubes. Get your copy from your RCA tube distributor.

RCA Radiotron Check-up Restores Radio's Pep and Power

Radios, like anything else that's constantly in use, eventually tire and lose the efficiency which gave you outstanding performance when the set was new.

You can restore your radio's original pep and power—give it new life and "new set" tone by having your radio service man administer the cure-all of an RCA Radiotron check-up.

This check-up consists of 10 testing, cleaning and adjusting steps which cost you only $1.50.

Get More Service Jobs— Push the Check-Up

If you're a service man you will discover, as hundreds of other men in your business have, that the RCA Radiotron Check-up Plan not only gives you additional service jobs but in addition, helps you sell parts, new sets and other appliances that you have for sale.

You will find the RCA check-up an easy service to sell. Because there's nothing unusual about check-ups in American life. People are accustomed to check-ups of all sorts. They know the value of check-ups. Therefore, a radio check-up is quite acceptable.

You get selling help, too, direct from RCA Radiotron. For full column advertisements are running in the Saturday Evening Post and Collier's every other week . . . newspaper ads are appearing in over 100 cities . . . the check-up is being featured with commercial announcements on a full hour Sunday radio program. And in every one of these advertising efforts RCA Radiotron is featuring *you* as the man to perform this check-up service. In addition, RCA Radiotron also offers you mailing pieces for your own use—mailing pieces that will include your own name and address and which will bring you directly to the attention of all your prospects. Secure yours today. Use them. Get behind this check-up service—and profit! You can get full details from your jobber, who will also be glad to tell you about the new RCA Radiotron Auto Radio Check-up.

This is P. A. Time— The Time to Cash In!

Warm weather and bright sunshine are here. And that means it's P.A. time—and the time for you to cash in on installations of public address systems.

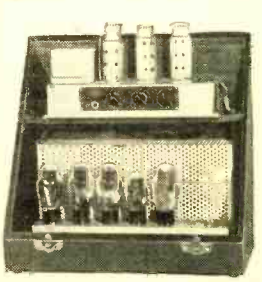
Your prospects? There are many. This season of the year is ideal for outdoor installations such as in amusement parks, athletic fields, camps, resorts, swimming pools and "garden" night clubs.

The best way for you to get your share of this P.A. business is to offer prospects RCA equipment. Public address systems bearing the RCA trademark provide real quality. And that's only natural. For behind them are the years of experience RCA has gained as the world's leading maker of sound products.

RCA offers these portable P.A. models that will cover all your needs for the type of equipment. Both give you the sales advantage of the RCA name. All are literally packed with performance features that help make them easy to sell. All sell at modest cost—yet assure you good profits.

Get after the P.A. market today. Get your share of the profits that are in it. Push the RCA public address systems shown here—and win many installation jobs! Write us for free details.

RCA Portable Sound System PG-98 . . . provides volume for audiences up to 1600 persons. 12 watts. RCA Velocity Microphone. Two Electro Dynamic Speakers. Easily accessible controls. Comes complete with six RCA Radiotrons.



RCA Portable Sound System PG-62-E . . . provides volume for audiences up to 3,000 persons. 20 watts. RCA Velocity Microphone with adjustable banquet stand. Two special Electro Dynamic Speakers. Provides for mixing voice with musical background. Comes complete with seven RCA Radiotrons.

In addition to these two systems shown above, RCA also offers another Portable Sound System, the PG-63-B—a 6-watt system providing volume for audiences up to 600 persons.

—says

MR. FRANCIS D. WARDNER

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Lesson 63—Filters

IN designing a band-pass filter we usually have three things given: The impedance the filter is to work out of, or into, and the upper and lower cut-off frequencies. With this data, the capacitances and inductances are found by the following formulas:

$$C_1 = \frac{f_1 + f_2}{4\pi f_1 f_2 Z} \text{ (farads)}$$

$$C_2 = \frac{f_1}{\pi f_2 (f_2 - f_1) Z} \text{ (farads)}$$

$$L_2 = \frac{(f_2 - f_1) Z}{4\pi f_1 f_2} \text{ (henries)}$$

C_1 and C_2 are the capacitances in farads, as indicated in the conventional band-pass filter shown in Figure 1, L_2 is the inductance of each coil in *henries*, f_2 is the higher cut-off frequency in cycles per second f_1 is the lower cut-off frequency, Z is the characteristic impedance of the filter. As with the other filters described, Z should be made as nearly equal to the impedance of the source and load as practical. In practice, the impedance selected is usually that of the line, for some frequency near the middle of the pass-band. The use of these formulas may be illustrated by the following example:

Example: It is desired to make a band-pass filter for a superheterodyne receiver; the filter is to pass a band 10 kc. wide and is to have its cut-off frequencies at 100 and 110 kc. It is to be terminated at one end by a resistor of 50,000 ohms which is in the plate circuit of a 227 type vacuum tube having a plate impedance of 10,000 ohms; at the other end it is terminated by a variable grid leak which is adjusted to match the impedance of the filter.

Solution: Impedance R, of the parallel circuit feeding into the filter:

$$\frac{1}{R} = \frac{1}{50{,}000} + \frac{1}{10{,}000} \text{ or } R = 8350 \text{ ohms (approx.)}$$

$$C_1 = \frac{f_1 + f_2}{4\pi f_1 f_2 Z} =$$

$$\frac{100{,}000 + 110{,}000}{4\pi \times 100{,}000 \times 110{,}000 \times 8350} =$$

.000182 microfarads

$$C_2 = \frac{f_1}{\pi f_2 (f_2 - f_1) Z} =$$

$$\frac{100{,}000}{3.14 \times 110{,}000 \times 10{,}000 \times 8350} =$$

.003467 microfarads

$$L_2 = \frac{(f_2 - f_1) Z}{4\pi f_1 f_2} =$$

$$\frac{10{,}000 \times 8350}{4\pi \times 100{,}000 \times 110{,}000} = .0006 \text{ henries}$$

Note: In the above solutions C_1 and C_2 have been changed to mfd. by multiplying the answers given by the formulas by the conversion factor 1,000,000.

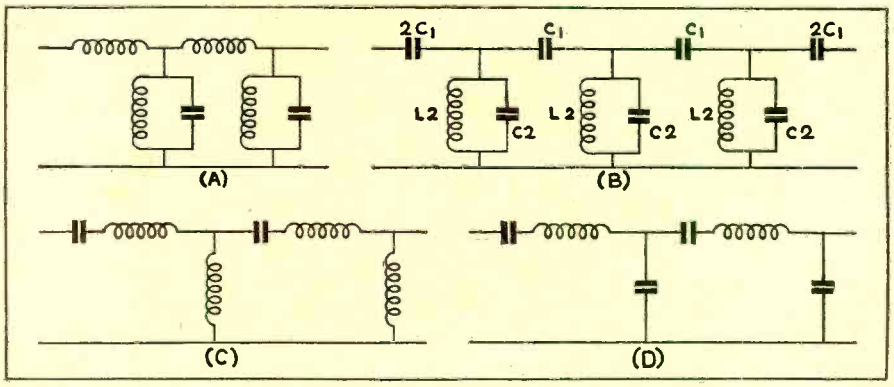

Figure 1. Conventional Band-Pass Filters

New Tubes

NEW YORK, N. Y.—Three new cathode-ray tuning indicator tubes have been introduced; these are the 6AB5, 6T5, and 6U5. The 6T5 is cathode-ray indicators of a new type; instead of a narrowing dark sector, the whole luminous ring becomes wider when a station is tuned in. This effect is obtained by a different arrangement of the electrodes. The 6T5 is designed for a plate supply of 250 volts and requires 22 volts on the grid for maximum illumination of the target. The 6U5 is similar to the 6G5 except for the dimensions of the bulb. The 6U5 is mounted in a T-9 bulb, which has an overall length of 4 3/16 inch and a maximum diameter of 1 3/16 inch.

The 6AB5 is a cathode-ray indicator tube somewhat similar to a 6U5 but for a maximum voltage supply of 135 volts. The requested grid bias for a shadow angle of 0° is 7.5 volts.

More G-Tubes

New York, N. Y.—Several new G-tubes with octal bases have been released by Sylvania. The 6C8G is a twin-triode tube, somewhat similar to the 79 but having individual cathodes for the two sections. The tube is recommended as a two stage amplifier or as phase-inverter. The 6U7G is a variable-mu pentode, similar to the 6D6 but supplied with an octal base. The 6V7G is an octal base tube, similar in characteristics to type 85.

The "Ham" Shack

(*Continued from page 21*)

higher than the simpler wood affairs usually used. However, their construction is considerably more difficult, and unless the amateur is a good carpenter, require the help of an expert.

Many stations have flagpoles or discarded telephone poles. These average in height to about 50 feet. In some sections of the country the telephone and power companies will sell second-hand poles at small cost. The problem is to erect them. Poles of this type require at least a 7-foot hole in the ground. To erect them it is necessary to use a gin pole about one-third the height of the mast, a block and tackle and to have the help of a number of persons. But once a mast of this type is erected, it is "up-to-stay!"

There are a few important rules to be followed in erecting any type of antenna mast. First the part that is to go into the ground must be painted with some material that will prevent rotting. Asphalt paint is excellent. Three or four coats should be applied. The mast itself should be fairly rigid; that is, it should not "bow" too much when one end is lifted. If it is too flexible it will be difficult to erect and probably will not stay there long, once it is up. A good grade of guy wire should be used. Nothing smaller than No. 10 B & S gauge galvanized wire should be used. No. 8 will last a long while and will hold a heavy load. Galvanized cable is not recommended because once it starts to rust each strand rusts simultaneously, and it will not take long before it will break through, whereas, solid wire will eventually rust on the surface, but will have a solid core for a long while after it starts rusting.

Also when a mast is being put up, as many persons as possible should be around to help—never less than four. Two should be assigned to hold the side guy wires to keep it straight. No one under any circumstances should stand under the mast unless he is pushing with a ladder, and then the ladder should be kept in a position so it will support the pole should the pusher weaken.

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On 20 meter C. W.: W1AMP, W1ANQ, W1AXA, W1AXX, W1BFT, W1BIE, W1BPY, W1CDX, W1CH, W1CUX, W1DMX, W1DP, W1DUK, W1APA, W1ELR, W1FAU, W1FDN, W1FKS, W1FN, W1FUY, W1GCX, W1GF, W1GJQ, W1HOU, W1HRJ, W1ICA, W1ICI, W1IBZ, W1IJL, W1ISC, W1JGD, W1JOX, W1JPW, W1JNL, W1JPJ, W1MP, W1OX, W1TW, W1ZW, W2AWF, W2ADQ, W2ATR, W2BER, W2COL, W2CJM, W2CSL, W2DOE, W2FHI, W2GJF, W2FGG, W2FMR, W2GWF, W2IKZ, W2IRV, W2IYO, W2IPI, W2JPI, W2JWL, W2JKQ, W2OA, W2QZ, W2GOZ, W2FVL, W2BCR, W2CYS, W2BYK, W2HVQ, W2CPA, W2EEG, W2ELD, W2HXJ, W2SE, W2JME, W2FAR, W2CDM, W2CTC, W2FDK, W2LA, W2IIZ, W2HSB, W2DXB, W2HCM, W2OC, W2KBA, W2JOZ, W3FKK, W3GHD, W3ENX, W3FLH, W3DGS, W3FXB, W3GAP, W3BQL, W3KD, W3AVJ, W3BQP, W3DYU, W3FLD, W3EE, W4EG, W4DQV, W4TR, W5BUX, W5FFW, W5KC, W5FIO, W5LP, W5CRS, W5EUL, W6ABB, W6AC, W6ACL, W6AFH, W6ATJ, W6BAM, W6BAW, W6BIP, W6BXU, W6CEM, W6CSI, W6DFO, W6DJV, W6EPZ, W6FMH, W6FMY, W6FKZ, W6FZE, W6FZL, W6GCX, W6GK, W6GPB, W6HAS, W6HCF, W6ICW, W6IJH, W6IOJ, W6IPH, W6ITY, W6IYN, W6JAC, W6JBO, W6JGQ, W6JSG, W6KBD, W6KQL, W6KRI, W6KRS, W6KU, W6KUT, W6KWB, W6KWC, W6LCP, W6LDJ, W6LEA, W6LER, W6LJV, W6LPB,

(*Turn to page 45*)

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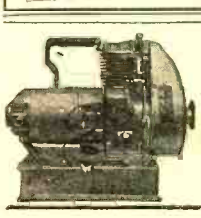

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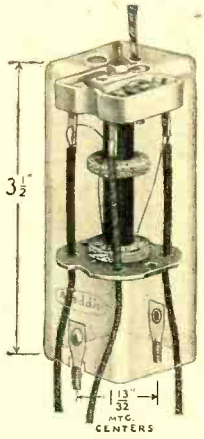

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THE TECHNICAL REVIEW

CONDUCTED BY THE TECHNICAL EDITOR

Alternating Currents in Radio Receivers, by John F. Rider, published by John F. Rider, 1937. This is another one in the series of books under the general title "An Hour a Day with Rider." Many servicemen have only a very hazy conception of alternating currents, electron motion, sine waves, complex waves, and phase differences. Yet, modern receivers are employing new circuits which cannot very well be understood without a thorough knowledge of the above subjects. Therefore, this book should fill a definite need among servicemen. The author discusses in a non-mathematical manner, the alternating current phenomena so that the reader can visualize them. The chapter headings are: I, Introduction (how the electrons move, how fast, and what distance), II, Cycle and Frequency, III, Values of Alternating Current and Voltage, IV, Sine Waves, V, Phase relation in a. c. Circuits; VI, Complex waves; VII, Modulated and Unmodulated waves; VIII, Alternating Currents in Radio Receivers.

Two Hundred Meters and Down, by Clinton B. DeSoto, American Radio Relay League, 1936. A history of amateur activities from the beginning till the present and also a history of the development of radio in general. The amateurs take pride in recalling the role they played in pioneering and how many of the older amateurs made important discoveries and are now among the foremost radio authorities.

Part one of the book describes this early time of pioneering and gives an interesting story from Faraday to Marconi and beyond. The first regulations are described and how the amateurs were pushed below 200 meters. The second part recalls the period after the war, the sudden birth and boom of broadcasting, the spanning of the Atlantic by amateurs on waves below 200 meters. In the third part the later accomplishments are described; short waves, emergencies, expeditions.

Review of the Proceedings of the Institute of Radio Engineers for April, 1937

Characteristics of American Broadcast Receivers as Related to the Power and Frequency of Transmitters, by Arthur Van Dyck and Dudley E. Foster. The characteristics of American broadcast receivers now in use have been investigated to determine the permissible input and frequency separation for freedom from cross talk, heterodyne beats, and flutter effects. Seven types of interference are described separately in the data on the susceptibility of present receivers to each type.

Multiple Amplifier, by L. A. Kubetsky, The development, by the author, of amplifying tubes utilizing secondary emission is discussed. The latest type is described as possessing the quality of small dimensions, high sensitivity (10-100 amperes per lumen), high over-all amplification (10^6), high voltage output, minimization of noise, absence of microphonics.

Alternating-Current Resistance of Rectangular Conductors, by S. J. Haefner. New experimental data are presented for conductors having ratios of width to thickness of 1 to 1 to 2400 to 1 for frequencies up to eight kilocycles.

The Production of Rochelle Salt Piezoelectric Resonators Having A Pure Longitudinal Mode of Vibration, by Norman C. Stamford. The correct orientation of specimens cut from Rochelle salt crystals for use as piezoelectric resonators having a pure longitudinal mode of vibration is developed from Voigt's theory of piezoelectricity, and the frequency of resonance of these specimens is derived from the constants of the material. Practical details are given regarding the growing of the crystals and grinding of the specimens.

Review of Contemporary Literature

THE following are reviews of articles appearing in recent issues of technical magazines; the name of the magazine and its date are given after the title of each article. Copies of these articles are not included under the "Free Booklets"—they are available from your book-dealer or direct from the publishers. Addresses of publishers will be furnished on request.

Practical Feedback Amplifiers, by J. R. Day and J. B. Russell, Electronics, April 1937. Data and complete information on three practical amplifiers employing inverse feedback.

Electronics Engineers' Library, Electronics, April 1937. A list of books for students and engineers, covering mathematics, physics, Engineering, Communications and Electronics. A short note indicates how much previous education is needed to benefit from each book.

Distortion in Diode Detector circuits, by A. W. Barker, Radio Engineering, April 1937. Some little known causes of distortion in diode circuits and what may be done about them.

Distortion measurements in the broadcasting station; The General Radio Experimenter, April 1937. Description of a distortion and noise meter for use at broadcast stations.

Factors Relating to faithful Reproduction. by C. M. Sinnett; Proceedings of the Radio Club of America, March 1937. Technical description of automatic tone com-

pensating circuit and volume expander in a new RCA Victor phonograph.

Automobile Receiver Design, by J. C. Smith, RCA Review, April 1937. The author discusses the problems of vibrators, antennas and ignition interference suppression.

Horn Loudspeakers, by H. F. Olson, RCA Review, April 1937. A theoretical discussion of horns, their impedance and directional characteristics.

A new Form of Interference—External Cross-modulation, by D. E. Foster. Any corroded joints in antenna or ground system or in nearby metallic objects may act as rectifiers and cause cross-modulation external to the receiver.

Air-Wave Bending of Ultra-High-Frequency Waves, by Ross A. Hull, part one; QST, May 1937. An outline of the result of observations by the author during the last 2½ years.

The Use of Oil Condensers in Amateur Transmitters; Aerovox Research Worker, March 1937. Discussion of the design of high-voltage power supplies for amateur transmitters.

The Broadcasting and Postal Lottery Statutes, by Andrew G. Haley, Air Law Review, October 1936. A statement of the statute and an interpretation of its meaning; i. e. what is considered a lottery and what is not.

Free Bulletins New House Organ

The Clough-Brengle Company recently published the first copy of an interesting little publication called "Instrument Topics." This new folder should receive wide interest from all users of electronic instruments, as many of its pages will be devoted to outlining authentic methods of test procedure. This is to be published periodically and is free to servicemen, radio engineers, and others in the industry. In applying for the folder it will be necessary to make a separate request on your card or letterhead or show the firm with which you are employed and your official title. Send request to RADIO NEWS, 461 Eighth Avenue, New York City, N. Y.

For Servicemen and Dealers

The Triplett Electrical Instrument Company just brought out a new catalog listing their complete line of radio testing instruments and a folder with special information on the model 666 pocket volt-ohm-milliammeter. To obtain free copies of these, write to RADIO NEWS, 461 Eighth Avenue, New York City.

Special Catalog

The Aerovox Corporation recently published a new supplementary catalog on industrial capacitor replacements for use in electrical refrigerators, oil burners and other motor driven equipment. It is offered free to servicemen interested in any of these fields. Send your requests to RADIO NEWS, 461 Eighth Avenue, New York City.

