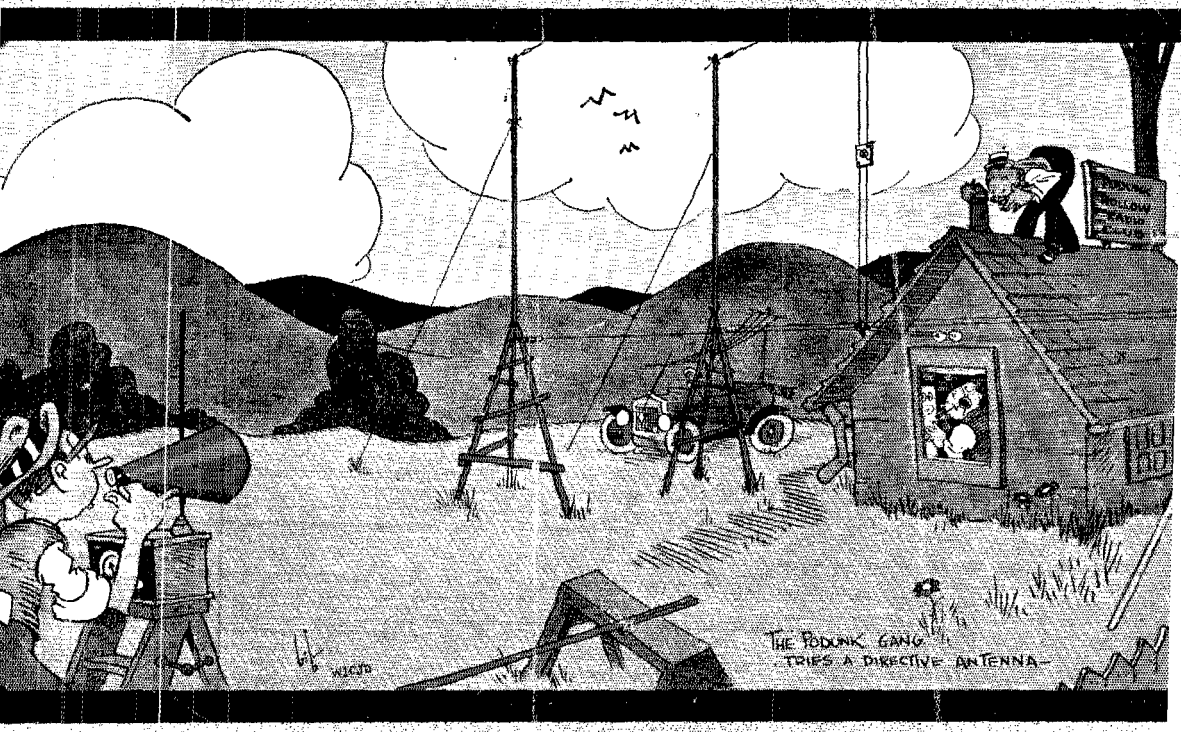
QST

DEVOTED ENTIRELY TO

AMATEUR RADIO

PUBLISHED SINCE 1915 BY THE AMERICAN RADIO RELAY LEAGUE INC.



MAY, 1930

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Each successive edition of the Handbook has been revised, hot modern material substituted for the practices that have been outgrown. The Sixth Edition has information on Crystal Control and Radiotelephony that did not appear in previous editions, in addition to everything else that the A.R.R.L. can think of for the guidance of a practical radio amateur.

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THE *The Sixth Edition of*

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By Handy & Hull

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This book is a publication of the American Radio Relay League, the amateur's own organization, written by amateurs for amateurs. It is hailed everywhere as the greatest help that an amateur ever saw. ¶ Because it starts in at the very beginning of the story and tells what amateur radio is, how to become an amateur, how to learn the code and how to operate a simple station, it is an invaluable and a sympathetic guide for the beginner. ¶ Because it progresses through working descriptions and building instructions for many varieties of receivers, transmitters, power supplies and antennas, and because it goes into all the intricacies of station operation and message handling, it is an indispensable necessity for the proficient amateur.

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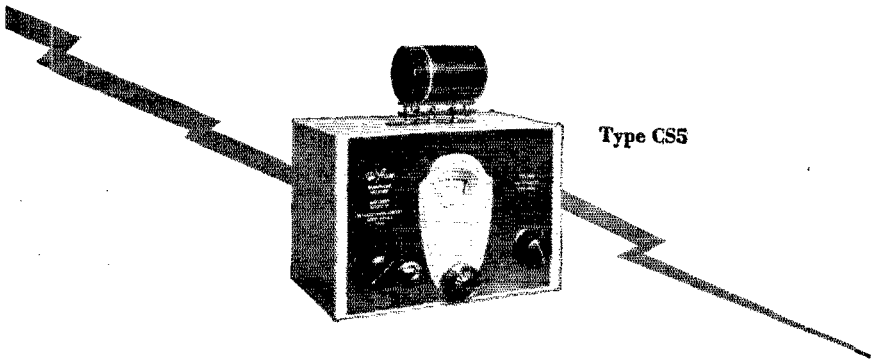
American Radio Relay League, Hartford, Conn., U. S. A.