Catalog of Theatre Sound-Equipment

The Wholesale Radio Service Company announce the new Lafayette catalog on "Facsimile-Tone" theatre sound systems. It is an 8-page booklet containing information on powerful wide-range sound reproducing systems, sound heads, speakers and accessories. The book is offered free to sound engineers and prospective users of this equipment. Address requests to RADIO NEWS, 461 Eighth Avenue, New York City.

Latest Parts Catalog

"Everything in Radio" is an appropriate name for the new Radolek 1937 catalog. It is a 164-page book, listing home and motor car receivers, radio parts, tools, testing equipment, and many other items. Free copies are available to bona-fide servicemen and dealers. Send your request to RADIO NEWS, 461 Eighth Avenue, New York City, N. Y.

For Dealers and Servicemen

Here is the latest RCA catalog on test equipment, replacement parts, receivers, transmitters and accessories. It contains a convenient cross-indexed guide for all important replacement parts. Through the courtesy of this company, RADIO NEWS is able to offer this finely illustrated bulletin to bona fide servicemen and dealers. Send in your request to RADIO NEWS, 461 Eighth Avenue, New York City.

RADIO NEWS Booklet Offers Repeated

For the benefit of our readers, we are repeating below a list of valuable, FREE technical booklets and manufacturers' catalog offers, which were described in detail in the March, April, May and June, 1937, issues. The majority of these booklets are still available to all readers. Simply ask for them by their code designations and send your request to RADIO NEWS, 461 Eighth Avenue, New York, N. Y. The literature marked with an asterisk is available only to bonafide servicemen, dealers, and engineers. In applying for these folders it is necessary to send in your request on your card or letterhead. If you are an amateur give call letters. The list follows:

Mh2—Test Equipment Catalog. Clough-Brengle Co.
Mh3—Engineering Bulletin on 6L6 Tube. Ken-Rad Tube and Lamp Corp.*
A11—56 page Catalog. Montgomery Ward & Co.
A12—Parts Catalog. Hammarlund Mfg. Co.
A13—McGraw-Hill Publishing Co., General catalog listing radio text books.
My1—Service booklet. Readrite Meter Works.
My2—Folder on small motor-driven "Handee" tool. Chicago Wheel & Mfg. Co.
My3—Resistor catalog. International Resistance Co.
My4—Instrument manual. Supreme Instruments Corp.
My5—D. Van Nostrand Company's general book catalog.
My6—Volume control guide. Central Radio Laboratory.
My7—Latest parts catalog. Wholesale Radio Service Co.
My8—Condenser catalog. Solar Manufacturing Company.
Je1—Circulars on power equipment. Pioneer Gen-E-Motor Corp.
Je2—Parts Catalog. Allied Radio Corp.
Je3—Radio Receiver Catalog. Modell's.*
Je4—Catalog on P. A. equipment. United Sound Engineering Co.*
Je5—Tube Chart. Arcturus Radio Tube Co.*

J. W. Collins on W2XAD-W2XAF

SCHENECTADY, N. Y.—Mr. J. W. Collins, O. B. E., trade and tourist commissioner for New Zealand, will speak over W2XAD and W2XAF on June 19. Mr. Collins will speak from midnight to 12:30 a. m. EST and again at 6 o'clock the same morning. Each transmission is on both short wave stations.

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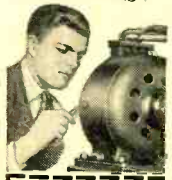

My Big Free Book tells you how we train you in 12 weeks—to start in the growing field of Electricity—by actual shopwork on real electrical machinery—not by books or correspondence. Amazing plan enables many to get training first . . . then take 18 Months to pay in small monthly payments starting 5 Months from date you start school. Experience or advanced education not needed. Many Earn While Learning. Free lifetime employment service. Diesel Engines, Electric Refrigeration and Air Conditioning instruction included. MAIL COUPON for FREE BOOK and all Facts.

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QRD? QRD? QRD?

CONDUCTED BY GY

NOW that we have been on the West Coast for a while, it seems that East Coast news and info is being neglected a bit. The small bones being thrown to our sleuth-hounds haven't enough juice within them fit to print. Shall we then use "Rumors" to satiate the appetite of our readers? This column does not advocate using the type of information that cannot be substantiated. Not that we fear libel suits, but primarily because we prefer printing the unadulterated truth, and nothing But.

RADIO at sea has grown to unthought of heights. To prove its merit, it is interesting to note a small item which appeared in one of the daily newspapers. Captain Kahlbetzer of the Red Star liner *Westernland* hove his ship alongside the *Manchester Producer,* 200 miles east of Newfoundland, in a tumultuous sea, for the purpose of transferring an injured seaman for an operation. It was part payment of an obligation contracted by Kahlbetzer when he almost lost his life in the Behring Straits some twenty-five years ago, but for the providential arrival of a Russian freighter. He now pays tribute to radio and radio operators for the part they are playing in this noble work. During his time there was no such thing.

Brother Karl Baarslag has again hit the front pages with the publication of his new book, "Coast Guard to the Rescue," which, as the name implies, portrays the important part played by the Coast Guard in rescue work. It is vividly written in the same style of his former saga of the sea, "SOS to the Rescue." "Coast Guard to the Rescue" should be included in the library of all seagoing radio men as completing the annals of "rescuing ships at sea." We know this book will meet with the same enthusiastic response and interest merited by Baarslag's former saga. Just another radiop who is stepping out and ahead.

Disaster at sea! Radio operators in times of emergency stick to their duty without thought of personal risk. Photo in our heading shows a view of a French film depicting operator of the fateful *S.S. Titanic* with the cabin awash. But, don't get excited—it's only a movie!

We now refer to a column some months back advising ops who have been out of the game for a few years and who wish to try their hand at operating again, not to travel to any of the coastal ports in the hope of securing assignments. In the first place, the cost of travel is prohibitive and, in the second place, it is depressing to find a number of First Class men occupying the beach because of the lack of billets to go 'round. It is very discouraging to start out with hopes of obtaining an assignment, only to find so many others waiting ahead of you. It is best to write for assignments, stating qualifications, to the various hiring agencies such as Radiomarine, Mackay, etc. The addresses of these and others can be had on request.

We pull a paragraph from a letter written by one of the men who recently resigned from ARTA. "It is a far easier matter to clean house in a union than it is to build up a new union and tear the old one down, even if the task does look formidable. However, I will admit circumstances alter cases and that there may be times when a dual union is the only solution. For years the U. S. Post Office clerks could get nowhere with their boss-controlled union, but finally a handful started a National Federation of Post Office Clerks in Chicago, in 1917. They had a hard time for years. I helped to build Local 251 in Brooklyn, then considered a hopeless stronghold of the reactionary U.N.A.P.O.C. In fact, it was as much as one's job was worth to be a Federation man. But slowly and surely we tore out the old phony and the local is today one of the strongest locals in the N.F.P.O.C. which is a power in the A.F.L. The old U.N.A.P.O.C. consists of a handful of old diehards. In this case dual unionism did work and was the only solution, although for years it was hampered by the old outfit at Washington in obtaining better wages and improved working conditions."

It seems the placid Pacific has been the scene of some of our most recent ship disasters, caused by fire and storm. The U.S. Navy strutted its stuff in a big way when the Light Cruiser Louisville went to the aid of the stricken fire-ridden British *M.S. Silverlarch,* 500 miles off Honolulu. The eight passengers were rescued and, the fire being confined to a few of the holds, the *Silverlarch* was escorted to port, where the fire was extinguished with live steam. Radio relayed the dread SOS transmitted by the *S.S. Volunteer,* via the *President Harrison,* to the *Fresno City,* which battled heavy seas to reach the wallowing freighter off the Japanese coast. The *Volunteer* was reported "out of control and water coming in too fast for the pumps."

Add disasters: The Navy came to the rescue again with the aid of an injured engineer off the tunafisher *Cabrillo* by the *U.S.S. Omaha* off the coast of South America. She rushed him to a Panamanian hospital for an operation. . . . The *S.S. Fijiian* had a gasoline explosion aboard and part of the crew left the ship. No message was transmitted about their plight except for a request to ships in their vicinity to stand by. They got the first blaze under control shortly thereafter and the crew returned. Then a new radio message reported fire, out of control and sinking. The crew was saved by the timely arrival of the N.Y.K. steamer *Shinko Maru.* . . . The *President Coolidge,* bound for the Orient out of San Francisco, collided terrifically with the incoming freighter *Frank H. Buck* in the Golden Gate Channel, in a pea-soup fog that would have made London blush with shame. The *Buck* was badly damaged but its entire crew was picked up by the *Coolidge,* which was able to proceed on her way. So, in spite of its name, *Pacific,* all is not always quiet on the Western Front.

And so, brethren of the glass wrist, we come to the end of another chapter in the affairs of radiops and ships at sea and, although dissension is flying about, new methods of procedure and operation continually being invented to harass and disgruntle us, there is still humor in the sun shining through the clouds. There is more shipping, better wages and working conditions are gradually improving. So with hopes for continued betterment, cheerio, ge . . . 73 . . . GY.

The "Ham" Shack

(*Continued from page* 41)

W6LWH, W6LVM, W6MEK, W6MFM, W6MJY, W6MNT, W6MUB, W6MVQ, W6MZS, W6NDB, W6NHA, W6NHC, W6NJQ, W6NSW, W6ODD, W6ZAA, W6AL, W6AOV, W6BYB, W6CXW, W6JJA, W6KLB, W6AJN, W6ASV, W6AYZ, W6BKC, W6BXI, W6BVX, W6CD, W6ENQ, W6EXA, W6EMV, W6GRE, W6GPX, W6HLH, W6IZU, W6JOH, W6KYQ, W6LEV, W6LRH, W6NCM, W6NKZ, W6NNR, W6OE, W6QL, W6TI, W6TT, W6UD, W6VB, W7AHS, W7AVR, W7AVV, W7AWL, W7AYO, W7BNK, W7BRT, W7BTB, W7BTZ, W7BVI, W7CFJ, W6CRD, W7DDU, W7DSZ, W7EGE, W7EHL, W7EHT, W7EK, W7EKA, W7FOR, W7ERA, W7ETN, W7EUY, W7FCD, W7FKD, W7FQQ, W7FPY, W7FWD, W7GP, W7MB, W7OC, W7VQ, W7WL, W7DZL, W7BTG, W7BD, W7ANZ, W7AYJ, W7AMX, W7DGY, W7FME, W7FTJ, W8AKC, W8ANB, W8APB, W8AU, W8AKB, W8APD, W8AZG, W8BWC, W8BTI, W8BQJ, W8CRA, W8CTE, W8CNX, W8CJJ, W8CGL, W8DVX, W8DFH, W8DLD, W8DNE, W8DXJ, W8DPS, W8DCE, W8DRS, W8EMW, W8ERZ, W8EUY, W8EML, W8FOB, W8FGX, W8FMH, W8HXJ, W8HIH, W8IKR, W8JPB, W8JMP, W8KOL, W8KVX, W8KWJ, W8KKR, W8LDR, W8LJ, W8LZF, W8MBI, W8NNT, W8OOF, W8OIZ, W8OMA, W8OAW, W8PNB, W8PZB, W8PKE, W8PZF, W8PAJ, W8WO, W8YA, W8ZY, W9APV, W9ALV, W9FEJ, W9BUL, W9PGS, W9TB, W9UUJ, W9UMA, W9TJI, W9RKX, W9TPL, W9DIJ, W9KCX, W9UIQ, W9WTW, W9ADN, W9LKZ, W9EAG, W9KQV, W9DNP, W9RUP, W9FS, W9VXV, W9WEL, W9IQZ, W9LW, W9IPTV.

On 40 meter C. W.: W5EXR, W6ALQ, W6ANQ, W6BVC, W6BXU, W6CUZ, W6DH, W6EUE, W6FMD, W6ITY, W6IUZ, W6LPZ, W6MFJ, W6MGZ, W6MNA, W6MNI, W6MPK, W6MRP, W6NCJ, W6BSV, W6BTM, W6KEV, W6KRJ, W6LJE, W6NDM, W6NSL, W7AIB, W7FNQ, W7FVJ, W7KZ, W7CYQ, W9EBU, W9WUW.

By Rodney Newkirk, 1517 Fargo Avenue, Chicago, Ill., on 20-meter 'phone: CO7HF, CO2KC, CO2WZ, CO2EG, CO2OK, CO2ON, CO2MH, CO2ON, CO2OQ, CO2KL, CO8YB, CO8OG, CO8AE, CO2WW, CO2HC, CO2KY, CO2NF, XE2AH, XE1AX, XE2W, XE2N, VK2JU, LU2BJ, LU2CA, LU1QA, VP2BC, VP6FO, VP6YB, VP9R, VP9G, VP3BG, VP7NA, CP1AA, PY8AD, K5AA, CE3DW, HK1ABM, HK1GK, HK1BM, HK3JA, HK3RC, HK4EA, HK5OBC, TI2LR, TI2DC, TI2RC, TI2EA, HI5X, H17G, H17P, HC1JW, HC1JB, SU1CH, F8KW, G2XV, G5JO, G5ML, G5NI, G5ZG, G6LK, HH2B, K6JLV, K6NTV, VO1G, VO1I, VO1P, VO2N, VO2Z, YN1HS, OA4AB, OA4AG, OA4AK, K4UG, YV5AA, YV5AZ, YV5AP, YV5AN, YV5ABE, YV5AE, YV3AE, YV3AD.

The Service Bench

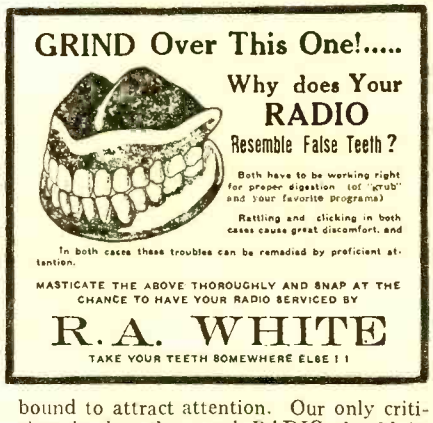
(*Continued from page* 38)

sales message of—"Sales, Rentals, Service, Sound Cars, Office Call Systems, Laboratory Measurements." Larry Ruddell, proprietor, writes us: "The sound projector on the roof of the car may be of interest to RADIO NEWS readers. It can be raised and lowered, and pointed in any direction from within the car. It is outlined in green neon tubing operated from the car's battery through a revamped Ford spark coil. A built-in metal shutter protects the speaker cone from the elements. Together with a crystal pick-up, flat characteristic amplifiers built and measured in our laboratory, and adjustable high and low-frequency compensation, it affords reproduction not customarily associated with mobile installations. Overall sound-pressure measurements, from crystal pick-up through the speaker are excellent to past 7000 cycles, barring a few minor speaker peaks.

"A 12-volt dynamotor supplies 400 volts plate power to either of two 30-watt resistance-coupled amplifiers, which also contain a.c. power packs. A 350-watt, 110-volt a.c. fan-belt generator is employed as a stand-by power supply. Grandstand crowds of 4000 people have been covered easily without setting up any additional speakers. The truck is painted light green, with darker green fenders and molding."

Service Sales Promotion

Not exactly a pretty ad, but certainly an effective one, is that illustrated in Figure 6. A toothsome bit, one might say, and



bound to attract attention. Our only criticism is that the word RADIO should be in larger type so that the advertisement is not taken for what it isn't—a dental ad.

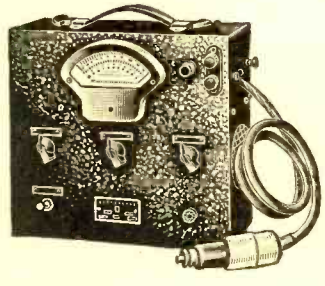
(*Turn to page* 62)

Profits from Those Tough Ones

You can't give your customers their money's worth and make profits from those "hard-to-fix" radio repair jobs without good equipment and knowledge of modern methods.

Competent authorities estimate 34,000,000 radio sets will be in use during this summer.

Be prepared to get your share of the profits from servicing these receivers by using the BEST equipment available -- C-B instruments.



MODEL 88
Vacuum-Tube Voltmeter

Invaluable for automatic frequency control adjustments, gain and impedance measurements, checking oscillator stages, amplifier performance, and other difficult measuring problems. MODEL 88 Vacuum-Tube Voltmeter, complete $45.50

Use the C-B Easy Payment Plan—only $5.50 down and ten monthly payments of $4.57.

Free

Write for our new technical bulletin

INSTRUMENT TOPICS by C-B
FOR THE USERS OF ELECTRONIC INSTRUMENTS

telling all about the Vacuum-Tube Voltmeter and what it does.

Mail Coupon Now

Please send additional information on the MODEL 88 Vacuum-Tube Voltmeter.

Name .....

Address .....

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

The CLOUGH-BRENGLE CO.

2813 W. 19th St., Chicago, Ill.

DEPENDABLE ECONOMICAL MODERN

KEN-O-TAP
THE PRACTICAL SOLUTION TO THE MODULATION PROBLEM

KEN-O-DRIVE
THE MODERN ANSWER TO CRITICAL DRIVER OPERATION

KEN-O-DYNE
THE PRECISION METHOD OF MATCHING OUTPUT TUBES TO SPEAKERS

KEN-O-LINE
THE EFFICIENT COUPLING DEVICE FROM UNIVERSAL LINE

Ask your dealer for a free copy of our revised 16 page T line catalog. Contains a large selection of modern audio circuits ranging in power output from four to 120 watts. These circuits feature Beam Power Tubes, Inverse Feed-Back and Cathode Drivers which provide the ultimate in audio design.

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VITREOUS ENAMEL RESISTORS

for all REPLACEMENT REQUIREMENTS

Here's a longer lasting resistor—carefully wound by UTAH, so you know it's right. The entire unit is porcelain covered—right down to the long leads. All sizes from 10 watt to 200 watt are available from stock. Values to cover all requirements.

UTAH has a complete line of variable and fixed resistances every serviceman should find out about. Write Dept. RN-7.

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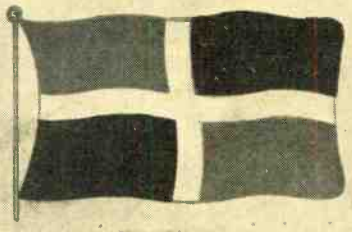
TORONTO, ONTARIO, CANADA
BUENOS AIRES (UCOA RADIO PRODUCTS CO.)
"15 YEARS OF LEADERSHIP"



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Potencia Power 50 Watts Frecuencia Frequency 6185Kc.
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Local time. 20 minutes in advance E. S. T.
Esta Estación ha sido reportada desde toda América, Europa, La India y desde el lejano oriente Japon.
We have report from all America, Europe, India and Japan.

H-I-1-A

LA VOS DEL YAQUE

Verification card of HJ1A sent in for picturization by Observer Sahlbach. Another good one to try for.

The DX Corner (Short Waves)

(*Continued from page 32*)

kc., (from ann.), (Alfred, Shamleffer, Atherton), Saturday 7-8:20 p.m., (Fallon, Herzog, Gallagher, Kentzel).

HBP, Geneva, Switzerland, 7797 kc., (Jaime), Saturday 5:30-6 p.m., (from ann.), (Alfred, Shamleffer, De Ment, Sprague, Kemp, Doyle, Ralat), Address: 12 Quai de la Poste, Geneva.

HBL, Geneva, Switzerland, 9595 kc., and 9345 kc., Saturday 5:30-6 p.m., (Alfred, De Ment, Cartin, Weiss, Kemp), Address: same as HBP.

HBQ, Geneva, Switzerland, 6675 kc., (from ann.), (Alfred).

HBU, Geneva, Switzerland, 14,535 kc., (Sprague).

Africa

EAJ, Tenerife, Canary Islands, 28.9 meters, 8:06-8:15 p.m., (Liljegren).

EA8AK, Tenerife, Canary Islands, 7,140 kc., 9:30 p.m. (Betances).

CR7BH, CR7AA, (6137kc.), CR7BA, Lourenzo Marques, Mozambique, Africa, 11,718 kc, 9:30-11 a.m., Herzog, Craston, Sporn,) Weekdays 6:45-7:30 a.m., 10:30 a.m.,-12:30 p.m., 1:30-5 p.m., Sunday 12-1 p.m., 4-5 p.m., (Beckemeyer, Partner, Sakely), 11,720 kc., (Howald, Beck, Kernan, Hamilton, Weiss, Gallagher).

EAJ43, Santa Cruz de Tenerife, Canary Islands, 10,360 kc., 28.90 meters, 4 kw., from 3 veris (Geneve, Shamleffer, Kernan, Ralat, Gallagher), Schedule 19:15-21 GMT and 23-2GMT wants reports, EA8AB not working letter from station to Editor). Slogan "Radio Club de Tenerife" Address, P. O. Box 225.

CR6AA, Lobito, Angola, 9,660 kc., 3:45-5:30 p.m. (Herzog).

FIU, Tananarive, Madagascar, 31.2 meters, daily 10-10:45 a.m. (Westman).

OPM, Leopoldville, Belgian Congo, 10,140 kc., daily 7:10 a.m. (Craston).

EHZ, Tenerife, Canary Islands, Africa, 10,370 kc., 7:20 and 8:20 p.m. (Kernan), Poste Bizertin, Bizerte, Tunisia, 6,160 kc., 5-7 p.m. without call letters, (Beckmeyer, Craston).

IUC, Addis Ababa, Ethiopia, 11,950 kc., 11:36 p.m. (Chambers).

SUZ, Cairo, Egypt, 13,830 kc., 2:55 a.m., (Chambers), 14,001 kc., Sunday 5:30 p.m. (Murray, Kemp).

Algiers, Algeria, 24.75 meters, daily 4 p.m.-1 a.m. (Hedgeland).

VQ7LO, Nairobi, Kenya, 6,080 kc., Sunday 11 a.m.-2 p.m., Saturday 11 a.m.-3 p.m., (Hare), Monday through Saturday, 6-6:30 a.m. (from veri) (Stevens).

YBG, Medan, Sumatra, 10,430 kc., (Craston).

EA9AH, Tetuan, Spanish Morocco, 7,020 kc., 14,030 kc., (Geneve, Herzog, Craston Betances, Kentzel) Address: P. O. Box 124.

ZTJ, Johannesburg, South Africa, 6,097 kc., Wednesday, 5 p.m. (Weiss) heard daily 11:45 p.m., 1:30 a.m., 3:15-7 p.m., 11 a.m.-1:30 p.m., 12-5:15 p.m.—News bulletins and dance music (Sigundson).

Radio Tunis, Tunis, Tunisia, 7,265 kc., 7:30 p.m. Interval signal is one stroke of gong, 8:20-9 a.m. and 4-5 p.m. (Bower).

Asia

JZK, Nazaki, Japan, 15,160 kc., signed 10 p.m., (Howald), Monday and Thursday, 4-5 p.m., (Doyle)

JZG, Nazaki, Japan, 6350 kc., 7 a.m., (Gallagher).

JVT, Nazaki, Japan, 6750 kc., 4:10-7:40 a.m., (Doyle)

JVF, Nazaki, Japan, 15,620 kc., daily 6-7 p.m., (Doyle).

JVJ, Nazaki, Japan, 11,660 kc., 6-7 p.m., (Pylute).

JZI, Nazaki, Japan, 11,800 kc., daily 9-10 a.m., (Weilsal), daily 12-1 a.m., (Howald), desires reports, (Markuson), daily 2:30-3:30 p.m., (Piorko, Westman, Hedgeland), daily 4-5 p.m., (Hartzell, Dodge, Emerson, Partner, Black, Hare, Gallagher, Keemp, Doyle, Sakely, Kashimoto, Pylute), chimes used.

JVP, Nazaki, Japan, 7510 kc., Sunday 12:30 p.m., (Hiljegren), daily 4-5 p.m., (from veri.) (Herzog, Dressler, Fallon, Sakely), daily 2:30-8:30 p.m., (Hamilton).

JVM, Nazaki, Japan, 10,740 kc., daily 4 a.m., (Alfred), daily 2:30-3:30 p.m., (Pioro, Hedgeland), 4-5 p.m., (from veri.), (Herzog, Dressler, Ryan, Hare, Randle, Fallon, Sakely, Kashimoto), chimes used.

JVD, Nazaki, Japan, 15,860 kc., all hours, (Gallagher), irregular, (Doyle)

JVU, Nazaki, Japan, 13,370 kc., 9 a.m., (Gallagher).

JVE, Nazaki, Japan, 15,720 kc., 11 p.m., (Gallagher), 15,660 kc., 3:35 a.m., (Chambers), 9-10 p.m., (Doyle)

JIB, Tyureki, Formosa, 10,530 kc., 2 and 10 a.m., (Gallagher, Markuson).

JVH, Nazaki, Japan, 14,600 kc., 6 p.m., (Gallagher), 5-6 p.m., 9-10 p.m., (Howald), 14,640 kc., replaces JVM at 4 a.m. and on., (Alfred, Herzog, Dressler), 12-1 a.m., (Pylate, Staley, Fallon, Sakely)

JVN, Nazaki, Japan, 10,660 kc., around mid-

night, (Gallagher, Hiljegren), daily 4 a.m., (Alfred), daily 2-8 a.m., (Munz), daily 4-5 a.m., (Hartzell, Herzog, Dressler, Dodge, Partner, Black, Howald, Hare, Kemp, Fallon, Sakely, Kashimoto).

TDE, Shinkyo, Manchukuo, Asia, 10,065 kc., daily 1-2 a.m., (from veri.), (Sporn), 1-7 a.m., (Craston).

JZI, Nazaki, Japan, 9530 kc., 9 a.m., (Gallagher), daily 9-10 a.m., (Weikal, Howald), 2:30-3:30 p.m., (McCartin, Westman, Dressler, Partner, Black, Hare, Herzog, Kashimoto), daily 2:30-:30 p.m., (Hamilton).

XGN, Shanghai, China, 17,640 kc., 6 p.m., (Gallagher).

XGW, Shanghai, China, 10,420 kc., 10 a.m., (Gallagheer).

XGOX, Nanking, China, 6820 kc., 10 a.m., (Gallagher), 6848 kc., (Weisz), 5:30-7 a.m., (Doyle).

ZBW3, Hong Kong, China, 9525 kc., daily after 7 a.m., (Alfred, Adams), daily except Saturday 11:30 p.m.-1:30 a.m., 3-10 a.m., Saturday 3-11 a.m., 9 p.m.-1:30 a.m., (Beckemeyer, Black)

CQN, Macao, China, 10,020 kc., Monday and Friday, 7-8:30 a.m., (Craston, Sprague), 10,065 kc., (White).

FZR, Saigon, French Indo-China, 31.5 meters, daily 8-11 a.m., (Sporn, Westman).

ZBW2, Hong Kong, China, 6090 kc., daily 1-4:30 a.m., (Sporn).

ZBW4, Hong Kong, China, 15,190 kc., irregular, (Partner), 11:30 p.m. to 1:15 a.m., (Doyle).

ZBW5, Hong Kong, China, 17,755 kc., daily 4-10 a.m., (Doyle).

PLV, Bandoeng, Java, 9420 kc., 7 and 9 a.m., (Gallagher, Partner), 9:45-10:30 a.m., (Sakely).

PMH, Bandoeng, Java, 6729 kc., daily, (Gallagher), daily 10 a.m., (Markuson, Howald).

PMN, Bandoeng, Java, 10,260 kc., daily 5-7:30 a.m., (Alfred), daily 5:30-11 a.m., (Hartzell, Partner, Black, Gallagher, Sakely).

PMY, Bandoeng, Java, 5150 kc., 9 a.m., (Gallagher).

PLP, Bandoeng, Java, 11000 kc., daily 5-7:30 a.m., (Alfred, Ralat), 5:30-11 a.m. daily, (Hartzell, Partner, Black, Kemp, Doyle, Beckemeyer, Sakely).

YDB, Sourabaya, Java, 9610 kc., daily until 10 a.m., (Markuson), 9650 kc., daily 5:30-11 a.m., (Hartzell, Howard).

PLE, Bandoeng, Java, 18,830 kc., 8:30 p.m., (Craston).

YDC, Bandoeng, Java, 15,1560 kc., signed 10 p.m., (Howald).

HS8PJ, Bangkok, Siam, 9350 kc., 9 a.m., (Gallagher). Friday 8-9 a.m., (McCartin), 19,020 kc., Monday 2-3 a.m., (Sporn, Howald).

RW15, RV15, Khabarovsk, Siberia, 4275 kc., 9 a.m., (Howald, Sporn, Sakely).

VUB, Bombay, India, 9565 kc., new transmitter is being erected. (Beckemeyer).

Oceania

VK3ME, Melbourne, Australia, 9500 kc., daily 5-7 a.m., signed with "God Save the King". (Alfred, Ralat, Dressler, DeLaet, Ryan, Kemp).

VK3LR, Melbourne, Australia, 9500 kc., signs at 9:45 a.m., except Sunday, (Howald); daily 6:30-7 a.m. (Dressler); Kookaburra laugh with announcement. (Oliver, Beckemeyer, Sakely, Kentzel, Kemp, Randle).

VK2ME, Sydney, Australia, 9590 kc., Sunday 1-3 a.m., 5-11 a.m. (Munz, Markuson, Dressler, DeLaet, Randle).

VK6ME, Perth, Australia, 9590 kc., 6-7 a.m., (Herzog, DeMent, Craston, Tate); daily except Sunday 6:30-7:30 a.m., (Lueth, Hamilton).

VK9MI, Australia, 6040 kc., 6:30-7:30 a.m., announcements with chimes and whistles, (Sporn, Kernan).

W10XGY, Yacht "Elano", Pearl Walter Harbor, 12900 kc., 2 p.m. (Herzog).

VPD2, Suva, Fiji Islands, 9540 kc., daily except Sunday 5:30-7 a.m. (Hartzell, Lueth, Partner).

ZLT, Wellington, New Zealand, 11000 kc., 1 a.m., on (Howald, Gallagher, Kemp).

KIO, Kahuku, Hawaii, 11860 kc., 12:40 a.m. (Howald); 11690 kc., 1 a.m. (Gallagher)

KKH, Kahuku, Hawaii, 7520 kc., 1:15-11:30 a.m. (Gallagher).

Central America

HP5F, Colon, Panama, 6080 kc., 8:30-9:15 p.m. (Beck, Law). Slogan: "La Voz de Colon". Address: Carleton Hotel, P. O. Box No. 405.

HP5B, Panama City, Panama, 6030 kc., 7-10:30 a.m. (Doyle, Coover).

HP5H, Panama City, Panama, 9650 kc., Sunday 10 a.m., wants reports. (Burokowski).

HP5K, Colon, Panama, 6000 kc., 10:30 p.m. (Unger); uses bugles 3 tone chimes and gong, 8:30-9:30 p.m. (Beck). Slogan: "La Voz de la Vitor". Address: P. O. Box No. 33.

HP51, Aguadulce, Panama, 11895 kc., daily 7:30-9:30 p.m. (Jaime, Atherton, Schrock); 11900 kc. (Alfred); three gong stroke three times. (Beck, Craston, Ralat, Partner). Slogan: "La Voz del Interior".

HP5L, David, Panama, 11740 kc., irregularly. (Alfred); 7 p.m. (Partner).

HP5J, Panama City, Panama, 9590 kc., daily 6-10 p. m. (from announcement). (Dressler).

TGWA, Guatemala City, Guatemala, 9450

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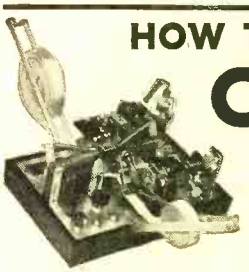

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These new Gadgets will be ready for shipment June 21st.

kc., schedule: daily 6-8 a.m., 2-6 p.m., Sunday 1-5 a.m (Alfred, Jaime, Beck, Fallon). Slogan: "Radiofusora Nacional".

TGWI, Guatemala City, Guatemala, 11850 kc., midnight. (Alfred).

TGI, Guatemala City, Guatemala, 6230 kc., requests reports, 12-12:30 a.m., (Alfred); 6300 kc. (Gallagher).

TG2, Guatemala City, Guatemala, 6250 kc., requests reports, 12-12:30 a.m. (Alfred, Murphy); 6300 kc. (Gallagher).

TG2X, Guatemala City, Guatemala, 5940 kc. (Lopez); requests reports. (Beck).

TIEP, San Jose, Costa Rica, 6700 kc., 9 p.m. (Coover); daily 11-12 p.m., 7-8 a.m. (from veri) (Adams, Sporn, Herzog). Slogan: "La Voz del Tropico". Address: P. O. Box No. 257.

TILS, San Jose, Costa Rica, 5903 kc., signed at 11 p.m. (Alfred); 5800 kc., (Jaime); 11810 kc. (Schrock, Atherton). Address: P. O. Box No. 3.

TI4NRH, Heredia, Costa Rica, 9670 kc., 9:45 p.m. (Ralatt); 9610 kc., signed at 12 a.m., with chimes; reports requested (from announcement) (Wittig); Tuesday 9:20-10 p.m. (Kernan); 14428 kc. (Fallon); schedule: 11:30-midnight, 12-12:40 a.m. (Kernan). Slogan: "The Voice of Costa Rica".

TIPG, San Jose, Costa Rica, 6410 kc. (Herzog); schedule: 7-9 a.m., 12-2 p.m., 4-11:30 p.m. (from veri) (Stillman, Lopez). Slogan: "La Voz de la Victor". Address: Perry Girton, P. O. Box No. 225.

TIMS, Puntarenas, Costa Rica, 5900 kc. (Chiang); schedule: daily 6-10 p.m. (from announcement) (Beck). Slogan: "Radio Tims".

TIGPH, San Jose, Costa Rica, 5820 kc., 7-11 p.m. (Cartin).

TIXGP3, San Jose, Costa Rica, 5380 kc., (Beck). Slogan: "La Reina del Aire". Address: P. O. Box No. 800.

TI5HH, San Ramon, Costa Rica, 3:30-4 p.m., (Beck). Slogan: "La Voz de San Ramon". Address: R. Herrara O.

YMCR, Managua, Nicaragua, 9750 kc., schedule: week days 7-9 p.m. (Lindberg).

YNOP, Managua, Nicaragua, 5758 kc., irregularly and 8-10 p.m. (Alfred). Slogan: "Radiofusora Boyer".

YNLG, Managua, Nicaragua, 8500 kc., schedule: 12-1:30 p.m., 6:30-9 p.m. (Lopez, Alfred). Slogan: "Ruben Dario": "La Voz de la Pilot".

YN1PR, Nicaragua, 8000 kc. (Jaime).

HRD, La Ceiba, Honduras, 6235 kc., 8 p.m. (Coover); daily 7-10 p.m. (from veri) (Munz). Slogan: "La Voz de Atlantido".

South America

YV1RL, Maracaibo, Venezuela, 5930 kc., reports requested. (Gallagher, Jaime, Schrock, Chiang, Randle); chimes with announcements. (Burakowski, Gossett). Slogan: "Radio Popular". Address: P. O. Box No. 247.

YV1RD, Valencia, Venezuela, 6520 kc. (Jaime); 6075 kc., 5-10 p.m. (Law); 6070 kc. (Gallagher).

YV4RG, Maracay, Venezuela, 6300 kc. (Jaime).

YV5RB, Caracas, Venezuela, 6158 kc., 7:30 p.m. (Ralat).

YV4RA, Varenera, Venezuela, 6520 kc. (Liljegren).

YV1RA, YV1RB, Maracaibo, Venezuela, 5850 kc. (Foshay, Lopez). Slogan: "Ecos del Zulia".

YV3RA, Barquisimeto, Venezuela, 50.9 meters, 7:15 p.m. (Randle); 8 p.m. (Coover). Slogan: "La Voz de Lara".

YV5RI, YV1RI, Coro, Venezuela, 6210 kc. (Ruppert, Chiang); Saturday. (Shamleffer, Ralat); 8:30-10:30 p.m. (Beck). Slogan: "Radio Corro".

YV2RA, San Cristobal, Venezuela, 5720 kc. (Herzog).

YV5RG, Caracas, Venezuela, 6400 kc., 5:30 p.m. (Ralat).

YV5RD. Caracas, Venezuela, 6160 kc., 12-2 a.m. (Sporn).

YV1RG, Valera, Venezuela, 6230 kc. (Betances). Slogan: "Radio Valera".

YV4RB, Valencia, Venezuela, 6520 kc., 6 p.m. (Ralat). Slogan: "La Voz de Carabobo".

YV4RD, Maracay, Venezuela, 6300 kc. (Beck, Burakowski); 5:45 p.m. (Ralatt). Slogan: "La Voz de Oragua".

YV5RP, Caracas, Venezuela, 6270 kc., relays YV5RQ. (Beck); daily 10-12 p.m., 9-11 a.m. (from veri) (Sporn). Slogan: "La Voz de la Philco". Address: P. O. Box 508.

YV1AP, Maracaibo, Venezuela (Samson). Address: P. O. Box No. 261.

YV5RC. YV5RA, Caracas, Venezuela, 5800 kc., 7:30-9:30 p.m. (Emerson, Foshay, Coover).

YV4RH, Valencia, Venezuela, 5910 kc. (Chiang); 5920 kc., irregularly. (Fallon).

YV1RH, Maracaibo, Venezuela, 6360 kc., schedule: 6-7:30 a.m., 11 a.m.-2 p.m., 5-11 p.m. (from veri) (Herzog, Coover); wants reports. (Unger, Ralat). Slogan: "Ondas del Logo". Address: P. O. Box 261.

YV4RB, Valencia, 6520 kc., 6-10 p.m. (Cartin).

HJ1ABE. Cartagena, Colombia, 9500 kc., Monday 10-10:30 p.m. (Shamleffer, Jaime, Weikal); except Sunday 6-10:30 p.m., Sunday 9 a.m.-3 p.m. (from veri.) (Schrock, Alfred, Beck, Staley, Ryan, Herzog, Stillman, Ralat, Wittig). Slogan: "Lo Voz de los Laboratorios Fuentes". Address: P. O. Box 31.

HJ1ABG, Barranquilla, Colombia, 6040 kc. (Jaime, Liljegren); 6025 kc., signed at 11 p.m. (Alfred); 9:30-10:15 p.m. (Wittig). Slogan: "Emisora Atlantico".

HJ1ABP, Cartagena, Colombia, 9600 kc. (Liljegren); Saturday 10-11 p.m. (Weikal); 9620 kc., 7 a.m. (Hartzell, Alfred, Shamleffer, Emerson); signed 8 p.m. Sunday. (Atherton, Coover, Murray, Ralat); uses chimes (Beck). Slogan: "Radio Cartagena". Address: P. O. Box 37.

HJ1ABB, Barranquilla, Colombia, 6135 kc., 8-9 p.m. (Alfred); 9555 kc., 3 p.m. (Ralat); 3 p.m. on, 4780 kc. (Betances). Slogan: "La Voz de Barranquilla". Address: P. O. Box 715.

HJ1ABC, Quibdo, Choco, Colombia, 6000 kc. (from veri.). (Adams). Slogan: "La Voz del Choco".

HJ1ABJ, Santa Marta, Colombia, 6025 kc., daily 3-10:30 a.m. (Sporn).

HJ4ABH, HJ4ABA, Armenia, Colombia, 9520 kc. (Liljegren); daily 7-10:30 p.m.; signs with "Indian Love Call". (Alfred, Shamleffer, Fallon, Welper, Kemp, Ralat, Wittig.) Slogan: "La Voz de Colombia".

HJ4ABP, Medellin, Colombia, 6030 kc., until 10:45 p.m. (Alfred, Kemp, Atherton). Slogan: "Emisora Philco", "Emisora General Electric".

HJ4ABB, Manizales, Colombia, 6105 kc., Tuesday 8:15 p.m. (Ralat, Kemp).

HJ4ABC, Ibague, Colombia. (Foshay).

HJ3ABF, Bogota, Colombia, 6069 kc. (Law).

HJ3ABD, Bogota, Colombia, 6050 kc., 6:45 p.m. (Ralat).

HJ3ABB, Bogota, Colombia, 12000 kc., 7:45 p.m. (Ralat). Slogan: "Emisora Nueva Granada".

HJ3ABX, Bogota. Colombia, 6122 kc., 11:30 p.m. (Ralat). Slogan: "La Voz de Colombia".

HJ2ABC. Cucuta. Colombia, 9270 kc., sign at 10 p.m. (Shamleffer, Jaime); 9575 kc., 5 p.m. (Ralat); 4800 kc., 9-10 p.m. (Kentzel).

HJ5ABD, Cali, Colombia, 6080 kc., 7-11 p.m. (Cartin).

HJU, Buenaventura, Colombia, 9500 kc. (Jaime); 9510 kc., Monday 8-11 p.m. (Alfred); Monday, Wednesday, Friday 8-10:45 p.m. (Fallon). Slogan: "La Voz de Pacifico". Address: National Railroads of Colombia.

HKY, Bogota, Colombia, 8790 kc., 9-10 p.m. (Beck).

LSX, Buenos Aires, Argentina, 10350 kc. (Kemp); Wednesday and Thursday 7-10:30 p.m. (Gossett).

LRU, Buenos Aires, 15290 kc., wants reports. (Gossett, Stillman).

LSN3, Buenos Aires, Argentina, 9900 kc. (Gallagher).

LSL, Buenos Aires, Argentina, 15810 kc. and 21600 kc., 1:30 p.m. (Gallagher, Kemp).

LR4?, Buenos Aires, Argentina, 19 meters, 6 p.m. (Alfred). Slogan: "Radio Splendid".

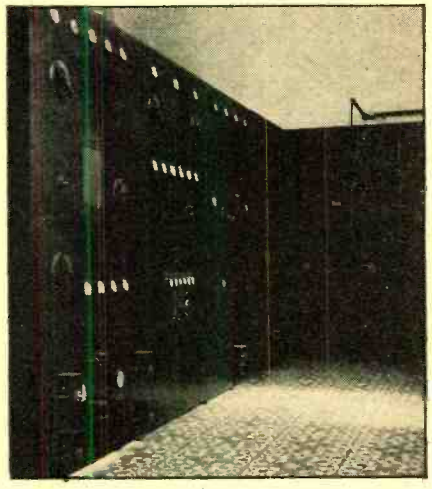
LRX, LR1, Buenos Aires, 9660 kc., daily 6-10:30 p.m. (Alfred, Shamleffer, Partner, Black, Stillman, Lopez). Slogan: "Radio El Mundo". Address: Calle Maipu 555.

OAX4J, Lima, Peru, 9300 kc. (Jaime); daily until 11 p.m. (Alfred, Shamleffer, Ralat); 9340 kc., 8 p.m.-1 a.m. (Partner, Chiang, Kemp, Herzog, Beck, Betances). Slogan: "Radio Nacional". Address: Radio Internacional, Casilla 1166.

OAX4D, Lima, Peru, 5780 kc., Wednesday and Saturday 9-11:30 p.m. (from veri) (Alfred). Address: All American Cables Inc., Casilla 2336.

OAX5A, Ica, Peru, 11800 kc., signed at 1 a.m., (Shamleffer): Saturday 10:45-11:30 p.m. (Kentzel); Uses two-tone whistle. (Beck).

OAX4A, OAX4Z, Lima, Peru. 6080 kc., Sun-



CUBAN STATION TRANSMITTER

This is the transmitter set-up of Station COCH, Havana, Cuba.

day 7:30 p.m.-11:30 p.m. (from veri) (Foshay). Address: P. O. Box 921.

OAX4I, Peru, 1:35 a.m. (Beck).

OAX5B, Ica, Peru, 11795 kc., 9:30 p.m. (Ralat); daily 4-11:15 p.m. (Black, Beck). Slogan: "Radio Universal".

OCI, Lima, Peru, 10970 kc., musical program at 6:30 p.m. (Gallagher).

OAX4G, Lima, Peru, 48.1 meters, 7-9:30 p.m. (Gossett).

PPQ, Rio de Janeiro, Brazil, 11670 kc., 8-8:30 p.m. (Alfred); daily 7:30-8:15 p.m. (Lueth).

PRF5, Rio de Janeiro, Brazil, 9501 kc. (from announcement), until 9:40 p.m. (Shamleffer); daily 1:45-2:45 p.m. (from veri) (Westman); daily 7-8 p.m. (Sporn, Ryan); 5:30-5:45 p.m. (Fallon).

"Radio Libertad," 9520 kc., 7-8 p.m., signs with "Marseillaise". (Shamleffer).

YV3MR, Georgetown, British Guiana, 6000 kc. (Gossett).

PZH, Paramaribo, Dutch Guiana, 7000 kc., 9 p.m. (Croston).

CEB, CB615, CB123, Santiago, Chile, 12300 kc. (from veri) (Sesma); daily 11 a.m.-1 p.m., 4-8 p.m. (Foshay, Herzog); 11 p.m. (Croston, Ralat, Partner). Slogan: "Radio Service". Address: Bandera 176, Casilla 761.

CB960, Santiago, Chile, 9600 kc. (Beck). Slogan: "Radiofusora Pilot".

PRADO, Riobamba, Ecuador, 6620 kc., 9 p.m. (Coover); Thursday 9-11:30 p.m., (Alfred). Address: P. O. Box 98.

HC2RL, Guayaquil, Ecuador, 6235 kc., (Jaime); Sunday 5:45-7:45 p.m., Tuesday 9:15-11:15 p.m. (Staley).

HC2RA, HC2EBA, Guayaquil, Ecuador, 9445 kc. (Alfred, Chiang); daily 9-10 p.m., Sunday 4-10 p.m. (Lueth, Tate). Slogan: "La Voz de Alma".

HCNA, Ecuador, 9440 kc., 11-11:30 p.m. (Wittig).

HCJB, Quito, Ecuador, 8950 kc., Monday, Wednesday and Saturday 1-3 p.m., 2-4 a.m. (from veri) (Sporn, Murray, Beck).

HC20BA, Guayaquil, Ecuador, 9450 kc., 9-10 p.m. (Beck). Slogan: "La Voz del Alma".

HC2CW, Guayaquil, Ecuador, 8400 kc., (Beck). Slogan: "Ondas del Pacifico". Address: P. O. Box 1166.

HC2ET, Guayaquil, Ecuador, 4600 kc., interval signal 12 chimes. (Beck). Slogan: "Radio Difusora del Telegrafo".

CXA4, Montevideo, Uruguay, 6130 kc., relays CX6. (Beck). Slogan: "Radio Electrico de Montevideo". Address: Mercedes 823.

CP6, La Paz, Bolivia, 9:30-10:30 p.m. (Beck). Address: Casilla 637.

West Indies

Radio Fort De France, Fort de France, Martinique, French W. Indies, 9.450 kc., daily 11:30 a.m.-12:30 p.m., 6:15-7:15 p.m., 9-0 p.m. (Edouard Boulanger, Fils, from veri) (Alfred, Craston, Sakely, Kentzel).

HH2S, Port au Prince, Haiti, 5.910 kc., (Jaime).

HH3W, Port au Prince, Haiti, 9,640 kc., (Jaime) Daily, 1-2 p.m., 7-8 p.m. (Doyle, Shamleffer, Ralat).

HIX, Trujillo City, Dominican Republic, 5.980 kc.

HI1X, Trujillo City, Dominican Republic, 15,250 kc., 6,430 kc.

HI2X, Trujillo City, Dominican Republic, 11,960 kc.

HI3X, Trujillo City, Dominican Republic, 15,280 kc., (from veri), Sunday 7:40-10:40 p.m., Tuesday trio, 12:10-1:10 p.m., 8:10-10:10 p.m., rest of week, 12:10-1:10 p.m. (Alfred, Weikal, Schrock, Messer, Chiang, Wilson, Beck, McCartin, Partner, Tate.) Desires reports—(Coover, Navals, Brown, Tomcak, Buchanan).

HIL, Ciudad Trujillo, 6.500 kc. (Jaime).

HIN, Trujillo City, Dominican Republic, 6,240 kc., 9 p.m. (Coover, Jaime, Randle, Unger,) 7:30-9:30 p.m. (Cindel) 15,290 kc., (Shamleffer), 12,500 kc., (Herzog, Brown) daily 6-11 p.m. (Kernan, Oiliver,) 12,480 kc. (Beck, Buchanan).

HI8A, Trujillo City, Dominican Republic, 6,479 kc., 9-10 p.m., and 1-2 a.m., (Alfred) Address: P. O. Box 1312.

HIT, Trujillo City, Dominican Republic, 6,630 kc., weekdays 12:30 a.m.-2 p.m. 6-8 p.m., Sunday 11 p.m.-1 a.m. (Alfred, Ralat). Slogan: "La Voz de La R.C.A. Victor". Address: P. O. Box 1105.

HIZ, Trujillo City, Dominican Republic, 6,130 kc. (Jaime). Signed at 9:15 p.m. (Ralat).

HIH, Trujillo Cit, Dominican Republic, 6,243 kc., (Liljegren), 6,780 kc., (Schrack), (from veri) Westman, 5:45 p.m. (Herzog,) signed Sunday 6:45 p.m. (Ralat).

HI1S, Puerto Plata, Dominican Republic, 6,450 kc., 7-8 p.m. (Willig), 6,420 kc., 12:15 a.m. (Hartzell, Sprague, Unger). Slogan: "La Voz de Hispaniola".

HIG, Trujillo City, Dominican Republic, 6,280 kc. Signed at 5 p.m. (Ralat).

HI2D, Trujillo City, 6,900 kc., 4 p.m. (Ralat). Slogan: "La Voz de la Accion Catolica".

HI7P, Trujillo City, Dominican Republic, 6,800 kc., daily 1-2 p.m., 7-9 p.m. (Ralat). Slogan: "Emisora Diario del Comercio".

HI5N, Moca, Dominican Republic, 6,150 kc., 7:15 p.m. (Ralat). Slogan: "The Voice of Moca".

COCH, Havana, Cuba, 9,428 kc., (Watson, Low), 11:15 p.m. (Unger.) 7 p.m.-1 a.m. (Ralat, Sprague, McCartin, Eramo, Wacker, Weiss,) signs at 10 p.m. (Pressler, Coover).

COCD, Havana, Cuba, 6,130 kc., Sunday until 3 a.m. (Sesma) 5-10 p.m. (McCartin,) 11 p.m. (Eramo).

COCE, La Corona, Havana, 8,823 kc., 11 p.m.-5 a.m. (Doyle).

COHB, Sancti Spiritus, 6.280 kc.

COCN, Havana, Cuba, 11.990 kc., signed at 11:33 p.m. (Brown). address: P. O. Box 38.

COCQ, Havana, Cuba, 9,750 kc., 8 p.m. (Coover, Liljegren, Watson, Ranelle, Beck), 6 a.m. (Herzog). Schedule 7 a.m.-1 p.m. (Wacker, Pylete, Doyle, Ryan).

COCX, Havana, Cuba, 11,435 kc., 5:55-8:00 p.m. (Liljegren, Watson, Unger) 10,660 kc., (harmonic?) (Herzog, Coover).

COCO, Havana, Cuba, 12.000 kc., (Wiekal). after 3 a.m. (Hedgeland). 8 p.m. (Unger), 6,000 kc., 3-10 p.m. (McCartin, Welper), 8 a.m.-noon (Wacker, Randle).

North America

XEWI, Mexico City, Mexico, 11900 kc., Tuesday, 9:30-11 p.m., Friday, 8-11 p.m., also on 6015 kc. (Alfred, Ralat,) 11-12 p.m. (Wittig, Black) Saturday, 10-11 p.m. (Shamleffer, Gossett). Slogan: "My Voice to the World from Mexico." Address: P. O. Box 2874.

XEYU, Mexico City, Mexico, 9600 kc., requests reports, signed at 1:32 a.m. (Alfred) Saturday 12 a.m. (Hartzell, Lopez, Gallagher). Address: Nopolis 60, 60 Napoli Street.

XEXA, Mexico City, Mexico, 6180 kc., daily 8-11 p.m. (Howald), reports requested, (Fallon, Sporn), 6132 kc. (Brummund, Sporn), 6160 kc., (Gassett). Address: Dept. of Publicity & Propaganda.

XEBT, Mexico City, Mexico, 6000 kc., 7 p.m.-4 a.m. (McCartin), 6100 kc., (Emerson, Beck), interval signal is three cuckoo calls.

XECR, Mexico City, Mexico, 7380 kc. (Emerson).

XEPW, Mexico City, Mexico, 6110 kc., chimes used, (Beck, Alfred, Fallon, Law), daily except Sunday 8-12 p.m. (Partner, Brummund). Slogan: "La Voz del Aguila Azteca des de Mexico". Address: P. O. Box 8403.

XEFO, Mexico City, Mexico, 6120 kc., (from ann.) (Beck) 9400 kc. (Alfred). Address: P. O. Box 2641.

XEUW, Veracruz, Mexico, 6020 kc., (Jaime, Sesina).

XEUZ, Mexico City, Mexico, 6120 kc., (from veri.), 2:15 a.m. (Alfred, Jaime, Law, Sakely). Slogan: "Cadena Radio Nacional." Address: Same as XEFO.

XEBR, Hermosillo, Sonora, Mexico, 11820 kc. Chimes at intervals (Beck), daily 9-10 p.m. (Alfred, Atkinson, Chiang, Brown, Lopez). Slogan: "Herald of Sonora". Address: P. O. Box 68.

XEDQ, Guadalajara, Mexico, 9480 kc., (from veri.) 10-12 p.m. (Alfred) 9520 kc. (Jaime, Sesina, Black, Beck). Cuckoo calls, chimes and sirens. Slogan: "Radio Fonografica de Guadalajara". P. O. Box 197.

XEME, Merida, Yucatan, 9520 kc., 2:30-3 a.m. (Alfred). Address: Calle 59, 517.

XEBM, Mazatlan, Sinaloa, Mexico, 15440 kc., (Beck), uses bugle calls, siren, and chimes. Slogan: "El Pragonero del Pacifico". Address: P. O. Box 50.

XECU, Mexico D.F. Mexico, 6075 kc., 5-10 p.m. (Law).

XERY, Mexico, D.F. Mexico, 5920 kc., (Beck). Slogan: "Allente de Bravo".

CFRX, Toronto, Canada, 6070 kc., relays CFRB.

CRCX, Toronto, Canada, 6090 kc., daily 5-11:30 p.m. (Sporn).

CFRB, Toronto, Canada, 6900 kc., 6-11 p.m. (Alfred, Howald, Sesina), 11720 kc. (Law, Chiang, Wittig, Unger). Address: Roger—Majestic Corp.

VE9HX, Halifax, N. S., Canada, 6130 kc., 1-1:30 a.m. (Alfred), schedule: 10 a.m.-2 p.m., 6 p.m.-12 midnight, daily except Saturday, Sunday, and Friday; Saturday 2-4 p.m., Sunday only 3 p.m.-midnight (from veri.) (Herzog, Kemp).

CJRO, Winnipeg, Canada, 6159 kc. (Jaime), 11-11:30 p.m. (Sprague).

CJRX, Winnipeg, Canada, 11720 kc., 11-11:30 p.m. (Sprague).

CFCX, Montreal, Canada, 6000 kc., 5-11 p.m. (McCartin, Sprague).

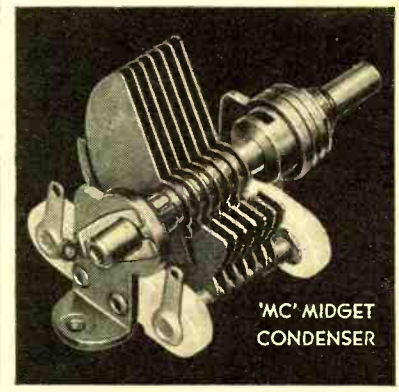
VE9CS, Vancouver, B. C., Canada, 6075 kc., relays CFHC. (Law).

VE9EM, Vancouver, B. C., 4800 kc., heard testing. (Kemp).

W1XK, Springfield, Mass., 9570 kc., (Jaime, Watson, Randle), 6 a.m., (Wittig, Hurley).

W1XAL, Boston, Mass., 4:55 p.m. (Randle), 11790 kc., 4:30-5:30 p.m. (Liljegren), 15250 kc., 10-11 a.m. (Shamleffer, Hare), Tuesday and Friday, 7:30-9:15 p.m., Monday through Friday, 7-9 p.m., Saturday 4-7 p.m., Sunday, 10-12 a.m., and 5-7 p.m. (White).

W3XAL, Bound Brook, N. J., 17780 kc., (Liljegren), 6100 kc., 16843 kc., 5:15 p.m. (Randle), 6-11 p.m. (McCartin, Sigundson), 17850 kc., Monday, Wednesday, and Saturday 5 p.m.-12 p.m., 6100 kc., daily 9 a.m.-5 p.m. (Ryan), requests reports (Unger).



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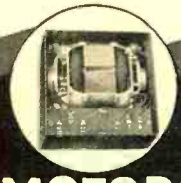

GEN-E-MOTORS

W6XKG, Los Angeles, Calif., (Randle), 25950 kc., has 24 hour schedule, (Schrock), 26400 kc., (Law, Atkinson, Atherton, Wacker, Sesina, Rheiner, Murphy), resquests reports, (Randle, Hamilton).

KEI, Bolinas, Calif., 9490 kc., 11:30 p.m. (Cox).

KCJ, Bolinas, Calif., 9000 kc., 11-11:05 p.m. (Pylute).

KKQ, Bolinas, Calif., 11950 kc., 9 p.m. (Alfred).

W3XAU, Philadelphia, Pa., 9580 kc., 6060 kc., 8-11 p.m. (McCartin, Law, Weiss, Sprague).

W8XK, Pittsburgh, Pa., 15200 kc., 11800 kc., (Jaime, Watson), 6140 kc., 7-12 p.m., 21500 kc., 6.30 a.m., daily (Pylate), daily 9 a.m.-7 p.m. (Ryan).

W9XAA, Chicago, Ill., 6080 kc., 9:15 a.m., (Eramo, Weiss).

W9XF, Chicago, Ill., 6100 kc., (Jaime, Watson, Herzog).

WX9PD, St. Louis, Mo., 31600 kc., requests reports, (Randle).

W8XWJ, Detroit, Mich., 31600 kc., requests reports, (Randle, Sigundson).

W2XGB, Long Island, N. Y., 12860 kc., 1-2 a.m. (Beck.)

W2XE, New York., 15270 kc., 17700 kc., (Jaime, Liljengren), 21520 kc., 7:30 a.m. and on (Randle). 17760 kc., (Atkinson).

W2XAF, New York, N. Y., 9530 kc., (Jaime, Liljegren, Hare, Watson).

W2XAD, New York, N. Y., 15300 kc., (Jaime) 15330 kc., (Liljegren, Hare), schedule 10 a.m.-6 p.m., (Randle, Sigundson, Ryan, Hamilton, Beck).

W8XAL, Cincinnati, Ohio, 6600 kc., (Jaime, Randle, Weiss) 6060 kc., (Sprague).

W3XES, Baltimore, Md., 35600 kc., schedule 9 a.m.-5 p.m. (from veri.), (Randle).

W9XAZ, Milwaukee, Wis., 26400 kc., 4:45 p.m., (Randle, Law), week days 1-12 p.m., Sundays, 1-5:30 p.m. (Wacker).

Readers Who Are Awarded "Honorable Mention" for Their Work in Connection with This Month's Short-Wave Report

Jaro Kober, Ernest W. Law, Herman Ruppert, Eric W. Watson, Olof Liljegren, Luis Diez, Hugo W. Richter, Donald Robinson, Roy E. Chisholm, Jose Lopez, Clyde Crisell, Steve Gorykowski, Max Hausdorff, Edward Peterson, Robert Muguet, H. Westman, Charles W. Egzenweiler, A. Sigundson, Thomas Walczak, Pete Chagaris, Leslie W. Orton, A. Clyde Fisher, Oscar Jaime, Jr., P. J. Cawsey, Harold E. Schrock, J. C. Innes, Troy Welper, Roy Chisholm, Simon Nodell, Louis C. Sciez, M. E. Packman, Jr., Clarence Hartzell, W. Labega, W. J. Stillman, Herman E. Wittig, Howard N. Schmidt, Richard Connes, Roy E. DeMent, Werner Howald, Thaddeus L. Grabek, T. Burnell Unger, Juan Manuel Salazar, Charles Mourmouris, Armand A. Boussy, Wong Tit, L. F. Gallagher, Paul B. Silver, Adam J. Eckert, Jr., Vincent M. Poll, James Rubard, John C. Sibbin, N. C. Smith, Albert Marcus, Ed. Nowak, Jr., George J. Munz, Joseph Zajchowski, A. Yamamoto, Thomas Randle, Tony Petitjean, Lorimer W. MacAlister, William Buchanan, Wilbur Brown, Archwell L. Bower, Jack Thomas, Art. E. MacLean, Lee Meade Williams, Leslie Maxwell, Michael Waser, Jr., Ray D. Brown, W. J. Lander, Earl W. Jones, J. M. Sears, A. E. Milby, Edward Treadwell, Marvin Pylate, Irving Sporn, B. W. Southwell, Thomas Fallon, Jr., Joseph A. Ryan, Wayne Wicks, August Brodrecht, R. C. Messer, Louis Margolis, P. L. Stiles, Paul J. Mraz, E. J. Wacker, A. Androk, M. J. Markuson, R. C. Messer, W. F. Herzog, John Eramo, Wede L. Jacobs, H. E. Goleby, George Hare, Fletcher, W. Hartman, Grace M. Beck, I. Weisz, Claude H. Roberts, Dan T. Wollenschlager, Irving Goodeve, C. V. Hays, A. Kosynsky, Abraham Sutker, Elizabeth Ritter, Walter J. Dustin, Wade Chambers, Jorge Ralat, Harry Lueth, Wilbur Croston, R. F. Shamleffer, Anton J. Cindel, James Doyle, Barry Sesma, Zane Sprague, C. R. Wilson, Manuel Betances, Michael Hedgeland, Peyton Black, J. Wendell Partner, K. D. Beckemeyer, John Kernan, Howard W. Oliver, E. Geneve, John L. Tate, Kenneth Dressler, Floyd M. Murphy, Fred Atherton, J. A. Lindebert, Jr., Arthur B. Coover, Orville Brown, Troy Welper, M. Rheiner, Albert Emerson, F. W. Dodge, Manuel Ortiz, C. V. Hays, Fred Coxe, Clair D. Van Meter, Mike Janyon, David Hurley, Jr., N. Hendry, Virgil Gossett, B. Kashimoto, Frank Sakely, H. F. Hamilton, J. R. Solodin, Joe Novak, Burnell Unger, C. Hays, G. C. Gallagher, Morgan Foshay, Simon M. Cartin, Elmer Samson, L. M. Jensen, William Peterson, Fred W. Alfred, Kenneth Futrell, D. Mason Gledhill, Lyle M. Nelson, Arthur Hamilton, C. H. Williams, A. W. Brummond, I. H. Burakowski, Jack Staley, H. Kemp, Harry E. Kentzel, George Hare, William Buchanan, John Tomcak, Li Chi Chiang, Sherry Adams, J. Atkinson, P. Piorko, Gilbert L. Harris, W. G. Umstead, Arthur Immicke, Carl & Anne Eder, Albert Augustine, James E. Moore, Jr., R. B. Oxrieder, R. W. Sahlbach, Leslie Mott, E. de Cottignies.

SWISS LISTENING POST

Listening post of Observer Hugo W. Richter with his pet Tom cat, "Pete", who resents CW interference.

"Ham" Transmitter

(*Continued from page 24*)

carbon microphone for voice transmission, although the transmitter is arranged so other types of microphones may be used if desired.

The power supply delivers 325 volts to the plates of the tubes with dropping resistors in other circuits to reduce this value to the ratings of the respective tubes. More than ample current is available through the use of two type 83 rectifier tubes in parallel.

Plug in coils are used. Operation on all amateur bands requires fifteen coils. Three are used at a time, one in the oscillator circuit, one in the buffer and a third in the r.f. amplifier. One of the interesting features is the method of providing flexibility and quick changeover from one band to another. This is the semi-fixed tuning arrangement for the oscillator and buffer circuits. For instance, the oscillator coil is adjusted by means of a trimmer condenser mounted through the chassis. If the trimmer is properly adjusted for the highest frequency crystal to be used in any band up to and including the 7,000 kilocycle band, another crystal may be substituted in this same band without retuning. However in the 14,000 k.c. band the trimmer will require readjustment when the crystal is changed. It was found the oscillator may be tuned easily when a neon lamp is used to indicate r.f. It is held near the oscillator coil.

The buffer circuit also is tuned by means of a trimmer condenser and adjustment is made in the same manner as in the oscillator stage. The 802 is operated at below normal voltage and draws small plate current, but provides adequate excitation for the r.f. amplifier.

Tuning of the r.f. amplifier is done by means of the control on the front panel. Adjustment of course is for minimum plate current on this tube. The r.f. amplifier plate coil also has an antenna coil wound at the "cold" end, providing for connection to either a "Zeppelin" or matched impedance type of antenna. A Marconi type antenna may be used on the lower frequencies.

Another interesting feature is the method of adjusting the coils for the two lower frequency amateur bands. These coils con-

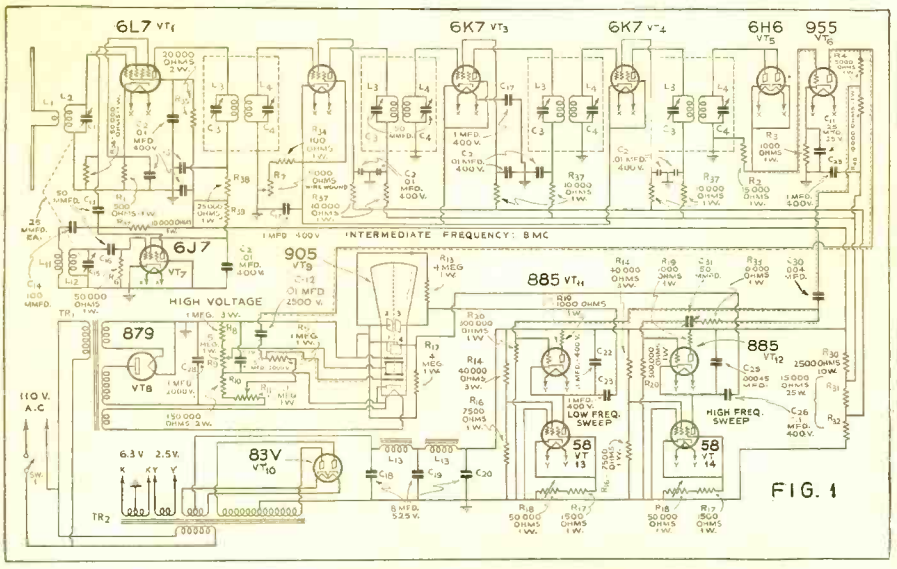

FIG. 1

LATEST DATA ON DON LEE TELEVISION RECEIVER

Constructors should use this diagram when wiring the television receiver described in the May issue. Wiring changes have been made to resistors R19 and R36; Value changes in C23, C12, R9, R30, R31, R32. When and if other improvements make their appearance, these will be incorporated in new diagrams from time to time.

tain their own trimmers which connect in parallel with those already in the set.

Neutralizing voltage for the r.f. amplifier is obtained from the plate circuit of the buffer stage by means of two taps on this coil. The neutralizing condenser for the 807 consists of a nut attached to the end of a screw that may be adjusted to obtain the proper capacity. Only a few micromicrifarads are needed.

Parasitic Filters

Parasitic filters are used in both the screen and grid circuits of the power amplifier and the screen circuit of the oscillator. These consist of 100 ohm resistors shunted by small r.f. choke coils.

Voltage for the carbon microphone is obtained from the power supply, and is approximately 5¾ volts. The modulation transformer is cut in or out of the circuit by means of the "phone—C.W." switch on the front panel. In the c.w. position the switch, which is a double-pole-double-throw affair, disconnects the plate voltage of the two speech amplifier tubes as well as the screen voltage on the 6L6's and substitutes a bleeder resistor. The resistor prevents the rectified voltage from reaching a value endangering the filter condensers when the key is in the "up" position. With the screen voltage removed from the 6L6's they draw no plate current, even though plate voltage is still applied.

Keying the Rig

An insulated strip containing three terminals is provided for connecting the key. By using two of these it is possible to key both the buffer and r.f. amplifier simultaneously while the oscillator continues to operate, or by using two other terminals, the oscillator and amplifier stages may be keyed simultaneously.

Some fixed bias is provided in addition to the grid-leak bias for the protection of the r.f. power amplifier. However, this is not sufficient to prevent high dissipation in the r.f. amplifier should excitation be removed. Therefore, the manufacturer does not recommend the oscillator be keyed alone. However, for frequencies up to and including the 7,000 band it is possible to key the oscillator simultaneously with the other stages.

The transmitter was put on the air at W2MW for tests. Despite its small power surprising results were obtained. On the 20 meter 'phone band five stations were worked in a row and reports varied from R6 to R9. These stations ranged in distance from 500 to 1,000 miles. One interesting test was made with a station in Atlanta, Ga. (W4CFD). He was worked three times during the day at different hours. He reported the signal R7 to 8 on all occasions, but some interference from a powerful mid-Western station. The transmitter was switched from 'phone to c.w. and it was possible to compete with the powerful interference. Later, as a test, the normal 400-watt transmitter at W2MW was put on the air and he reported he noticed very little difference in signal strength, and that interference affected the more powerful signal about as much as that from the low-powered transmitter.

Operating Tests

The transmitter was tested at 10 meters, but unfortunately conditions on the band at the time were nil, so that it was impossible to determine its effectiveness. However, output obtained seemed to be about the same as that on 20 meters and, normally, when the 10 meter band is functioning 16 watts of carrier on 'phone is about as effective as a half-kilowatt.

The transmitter was tested on the 75 meter 'phone band with an antenna that normally has from 500 to 1,000 watts behind it. In the short space of an hour five stations were worked. The tests were made in the late afternoon when the interference on this band is quite heavy. The first station worked (W2CET) was about forty miles airline from the transmitter and reported the signals QSA5 R8 and 100 per cent through all of the QRM. The second station (W8EMV) at Medina, Ohio, was close to 400 miles from the transmitter. He reported the signals QSA4 R7 due to some rather heavy QRM. The next station contacted was W3CKD at Monton, Pa. who reported the signal QSA5 R7 to R8. Two other contacts were had with second district stations within ten miles of the transmitter and both reports were QSA5 R9.

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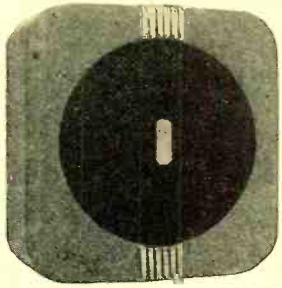

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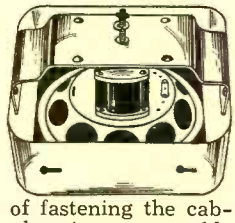

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WHAT'S NEW IN RADIO

WILLIAM C. DORF

(*Continued from page* 9)

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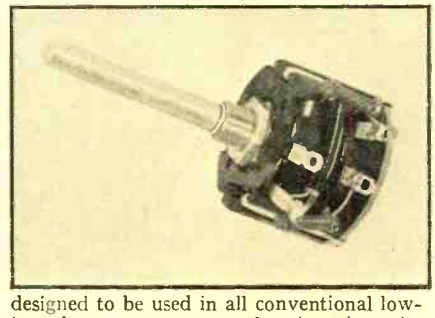
Constant Impedance Control

Using an old principle of design, the "bridged-T" network in a new application has enabled Centralab to offer a true constant impedance control at little more than the cost of a good potentiometer. Known as the "Delta-T Pad" these new units are



designed to be used in all conventional low-impedance attenuator and series-mixer circuits.

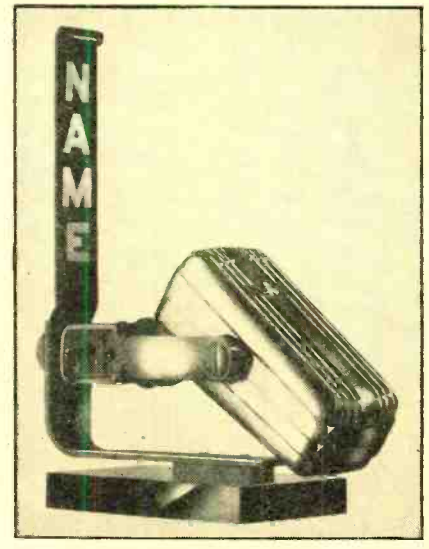
New Tube Checker

The Weston Electrical Instrument Corporation recently announced the new model No. 773 tube tester, available with carrying case, for special counter mounting (shown in the illustration) or as a matched companion unit for their model No. 772 analyzer. The checker features the same "anti-obsolescence" circuit and switching system first introduced in the model 770 tube checker two years ago—a system designed to test the newest tubes without adapters. A new feature of the unit is the "noise-test" jack, wherein headphones or an amplifying unit can be plugged to check on possible sputtering, "frying" or other tube noise in any or all

electrode circuits. A hot-cathode leakage test is provided, and the neon short check can be quickly made while the tube is hot to catch intermittent shorts. The 4½ inch meter scale has a color-band marking, differentiating between good and bad tubes.

Microphone Stand Contest

The Amperite Company invites our readers to submit a name for their new "mike" desk stand. The person submitting the best name receives the first prize of a microphone and stand. Those submitting

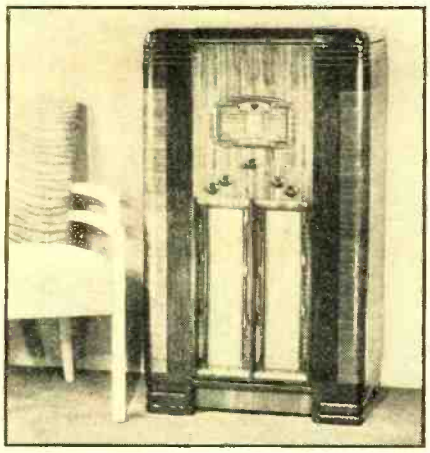


the ten next best names will be awarded a stand. The contest closes July first and the judges are John F. Rider, publisher, and Joseph Kaufman, of the National Radio Institute.

One of the features of the new stand, is with the microphone placed horizontally, the center of gravity is lowered, making the unit unusually stable. The leaf spring suspension acts as an excellent shock absorber.

Dial Tells Complete Story

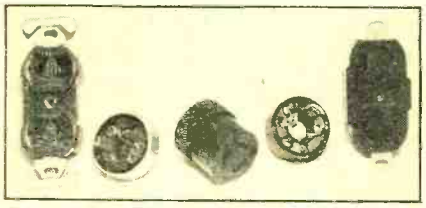
At first glance the most apparent refinement of the new Stromberg-Carlson model 145 SP ten-tube Labyrinth type high-fidelity receiver and automatic phonograph is the de luxe index type dial with tri-focal tuning indicator, micrometer sub-dial, volume indicator and other features all grouped in one attractive unit. Additional advances include tuning range 145 to 18,000



kc., automatic antenna selector new full floating pickup mounting, etc.

New Electrical Accessories

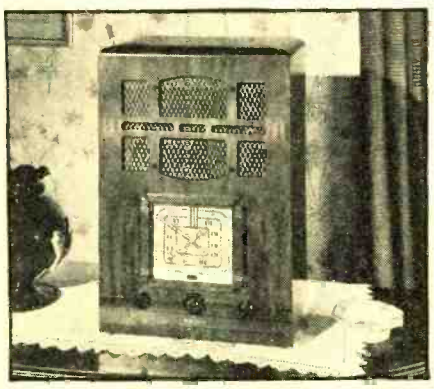
The Harvey Hubbell Company, specialists in all kinds of electrical wiring accessories, has just announced the following



new products, of interest to servicemen and radio dealers as well as electricians. Viewing the illustration from left to right, the first item is a new duplex-outlet for side wiring. It is finished with a bakelite face and will take the double "T" blade cord-grip plug shown next to it. The blades of the plug are a combination of tandem and parallel, riveted and key-locked together. The next three items are the new "twist-lock" devices; a 3 wire polarized bakelite connector and cap, and a duplex-flush receptacle for same.

Latest Farm Radio

This is the new RCA 5-tube, three-band superheterodyne, especially designed for use on the farm and in those districts without benefit of power lines. This model may be operated as a 2-volt set, using the following batteries: one Air-Cell or 2-volt storage battery; three 45 volt "B" batteries; one 7½ volt "C" battery or it can also be easily converted to 6-volt operation by employing the new RCA model CV-8 "Pak-O-Powr". This unit and a 6-volt storage battery are the only power supplies needed. The set has a tuning range from 530 to 1720 kilocycles. Its tube



equipment comprises one 1C6, one 1A4, one 1F6, one 30 and one 19 type power tube.

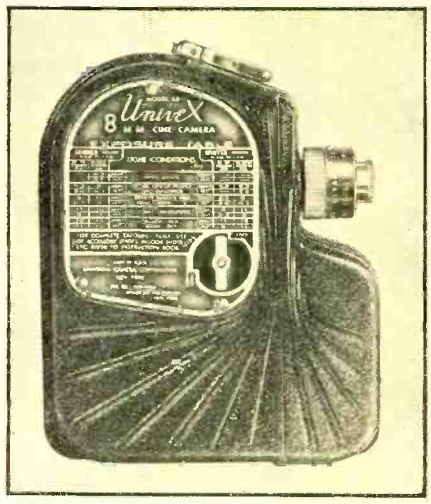
Dynamic Microphone

The moving coil, permanent magnet type microphone shown in the accompanying illustration, is made by the American Microphone Company. The new instrument is available with either high or low-impedence output. It is an all-purpose

"mike" of rugged construction, designed to be semi-directional, to have minimum feedback, and to provide high-quality.

Another Profitable Side Line

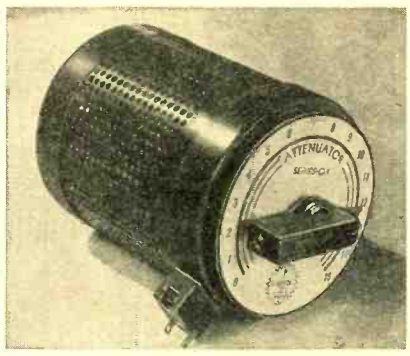
For extra sales and profits many radio stores are now handling home movie equipment. Dealers and servicemen in this business will be interested in the new Univex Cine low-cost movie camera. This instru-



ment employs 8 mm. film and there is a companion projector, model No. P8.

Constant-Impedance Output Attenuator

This is the new series CIA constant-impedance attenuator announced by the



Clarostat Manufacturing Company. It is recommended as an output level control for power amplifiers, or as an input attenuator for individual loud-speakers in a public address system. It is made to dissipate 25 watts of power continuously, regardless of setting, and has a minimum insertion loss of 1.3 decibles. Standard surge or input impedances available are 8, 15, 50, 200, 250 and 500 ohms.

The control is linear up to 45 decibles, in steps of 3 decibles with an end position of infinite attenuation. Impedance from load end is approximately three times the line value.

(*Turn to page* 64)

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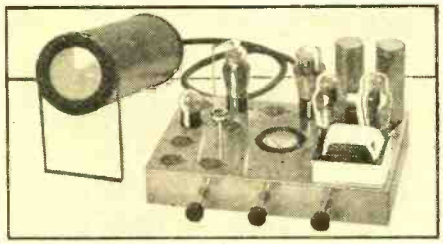

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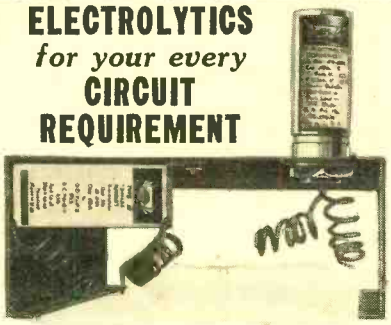

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Inter-Office Call Systems

(*Continued from page* 11)

master unit can be used either in a multiple arrangement or it may be employed with the "Call and Reply System" where it is used in connection with a number of loudspeakers placed at various points.

The Bullet-Phone

THE Transducer Corp. announces three new call systems offering the advantages of 2-way, and multi-station communication. The "Bullet-Phone" unit (see No. 7) functions both as a loudspeaker and microphone. It is modern in appearance and it takes up less space than the regular telephone instrument. The amplifier is compactly designed and can be mounted on the wall or on the side of the desk the same as a telephone bell box. The number and type of tubes employed include one 6J7, one 25L6 and one 25Z6. The manufacturer advises that conversations over the "Bullet-Phone" may be carried on in a normal tone of voice with the instrument placed anywhere on the desk. Its directional characteristics reduce to a minimum such background noises as typewriters, adding machines, etc.

Features Quality Reproduction

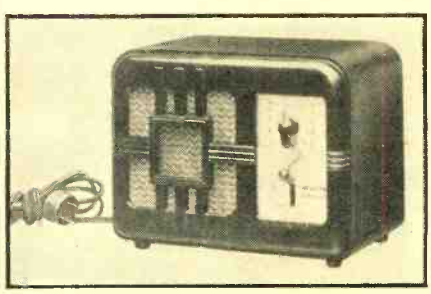
THE Operadio model 135 call system (see No. 12) employs connecting wires between stations and is designed to operate from 110 volt alternating or direct current. The response of the amplifier is so designed as to complement the frequency response of the speaker when used as a microphone, as well as a speaker, so that the overall result, as far as quality is concerned is the same as when using a separate microphone in conjunction with any good P.A. system.

The Operadio model 111 paging system (see No. 8) is designed especially for use in factories, hotels, public buildings, etc. The system is supplied complete with contact type crystal microphone, a special amplifier which mounts on the wall at some convenient place near the microphone; a foot switch for use when talking; and four permanent-magnet dynamic speakers in attractive steel wall cabinets. Speakers are connected in parallel through a two wire system.

Can Handle Ten Stations

NO. 16 shows the new Webster Company's model OCM inter-office communication instrument. This is a multiple system designed to accommodate up to ten stations. It features a circuit arrangement whereby a number of simultaneous conversations can be carried on at the same time. The instrument is housed in a strikingly-attractive, highly-polished, wooden cabinet with an ebony finish. They make four different models all operating from either alternating or direct current and employing connecting wires between sub-stations.

NO. 16



NO. 17

Unusual interest has been displayed in their new factory call system. No. 17 shows the operator seated at the switchboard and communicating to the different departments.

Operates from Alternating or Direct Current

THE Wholesale Radio Service Company's "Auburn" intercommunication systems (see No. 11) feature easy installation, simple operation and attractive appearance. Both systems furnish an efficient and fast means of holding direct 2-way amplified communication between two or more persons or departments. The selective system offers direct communication with any one of five different points, or with all five simultaneously. The second, a "common call" system is similar to the selector type of system, except that it does not incorporate a selector switch. Also, it is limited to the addition of three additional sub-stations, as compared to five in the selector system. Both systems are of the wired type. Completely assembled cables with plugs are available in 50 foot or 100 foot lengths.

"Duo-Matic"

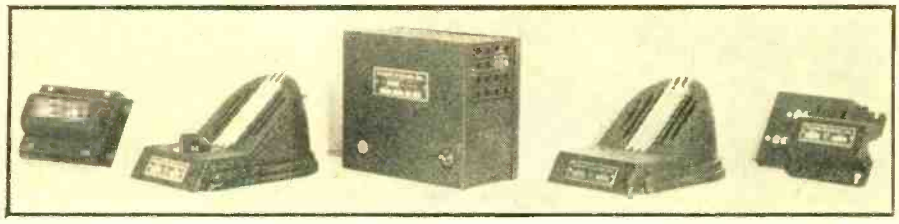
THE Dictograph Products Company, pioneers in the inter-communication field, announce the Duo-Matic call-system featuring loudspeaking, simultaneous 2-way communication. It operates 8 to 12 months on a few dry cell batteries, uses current only when operating, is silent when not in use and all staff stations may call the master station at any time promptly and privately. This system is really telephone equipment. (The master station and the staff telephone hand set are shown in Nos. 13 and 14). This company is also producing a call-system for use in trailers. With this instrument the driver can talk and listen without taking his eyes off the road or his hands from the wheel.

P.D.Q. Two-Way System

THE new Turner inter-communication system (see No. 15), furnished complete with simple diagrams and instructions, is designed to be installed in a few minutes time. A 2-station system consists of one automatic central unit, two walnut station cabinets and the necessary plugs, tubes, and hook-up wire. Additional stations can be added at any time, as no changes are necessary in the original system.

"Intercommunicator"

THE new Sound Systems, Inc., "Intercommunicator" call-system (see No. 18) is designed along ultra-modern lines to harmonize with modern desk accessories. It



NO. 18

is no larger than the ordinary telephone set. The combination speaker microphone unit is enclosed in a small aluminum casting 4 by 5 by 7 inches mounted at a 45-degree angle. The Intercommunicator is so designed that from 1 to 18 units may be used with one central amplifier. This system uses connecting wires between stations.

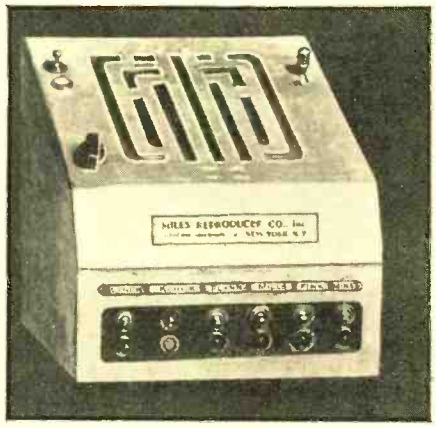
Communo-Phone

FIVE different models, three "wired" and two "wireless" type complete the Bogen "Communo-Phone" series of call systems. All models operate from either 110 volt direct or alternating current. The model 5SC station (see No. 10) houses a 4-tube amplifier and is provided with selective controls to enable conversation with any or all of the other stations on the system, either independently or simultaneously. The tubes used are: one 6J7, one 6C5, one 25A6, one 25Z6 and 1-25 watt, 120 volt bulb.

Information from the manufacturer points out that the model 5W system, (a wired-wireless type) has an external control which permits frequency selection so that several systems may be used independently in the same building. A 6-tube unit is used in each station and communication is possible between points over 1000 feet apart. They further advise that no jumper condensers are required at fuse boxes, even though stations are operating from entirely different branches of the power line.

"Vocaphone"

THE Miles Reproducer Company, Inc. specializes in all kinds of communication



equipment. Their "Vocaphone" (shown in No. 19) and "Socket-Phone" systems are available for multiple station operation with and without inter-connecting lines. They work from either alternating or direct current. A control is provided at each master station for volume and tone adjustment. This company also manufactures portable private phone systems, 1-way announcing systems, and paging systems, for hotels, restaurants, etc.

Specialists in Communication Systems

The "Teletalk" line of inter-office communication equipment made by the Webster Electric Company includes selective type systems, master station models, paging systems, and confidential models to afford privacy in conversation. They feature a new circuit arrangement to reduce line current drain whereby the tube filaments are kept hot and the high voltages are used only when talking.

"Talk-Bak"

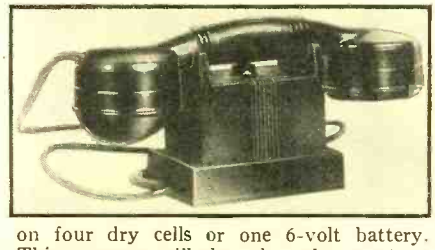
The Wright-DeCoster Company, Inc., well known loudspeaker manufacturer, has just introduced a special 5-inch "Nokoil" speaker, for combination use as a microphone and speaker with all kinds of inter-

communication systems. The "Talk-Bak" speaker, as it is known, is shown in a suggested type of cabinet. This company is in

a position to supply schematic diagrams, including information regarding the equalizer, the suggested type of amplifier and several different types of "Talk-Bak" installations.

"Cal-Fon"

The Universal Microphone Company introduces the "Cal-Fon" private phone system. The assembly constitutes a complete French hand-set. The housing also contains the buzzer, and the transformer, so that any number of phones can be used on one circuit by coding the rings for the office or individual being called. The system operates



on four dry cells or one 6-volt battery. This company will also adapt the new type of "Cal-Fon" for use on automobile trailers with the new model used for installation in the trailer itself, and an inter-communicating phone in the driver's compartment.

"Port-A-Fone"

The Electronic Devices, Inc., announce a new inter-communication system called the

(*Turn to page* 62)

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200 Meters And Down

CHICAGO, ILL.—The illustration shows a scene in the studio of WMAQ, NBC station, during one of the Saturday Midnight dramatizations of important events in amateur radio. The programs were sponsored by William J. Halligan, W9WZE, president of The Hallicrafters, Inc. They were built from material in DeSoto's book, "200 Meters and Down," and from records in the files of the A. R. R. L. The scene illustrated here was a re-enactment of the holdup of Dr. Philip Weintraub, W9SZW, a prominent Chicago dentist and amateur radio operator. Dr. Weintraub was saved due to the presence of a transmitter in his office. Seated all the way at the right is the sponsor, Mr. W. J. Halligan.

5-Meter Converter

(*Continued from page 23*)

box of similar size will serve. Considerable time and trouble will be saved if the unit is made on a standard chassis, with standard panel and cabinet. The r.f. socket is mounted on the partition between the r.f. and detector compartments. The detector and oscillator sockets are mounted on the chassis. The detector plate lead is thereby isolated from the r.f. circuits.

The alignment of this unit is not difficult. Connect the output terminals to the input terminals of the receiver to be used as the i.f. amplifier with twisted pair. Tune the receiver to 1,600 kilocycles. Now adjust the output transformer trimmer on the converter for maximum noise (hiss). This "hiss" is generated in the 954 converter plate circuit. The best method of aligning the detector appears to be as follows:

1. Connect an ordinary buzzer to a battery and place it somewhere near the converter.
2. Vary the detector trimmer until the noise is at maximum. Make sure the detector is on the low frequency side of the oscillator. (If the detector blocks as you decrease the trimmer capacity from the point of maximum noise you are on the low frequency side.) Do the aligning in the middle of the band.
3. The r.f. tuning is not ganged and therefore no trimming is necessary.

This converter has been tested on several types of receivers and the following facts have been observed:

1. The *ideal* receiver to use as an i.f. amplifier would include such features as variable selectivity, good a.v.c. action, a good tuning or "R" meter, automatic frequency control on its own oscillator and a manually adjusted noise silencer.
2. Tests made on the Hammarlund Super-Pro as an i.f. amplifier indicated that *maximum* selectivity (about 3 kc. band width) could be used with ease on crystal controlled signals in the five-meter band. The variable selectivity feature of this receiver allowed its use on good M. O. P. A. signals and well adjusted rod oscillators.
3. The use of a receiver with automatic frequency control simplified tuning tremendously as it held on to signals which drifted out without the control in use.
4. The signal to noise ratio was superior (regardless of the receiver used as the i.f. channel) to any 5-meter receiver yet tested by the author.
5. When using the Super-Pro, c.w. signals from crystal-controlled 5-meter transmitters as well as commercial harmonics were copied with ease.
6. If greater band width is required, to permit understandable reception of some of the less stable transmitters, a t.r.f. receiver will serve well as the i.f. portion. Such sets may be picked up today for a song. They will not, however, allow maximum selectivity on stable signals.

In conclusion, I feel a final word of warning is in order. This is an advanced piece of 5-meter equipment and only the advanced amateur should tackle it. Units made from the same set of plans by different people will often differ in performance. The advanced "ham" can easily correct the discrepancies himself. The novice is not in a position to do this.

List of Parts

C1—50-100 mmfd., midget variable condenser
C2, C3, C4—20 mmfd., midget variable condenser
C5, C7,—3-30 mmfd., midget mica trimmer condenser
C6—150 mmfd., mica trimmer condenser
C8—.005 mfd., 200 volt, paper condenser
C9—included with National XMA socket
C10, C13, C15, C16—.00025 mfd., midget mica condenser
C11—.005 mfd., paper condenser, 400 v.
C12—.05 mfd., paper condenser, 200 v.
C14, C19—.01 mfd., paper condenser, 400 v.
C17, 18—dual 8-8 mfd., 400 v., electrolytic condensers
L1—7 t., spiral wound No. 18 push-back wire, dipped in Duco cement
L2, L3, L4—7 t., ½-inch diam., spaced 2 X diam., No. 16 tinned copper wire
L5—National R-100 r.f. choke
R1—1500 ohms, ¼ watt
R2, R4—100,000 ohms, ½ watt
R3—2000 ohms, ¼ watt
R5—50,000 ohms, ¼ watt
R6—20,000 ohms, 25 watts
R7—2000 ohms, 10 watts
R8—150,000 ohms, ½ watt
T1—small power transformer, 300 v. each side c.t., 6.3 v. fil. winding
T2—1600 kc., transformer (See text)
S1—snap switch
VT1—954 acorn pentode
VT2—954 acorn pentode
VT3—955 acorn triode
VT4—5W4 rectifier

Auto Radio Servicing

(*Continued from page 13*)

in this article to indicate more than a handful of typical conditions. The individual serviceman should experiment with the types of auto radios which he will be called upon most often to service. The general procedure will be the same in all cases.

Connect the high side of the vertical plates in the cathode-ray oscilloscope, through the usual amplifier, to one side of the primary of the power transformer. Connect the ground side of the oscilloscope to the chassis of the auto radio receiver. Adjust the amplifier gain control for satisfactory vertical deflection, and the horizontal sweep circuit for synchronization at one-half or one-third the vibrator frequency to obtain two or three waves on the screen.

If difficulty is experienced in obtaining a stationary image, this is *prima facie* evidence of vibrator trouble. Two types of moving wave-forms may be experienced. Voltage fluctuations will show vertical instability, as indicated in the oscillogram of Figure 4. This is an RCA synchronous vibrator with burned rectifying points. Frequency instability will be evident in an erratic horizontal movement of the pattern, and will usually be caused by dirty or burned vibrator points.

The technique of experimentation should be carried out as follows: First investigate the wave-form of a perfect vibrator. Using an Arvin 17A, the vibrator curve, if in perfect condition, will appear on the screen as indicated in Figures 1, 2 and 3, and as in "a" of Figure 5. Bend one stationary contact so that it is at a greater distance from the operating reed. This may alter the frequency slightly, necessitating resynchronization. Note the distortion produced in the curve. Press the contact too close and again observe the curve. Resetting the operating contact to its normal position, make similar tests with one of the rectifying contacts—in the case of a synchronous rectifier. Contacts can be opened by inserting a piece of paper between vibrating and stationary contacts. Remove the buffer condensers—two .02 mf. condensers with a common ground in the case of the Arvin. Note the wave-form. Replace one condenser and again observe the pattern on the screen. A further observation should be made with excess capacity buffers. *During this experimenting, remember high voltage is developed in the secondary circuit, so take care to avoid shocks.*

Most of these tests can be effected with the suggested oscilloscopic connections in the primary power circuit. Where the secondary circuit is affected, the load variations will be reflected in the primary circuit, thus making a change of set-up unnecessary, and facilitating the work of routine servicing.

Returning to Figure 5: Oscillograms "a" through "h" were made on the Arvin. Curve "b" shows one contact too close; "c", the other contact too close; "d", one contact open; "e", no buffer condensers; "f", one buffer condenser; and "g" shows too much buffer capacity. At "h" is shown the output of the 84 with the filter connected, but observed on the tube side of the filter. Figures 5-i-j-k-l were made with a Philco non-synchronous vibrator under different conditions, showing correct and maloperation. Oscillogram "i" indicates correct adjustment; "j" with the

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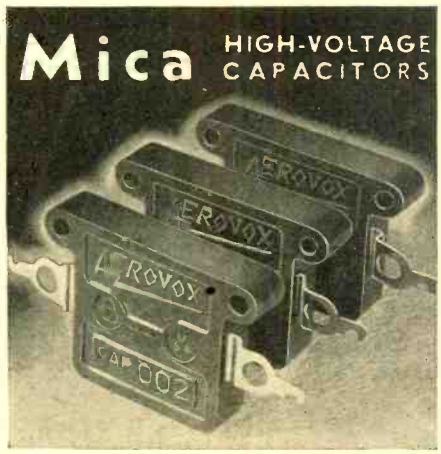

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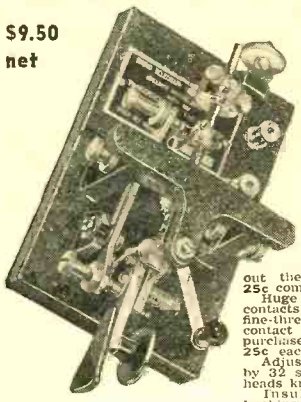

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Main spring selected as you all know with great care (these main springs likewise may be purchased by unfortunate operators having those "speed keys" that won't work right without the right spring at 25c complete with rivets).

Huge 3/16th fine silver contacts mounted on ¼" fine-threaded dot and dash contact screws (may be purchased separately at 25c each).

Adjustment screws ¼ by 32 screws. All screw-heads knurled and slotted.

Insulating washers, bushings bakelite. Dash button, dot paddle bakelite.

Bearing pins and screws oversized case hardened steel. Note also pigtails for electrical connections instead of depending on bearings.

All parts above base beautifully chromium plated.

Same gigantic solid one-piece cast base but now breath-takingly gorgeously finished like a piece of polished black marble with light veins running through it.

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starting contact too close; "k", the other contact too close; "l", contacts too far apart. Figures 5-m and 5-n show respectively a Radiart 3313 replacement for the RCA synchronous vibrator (shown faulty in Figure 4) and a Radiart 3320 replacement in a Philco—normal operation being indicated in both instances.

By synchronizing with the output wave of the filter system, and then connecting the oscilloscope to the output of the set, it can be determined if any "hash" is being fed into the r-f system, and thence to the audio circuits. Sometimes this is not audible as "hash", but is evident as distortion when a signal is being received—the modulated carrier riding the "hash" wave. A modulated oscillator—400 cycles—should be employed in making this test, and the "hash" will be disclosed as a distorted envelope. Radio-frequency chokes in the hot "a" lead and adequate by-pass condensers can then be added to filter the disturbance.

The layout in Figure 3 shows, in addition to the Arvin receiver, a National Union oscilloscope, with the RCA TMV-97-A oscillator at the left. The National Union "wobbulator", atop the oscilloscope, is not used in vibrator servicing, but is employed, of course, in lining up both home and auto radios.

V-T Voltmeter

(*Continued from page* 15)

rise to a value that would endanger the meter. During measurements the switch is kept closed.

When measuring d.c. or low-frequency a.c. it is most convenient to have the 75 tube plugged in the panel socket. For r.f. measurements, however, the cap of the 75 tube must be brought to the point where the voltage measurement is desired. This is accomplished by using the goose-neck adapter, shown in the photograph of the instrument.

The adapter consists of a 6-wire cable terminating at one end in a 6-pin tube cable connector socket. Each cable lead from the tube base connects to the corresponding panel socket prong. In addition, a .05-mfd., 400-volt condenser, connected with as short leads as possible between the cathode and plate prongs of the cable connector socket, is required to keep the 75 tube from oscillating at some ultra-high frequency.

No detailed constructional data will be given, since every constructor will have his own idea of the proper layout and mechanical construction, and there is no reason why these personal preferences should not be indulged as long as the constants of the individual parts are not changed. For this reason, also small hardware, chassis parts, tube sockets, etc., are not specified on the parts list.

The accuracy of measurement will depend on the accuracy of the reference voltmeter so that it will pay to obtain a high-grade instrument and accurate multiplying resistors for this purpose. However, the values of the condensers and other resistors specified are not critical. It is essential that the paper dielectric by-pass condensers have very low leakage.

Before the vacuum-tube voltmeter can be used, it must be properly balanced to obtain the proper bridge action. No difficulty will be encountered if the following procedure is used:

1. Turn the balance indicator sensitivity switch (SW3) to "Low." This connects the 30,000-ohm resistor (R6) in series with the milliammeter and prevents the possibility of damage from excessive current during the balancing operation.

2. Short input to voltmeter by clipping ground lead to cap of 75 tube.

3. Plug in the power cord, turn on the instrument and allow it to warm up for at least one minute.

4. Set bias-selector switch (SW1) to point 2 (0-10 v. range) and turn potentiometer 1 to the 10-volt position.

5. Turn switch 3 to "High."

6. Adjust bridge balance control (P6) until balance indicator reads 0.

7. Return balance-bias selector switch (SW2) to position 1 ("0" bias voltage).

8. Adjust voltmeter tube bias (P5) until a reading of approximately 1/10 ma. is obtained on the balance indicator. This adjustment is not critical. If difficulty is found in reducing the plate current to .1 ma., try another type 37 tube. Some have "remote cut-off" and are unsatisfactory for this purpose. The instrument is now ready to be used.

When connecting the voltmeter it must be remembered that a d.c. path must be provided to close the grid circuit. In measuring across coils and resistors, the return path can be the voltage source. On the other hand, when measuring a.c. voltages through a capacity, as would be required for eliminating the d.c. component in a circuit where both a.c. and d.c. are flowing, or because of the nature of the circuit, a separate d.c. path must be provided. This can easily be accomplished by connecting a high resistance (2 to 5 megohms) between the 75 tube cap and the voltmeter ground wire. The ground wire should also be attached to the low-potential point of the circuit. When measuring d.c. voltages, the 75 grid cap connects to the positive side of the voltage source, the voltmeter ground to the negative.

Using the Vacuum-Tube Voltmeter

Where approximate value of voltage is known:

1. Set reference voltmeter range switch (SW1) at a point sufficiently high to cover the maximum voltage which might be encountered (i.e., to measure a voltage having a value between 25 and 50 volts, set the reference voltmeter range switch so that 50 volts can be measured).

2. Set the bias selector switch (SW2) to cover the desired range.

3. Connect the vacuum-tube voltmeter input leads across the voltage source to be measured.

4. Slowly retard bias potentiometer until indication is found on balance indicator, and pointer returns to a position between 0 and the original setting, 1/10 ma.

5. Read peak voltage as indicated on reference meter.

Where voltage to be measured is unknown:

1. Set SW1 to highest position.
2. Set SW2 in highest position.
3. Slowly retard bias potentiometer 4.
4. If no indication of null point is found, move back one position on both the reference voltmeter range switch and the bias selector switch. Then, slowly retard bias potentiometer 3, noting balance indicator action. If no indication is found, repeat these operations on each preceding range until the null point is found. Then read peak voltage on reference meter.

Detailed notes on applications will appear in an article to follow.

Parts List

C1, C2—Mallory HS693 8 mfd., 600 v. condensers
C3, C4—Mallory RN242 8 mfd., 450 v. condensers
C5, C6, C7—Mallory TP443 1 mfd., 200 v by-pass condensers
C8—2 mfd. 600 v. paper dielectric condenser
CH1, CH2—Midget filter chokes, 12 to 30 henry, 35 ma.

CT1, CT2—Yaxley 864C center-tapped resistors, 64 ohm
P1—Yaxley M1MP 1,000-ohm linear wire-wound potentiometer
P2—Yaxley M4MP 4,000-ohm linear wire-wound potentiometer
P3—Yaxley M2OMP 20,000-ohm linear wire-wound potentiometer
P4—Yaxley M25MP 25,000-ohm linear wire-wound potentiometer
P5—Yaxley M1MP 1,000-ohm linear wire-wound potentiometer
P6—Yaxley M7OMP 70,000-ohm linear wire-wound potentiometer
R1—100,000-ohm 1 watt carbon resistor
R2—10,000-ohm, 10 watt wire-wound resistor
R3—250,000-ohm, 1 watt carbon resistor
R4—1,000-ohm, 5 watt wire wound resistor
R5—25,000-ohm, 5 watt wire wound resistor
R6—30,000-ohm, 1 watt carbon resistor
R7—10,000-ohm, 5 watt wire-wound resistor
R8—10,000-ohm, 5 watt wire-wound resistor
SW1—Yaxley 1316 single-circuit 6 point switch, with type 374 dial plate
SW2—Yaxley 1316 single circuit 6 point switch with type 375 etched dial plate
SW3—Yaxley midget jack switch No. 10
SW5—On-off switch for 110 volts
T1—Power transformer, midget receiver type: pri. 115 v 60 cycles, secondaries 700 v., c. t.; 5 v. at 2a.; 6.3 v. at .3a
T2—Power transformer, midget receiver type, pri. 115 v. 60 cycles, secondaries 600 v., c.t.; 5 v. at 2a.; 6.3 at .3a
2 Milliammeters, 0-1 ma.

One set of resistance multipliers for one of above meters to give voltage readings with the following ranges, 0-10 volts, 0-50 volts, 0-250 volts and 0-500 volts. If desired a high-grade three range 0-500 volt high resistance voltmeter can be substituted for one of the milliammeters and the set of multipliers

1 type 75 tube
1 type 37 tube
1 type 80 tube

Television Operators Wanted

(*Continued from page* 15)

the human organ of sight is essential. The eye is very complex, but all future developments and improvements will undoubtedly be based on this organ. All of the properties of the eye should be studied, with particular attention to the *persistence of vision,* the secret of television and motion pictures.

The future engineer or operator must also have an extensive knowledge of optics, lenses, and the properties of light. He must be familiar with the electron theory, and electronic properties and action, as correlated with the structure of matter. He must be well-grounded in the elements and principles of electricity and radio.

All of these underlying principles are basic fundamentals of television, and must be thoroughly understood. With these principles in mind their direct application to television can be specifically defined.

The future television engineer and operator must have an extensive knowledge of audio- and video-amplifiers, including a comprehensive understanding of their related circuits. He should be familiar with commercial electron tubes, and practical commercial amplification and attenuation circuits. He must be well-versed in the use and operation of the photo-electric cell. Since all television transmission will be accomplished with the very short waves, a thorough understanding of radio-frequency transmission with ultra-high-frequency oscillators is very necessary. The operator should be familiar with the theory, operation and use of the cathode-ray tube in modern installations.

It is generally believed that television in the future will take place through non-mechanical, non-moving circuits. Experimental receivers now being prepared by two leading set manufacturers have no moving parts, or scanning discs. However, it would be desirable to have a knowledge of the scanning disc, electric motor, and associated equipment. Synchronization in television is very important. This is performed either by use of motors, or by "relaxation" circuits designed for this work; both methods should be familiar to the television operator or engineer.

Much of the early television broadcasting will be done by means of the motion-picture. This will be necessary because of the radical change imposed upon commercial broadcasting and the adaptability of the motion-picture to television transmission. Therefore the television engineer or operator should be familiar with the operation, use, and care of commercial motion-picture projectors and their related use to television.

A study of the Kerr Cell should also be considered. This important, though little-known, tube is used for obtaining large clear-white images, by action of the polarizing light which is in proportion to the impressed magnetic signal.

The potential television engineer, technician, operator or serviceman should keep constantly in touch with all new developments in the television field, through leading radio magazines and technical journals. Experimentation with television probably leads all other fields of research at the present time, and it is highly necessary to be well informed on new developments. It would be wise to construct and experiment with all types of smaller television receivers and transmitters, in order to become familiar with their operation, peculiarities and characteristics.

When television does arrive commercially it will be on a large scale and there will be an ever-increasing demand for competent, efficient, trained engineers, operators and technicians. The trained man will find himself very much in demand only if he has been well-trained and is thoroughly familiar with the various phases of television. There is probably no one technical school, college, or other institution where all of this necessary training can be obtained. Only by patient personal study and application can the future engineer or operator completely master the many diversified complexities involved in the transmission and reception of television radio signals. Television will revolutionize broadcasting and radio transmission and reception. The industry will eventually discover that it has a large demand for competent men, but a very small supply actually existing.

P. A. Equipment

(*Continued from page* 19)

The chief feature of this new amplifier is in the use of a "reverse or negative feedback circuit," which permits high-power output with minimum distortion and improved frequency response. This circuit is the latest method for achieving these results.

Automatic equalization made possible by the negative-feedback circuit, is a means whereby the gain of the amplifier is automatically controlled so that amplification of various frequencies is compensated for, according to their strength.

The circuit, shown in Figure 1, consists of five stages, using two 6J7 type tubes as voltage amplifiers, one 6N7 for the mixer stage, one 6N7 as a phase inverter and driver tube, and two 6L6's for the output stage. A type 5V4G is employed for rectification.

The frequency response of the amplifier is rated 1 db. from 50 to 10,000 cycles. The technical specifications show the maximum available gain to be 138 db. (with 5 megohms. input) and the rated output into a 500 ohm. line, 20 watts, and peak power output, 30 watts.

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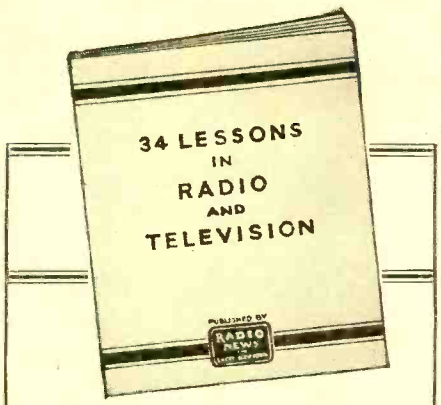

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The amplifier is equipped with four input channels, two of which can accommodate any of the low-level high-impedance microphones, including the "Velotron" and "Velophone" types, as well as photo-cells input devices. The input circuit also has provisions for a radio tuner or phonograph pick-up. Complete mixing and fading facilities are provided whereby any two or four inputs can be mixed at a time.

A feature that will prove popular is the new "Neo" illuminated dial. Up to now it has never been practicable to watch, on a darkened stage, the adjustment of volume and tone control settings, and have the audience unaware of what was being done. The necessity for throwing light against the control dials, in order to see them, made it difficult to operate according to cues pre-determined at rehearsal, and still preserve that illusion of effortless ease which is the basis of good showmanship. The new Neo-dials, however, glow too dimly to be visible when the amplifier is placed back to audience, yet shine with a bright neon red to be easily seen by an orchestra leader or other person who faces them. Thus the leader, or master of ceremonies, or drummer if desired, can operate this small but powerful amplifier in full view of the audience, without the audience knowing there is an amplifier on the stage at all.

Twenty-four watts of field excitation are available for several speaker fields, the resistance of which totals 5000 ohms. Versatility in use is increased by a wide range of voice output impedance, running from .35 to 500 ohms., and including eleven choices of impedance within that range.

The dimensions of the amplifier are 6¾ by 8¾ by 17 inches, and its shipping weight is 30 pounds.

Closet-Door Work Bench

(*Continued from page* 33)

panel, even with the edges, extending 3 inches below the bottom. The top and bottom are 3 inches wide by 19½ inches long and fit between the sides, just even with the back edges. To have a firm support for the drop-leaf hinges, a piece of pine 2 inches by 3 inches by 19½ inches is fastened between the extended sides at the bottom.

To reinforce the plywood table-top a rectangular frame, made from 1 by 2 inch pine is attached to the underside. The legs are made of hard 1½ by 1½ inch pine and hinged to this frame with card-table hinges. A piece of 3-ply veneer, 12 inches high is fastened across both legs to reinforce them and prevent wobbling. Adjustable screw type levels are countersunk into the bottom of the legs to compensate for uneven flooring.

The bench-top is covered with Goodyear rubber flooring which is thoroughly cemented down to prevent bulging when the lid is closed. The entire edge of the bench is finished with 1 inch wide flat moulding. Two strong, flat, inside-shutter hooks are placed near the top of the sides to hold the lid closed, while the legs are held folded in place inside the lid frame by means of two brass turn-buttons. The most suitable lid hinges are the refrigerator door type. Wood screws are used exclusively in the assembly of the cabinet so as to insure greatest strength.

The cabinet is a complete assembly in itself and is attached to the heavy part of the door by six long wood screws. When it is desired to remove the cabinet to another location it is only necessary to take out these six screws and the entire unit is then portable. Five convenient outlets are wired along the three outer sides of the lid frame, current being secured through a heavy flexible cord from a base outlet in the closet.

When the bench is opened to working position it is directly in front of a window. Ample light for night-work is available from an adjustable lamp which also folds out of the way against the closed cabinet. Clips are used to hold all handle-type tools, while others hang from rods or hooks. Two standard drill-stands accommodate a full set of twist drills. A pair of hinged 1 by 2 inch pine arms fold out of the open cabinet and are drilled with holes to hold an assortment of files and small tools.

The completed cabinet and Work Bench has proven so practical that several of my friends copied the design with slight modifications to suit their own special requirements. In one case several drawers were added, while in another the cabinet has been made deeper to accommodate an amateur receiver and transmitter. The basic idea of design can be altered to suit any individual requirement and to provide for a personal working space in the smallest of homes.

Empire State Television

(*Continued from page* 8)

tion. The difficulties of making apparatus function outside the laboratory are being surmounted. The technical fundamentals of our system have been confirmed. Theory has been put into practice, and the experience gained thereby is enabling the laboratories to chart the needs of a practical television service.

"A major problem in television is that of network program distribution. The present facilities for distributing sound broadcasting cover the vast area of the United States and serve its 128,000,000 people. Similar coverage for television programs in the present state of the television art would require a multiplicity of transmitters and network interconnections by wire or by radio facilities still to be developed.

"The field tests are not completed, but the capabilities of the RCA television system are being constantly expanded, and we are moving toward ultimate realization of satisfactory high-definition television for public service."

In addition to the technical phases of television progress, NBC has been concerned with program development for the sight-and-sound shows that may soon be a commonplace on the airlanes. Continuity, make-up, costuming and other important production phases are being experimented with so that there will be no "guinea pig" era when the commercial launching of the new art takes place.

Miss Betty Goodwin, formerly of the press department, has been named the network's first "regular television announcer."

(Editor's Note: The audio and video signals from the Empire State are regularly received up through Connecticut and as far as Massachusetts, by amateurs, according to a representative of RADIO NEWS who interviewed many amateurs at a recent Amateur Convention in Middletown. At times when DX conditions prevailed on the ultra-high frequencies these signals came in with tremendous volume, exceeding that of locals. Just what this means in terms of interference between television

stations using frequencies in other cities remains a question of controversy.)

The following bibliography is appended for those readers anxious for popular and technical research on RCA-NBC television progress:

"Television." RCA Institute Technical Press. July, 1936.

"Television Radio Delay." RCA Review. October, 1936.

"Equipment Used In the Current RCA Television Field Tests." RCA Review. January, 1937. (This issue also contains other relative papers.)

"Seeing's Believing." RADIO NEWS. July, 1936.

"The Next Ten Years Will Be Television." RADIO NEWS. February, 1937.

The Radio Beginner

(*Continued from page 36*)

⅜-inch shaft will need a shaft reducer if the dial is for a ¼-inch shaft. The batteries are simply fastened with wood screws with insulated wires. The filament leads are soldered to the flashlight cells. First file or sandpaper a clean spot on the battery terminals, then tin the spot, tin the wire, and solder the wire to the batteries. Do not heat the batteries too much.

Calibration

When the wiring is finished, it is necessary to calibrate the oscillator. The broadcast band can be calibrated by comparing with broadcast stations, picking up both the broadcast station and the oscillator on a receiver. Set the oscillator somewhere in the room (no connections needed), tune in a broadcast station of known frequency and turn the dial of the oscillator until it too is heard. When the oscillator signal is broad, move the instrument farther away from the aerial or reduce sensitivity on the receiver. Note at what point of the dial this known frequency was obtained. Repeat the procedure with other stations and make a curve for the oscillator, plotting dial setting against frequency. Thereafter it is possible to obtain a signal at any desired frequency by referring to this curve.

To calibrate the i.f. band, harmonics must be used. Disconnect the aerial from the receiver, run a wire from the antenna post to the oscillator—just lay it near the instrument. Set the oscillator dial to 100 (C1 fully meshed) and search for the signal on the receiver, this will probably come in somewhere near 710 kc. and again at about 880. The actual frequency is now the difference between the two. To get it more exact, divide the difference into 880, which will give about 5. The exact frequency is 880/5. By reading the frequencies accurately, the result will be very close to the exact frequency. This method can be used to determine frequencies at other spots on the dial. Again a curve should be made of dial setting vs. frequency, so that an exact setting for 456 kc. can be obtained. The model constructed in the RADIO NEWS laboratory had ranges from 176-550 kc. and 540-1550 kc. Those who wish to cover 175 kc. and lower, can connect a fixed condenser of .00025 mfd. in parallel with C1, or across L2, which will cover this band adequately.

Output Indicators

When aligning circuits for maximum response, the ear may be used and the best adjustment found by listening, this requires a modulated oscillator. However, the ear is not very sensitive to small changes in sound intensity. A sharper indication is obtained by means of some measuring instrument. Lamps or neon tubes have been used but these aren't any better than listening tests because the eye is just as inaccurate as the ear.

The first type of "output meter" is some form of a.c. voltmeter. A low-reading a.c. voltmeter can be used, connected across the voice coil. This may have a range of 0-5 volts or 0-10 volts. The second type consists of a d.c. milliammeter with a rectifier. Rectifier-type voltmeters are on the market, but they can be made from a d.c. milliammeter by the addition of a rectifier as shown in Figure 2a. The rectifier used can be one of the copper oxide type, available from radio supply houses, or a tube as in Figure 2b. Some have used a carborundum crystal successfully. The resistance R determines the range of the voltmeter. If the milliammeter in Figure 2a has a 1-ma. range, the resistance R should be 850 ohms. per volt. So for a 100-volt range R would be 85000 ohms; for a 10-volt range, 8500 ohms, etc. For a milliammeter with a range of 5 ma., divide the above values by 5.

In the case of Figure 2b, the resistor should be 20000 ohms to 50000 ohms, and a rather sensitive meter is required, 0-5 ma. or 0-1 ma. All the systems described so far, require a modulated oscillator.

A simple milliammeter, having a range of 0-15 ma. or less can be used in receivers equipped with a.v.c. The meter is simply placed in series with the plate lead of one or more of the controlled tubes. If the range of the meter is 0-15 ma., the current of two controlled tubes, should be sent through it. Meters with ranges of 0-10 ma. or less should receive the current of but one tube. If the range of the meter is less than 0-7 ma., it may be necessary to shunt it with a rheostat of 0-30 ohms., adjusting the resistance for full-scale deflection when no signal is coming in.

This type of meter will show a decreased current when a signal is tuned in and all adjustments are made for minimum current. Also, the oscillator may either be modulated or unmodulated; in the case of unmodulated signals sharper indications are obtained and the speaker is silent.

Finally, it is possible to get an indication without a measuring instrument by the use of a tuning indicator tube like the 6E5, 6G5, etc. These are used by RCA under the trade name "Magic Eye." The tube is cheaper than a good milliammeter and the associated equipment is inexpensive. Figure 3 shows how it should be connected. The tube is a miniature cathode-ray tube with a triode amplifier in one envelope. When in operation, the tube shows a luminous ring with a dark sector. This dark sector narrows down when a negative voltage is applied to the grid. Thus the grid can be connected to the a.v.c. circuit for alignment purposes. This again does not require a modulated signal. The tube requires a 6.3 volt filament supply and 250 volts plate supply at very low drain; all power can be taken from the receiver.

Parts List

C1—single gang variable condenser, .000365 mfd.
C2—Solar mica condenser, .002 mfd. (for unmodulated oscillator, .00025 mfd.)
L1—see text and Figure 1
L2—Hammarlund r.f. choke, type CHX, prepared as described in text
R1—15 ohm wire wound resistor
R2—IRC carbon resistor, 1 meg., ½ watt (for unmodulated oscillator: 50000 ohms, ½ watt)
S1—Single-pole-single-throw toggle switch
S2—Double-pole-double-throw toggle switch
1—Eby base mounting socket, 4-prong
1—Bud tuning dial, type 713
3 inches bakelite tubing, 2½ inches diameter, for L1
2—Eveready flashlight cells, type 950
1—Eveready 22½ volt battery, type 768
1—Type 30 tube
Baseboard 9 x 6 inches

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(*Continued from page* 55)

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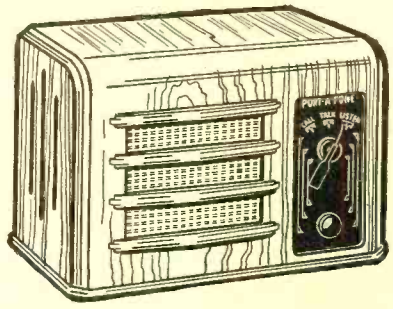

indicator to "talk," speak in a normal conversational tone, and your voice is carried over the power wires to another station. The instrument weighs only 8 pounds.

The Service Bench

(*Continued from page* 45)

Service Notes

A lot of the lads tell us that Rider's new book on Philcos out-Philcos Philco—and that it's what they have been waiting for a long time. We'll review it next month.

RCA has just issued a new parts catalog which is more than worth the trouble of securing through your jobber. In it are pictured and described replacement parts, test and measuring equipment, tubes, radio accessories and amateur apparatus. A handy cross-reference replacement guide for RCA Victor lines up the corresponding models of G. E., Graybar and Westinghouse.

Speaking of RCA, the folks down in Camden have brought out two new popular-priced record players, the R-93-A, listing for $18.50, and the R-94, with a suggested list price of $28.95. While there is a nice profit selling these items themselves, the real money is in building up a record business which runs on and on long after the turntable and pick-up unit is sold. Razor companies don't make money on razors—it's the blades they sell that counts!

Wonder who'll be running around in the sound truck shown in Figure 7? Just

FIGURE 7
The name of some serviceman reader of RADIO NEWS *is probably on this truck by now. Alongside are Eddie Riedel and Earl Dietrich of Raytheon, who is giving away the truck.*

about the time this is published Raytheon is giving away this elaborately-equipped "ballyhoo wagon" to some lucky serviceman!

Take a tip from Sylvania and decorate your shop or store with the display shown in Figure 8. The large one fits a window

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FIGURE 8

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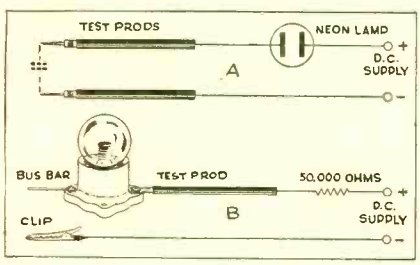
The Radio Workshop

(*Continued from page 35*)

age in several good condensers. This condition was brought about by minute leakage through the insulation of the test leads, creating a high resistance path through the hands and the body. To remedy this condition I connected the neon tube at the



end of the test handle as shown in Figure B. In this method any possible leakage across the leads can not go through the neon tube.

An alligator clip forms a convenient negative test lead, also facilitates testing. With the clip connected to one side of the condenser under test there will be only one hand in the circuit and therefore no circuit through the body. Also, both tube and prod are constantly in view, so you will not miss the quick flash produced by a small condenser and think it open. Using 90 to 250 volts, I find a quarter-watt neon tube with 50,000 ohms in series, an ideal combination. For 300 volts and higher, use 100,000 ohms in series to protect the tube in case of a short.

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The DX Corner

(*Continued from page 37*)

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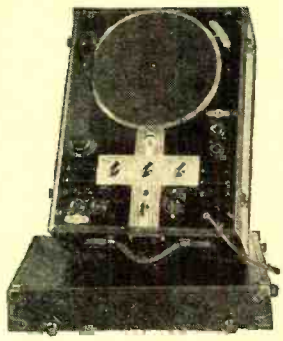

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There is a deep-rooted belief among English DX'ers that North American signals are strongest at the full moon, and weakest at the new moon. In practice this theory proves by no means 100 percent correct, but is near enough to cause the ardent listener to book a date with his radio when the moon is roundest.

WLW, KDKA, and WGY are three broadcasters associated with little mysteries. WLW, while testing as W8XO, was receivable at really good volume, but since dropping the experimental call has rarely approached its old form. Ten years ago KDKA and WGY shared No. 1 position as Atlantic crossers. Today WGY is only moderately well heard, and KDKA hardly at all.

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What's New in Radio

(*Continued from page 53*)

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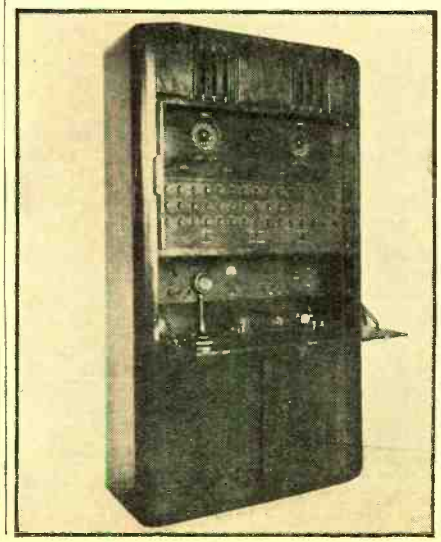

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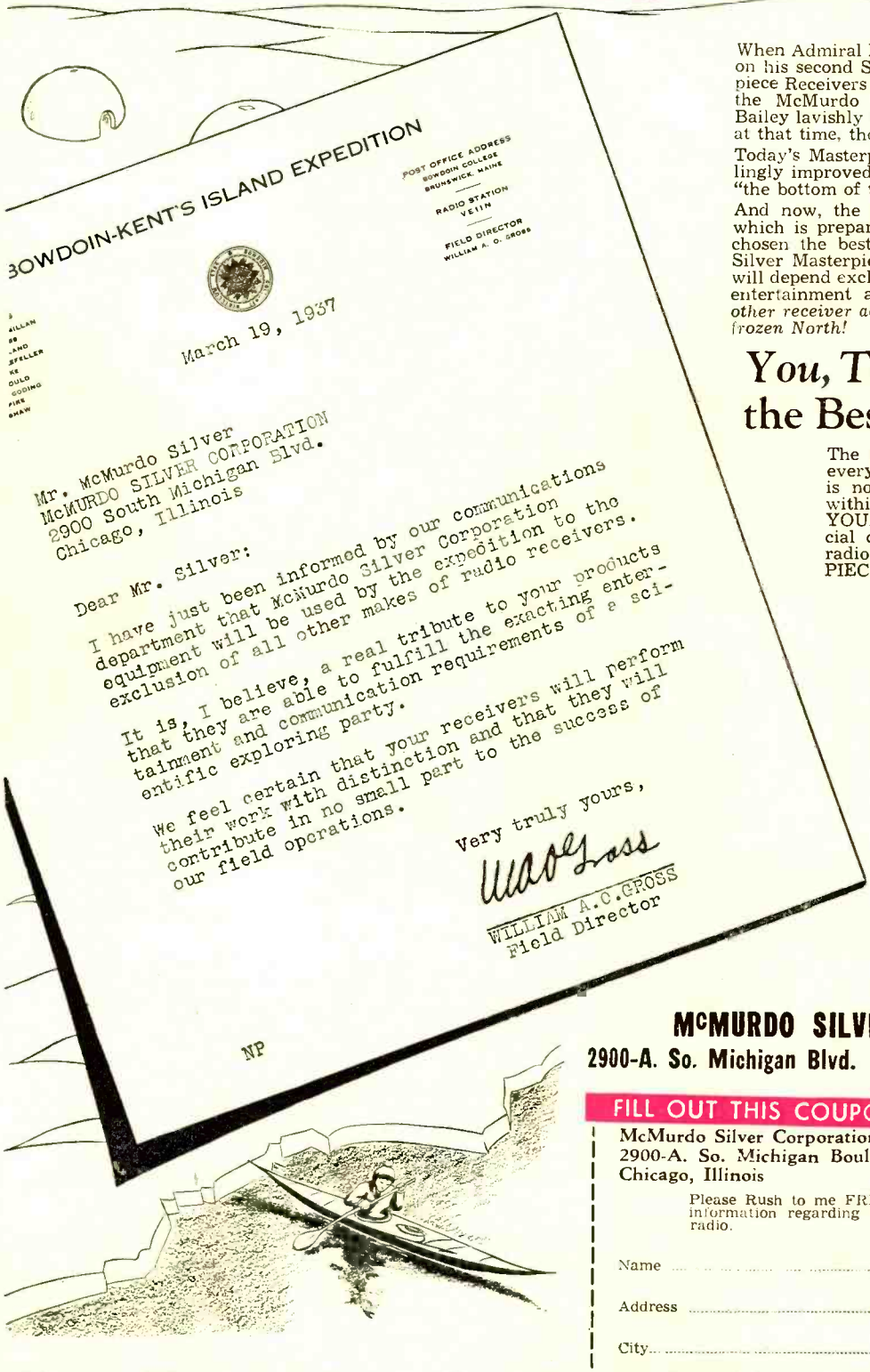
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Field Director

NP

When Admiral Byrd went to Little America, in 1934, on his second South Pole Expedition, four Masterpiece Receivers went with him. There are letters in the McMurdo Silver files from Chief Operator Bailey lavishly praising the Masterpiece which was, at that time, the world's best radio.

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*R. M. A. has defined High Fidelity as 7000 cycles at 20 D. B. down.
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Leading Radio Columnist HANDS AN ORCHID to the Super Sky Rider†

Visited by Diplomats

On Wednesday evening I was honored to entertain B. P. Stoyanovitch, Consul General of Yugoslavia, and his staff while we listened to a special broadcast up among the megacycles from Belgrade.

With a battery of five communications receivers which had been warming up for hours, I sat down full of confidence and started spinning dials. Well, maybe not confidence, exactly, but hope, anyway. But imagine my embarrassment when minutes passed and we logged practically everything in the world except Belgrade.

However, at the end of about fifteen minutes we dragged in a speech in an unfamiliar language, and immediately Mr. Stoyanovitch burst forth in happy smiles. It was the voice of the Prime Minister of Yugoslavia and the receiver that did the trick was the old reliable SX11 superskyrider. After trying for a few minutes to log the program on the other receivers, just by way of something to fall back on in case of emergency, but having no luck, we turned off the others and sat back to listen. And if you don't think a terrible weight was lifted from my brow when the skyrider did its stuff, then you never had eleven officials of a foreign nation standing skeptically by while you try to produce results in short wave radio reception.

†Reproduced from Ted Rogers' Radio Column, New York World-Telegram, April 17, 1937

See the New 1938 Super Sky Rider at your dealer's or write for complete information.

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