The latest achievement of the De Forest Laboratories



Type CS5

The New

DE FOREST SHORT WAVE RECEIVER

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510	—15 Watt Oscillator.	$ 9.00
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The new De Forest Radiophone Receiver, Type CS5 illustrated above, is designed to receive both telephone and telegraph signals on all frequencies between 1,500 and 15,000 kilocycles (20 to 200 meters).

Being small and light it is excellent for portable work. Its enormous amplification giving loud speaker signals on a 10 ft. antenna.

The special circuit uses four Audions; two Screen Grid Audions as radio frequency amplifier and space-charge-grid detector (power detector) and two Audions in a transformer-coupled audio amplifier. Housed in an aluminum case, 5" x 6" x 9", this receiver, although full-grown in strength and performance, makes an ideal short wave receiver for aircraft reception where light weight is a necessity. It is also adapted for general amateur use, small yachts, police cars and automobiles.

DE FOREST RADIO CO., PASSAIC, N. J.

Branch Offices Located in

Boston, New York, Philadelphia, Atlanta, Pittsburgh, Chicago, Minneapolis, St. Louis, Kansas City, Denver, Los Angeles, Seattle, Detroit, Dallas, Cleveland

Specifications for De Forest Radiophone Receiver Type CS5

Battery Requirements

Operates either from dry cells using Audions 422A and 499 or from 6 volt storage battery using Audions 422 and 401A. For loud speaker operation either Audions 420, 412A or 471B may be inserted in the last audio stage. Two 45 volt "B" batteries furnish the plate power.

Features

Extremely compact and light in weight.
Screen grid R. F. Amplifier.
Space-charge-grid power detector.
Two stages of audio amplification.
Zero body capacity.
Frequency calibration independent of antenna used.
Moisture and climate proof.
Negligible microphonics.

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510	$ 9.00	☐	
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DE FOREST RADIO COMPANY,
PASSAIC, NEW JERSEY

Enclosed please find $..... for which send me the items checked opposite.

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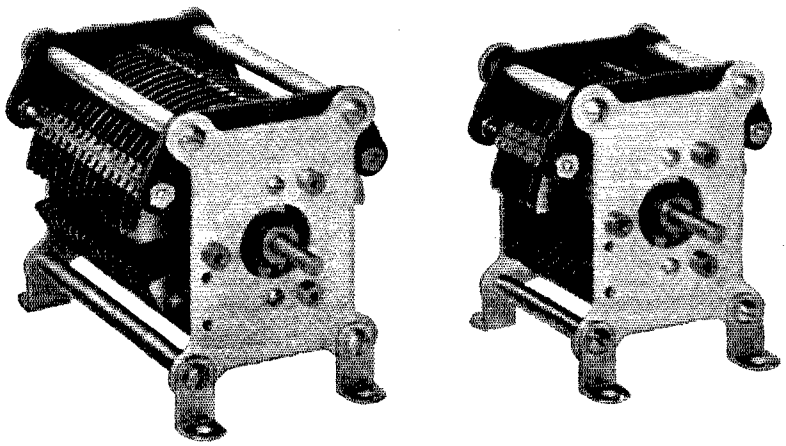
FOR THE
AMATEUR TRANSMITTER



General Radio high-voltage condensers are well built mechanically as well as electrically. Metal end plates, rigid-corner spacing posts, and soldered brass plates make for rigidity and low losses, qualities that are essential for high-voltage work.

SPECIFICATIONS

Breakdown Voltage: 3500 volts, peak. Condensers are built in jigs so that the 0.088 inch spacing between rotor and stator plates is accurately maintained.

Mounting: For panel or table mounting. Four feet supplied with each unit. Drilling template furnished. Counterweight assures permanence of settings.

Dielectric Suspension: First-quality hard rubber.

Type Number	*Capacitance*		*Overall Dimensions*	*Weight*	*Price*
	Max.	*Min.*			
334-R	250$\mu\mu$ f	30$\mu\mu$ f	$3\frac{3}{4}$ x $3\frac{3}{4}$ x $6\frac{1}{2}$ in.	2 lb.	$5.50
334-T	100$\mu\mu$ f	15$\mu\mu$ f	$3\frac{3}{4}$ x $3\frac{3}{4}$ x 4 in.	$1\frac{1}{8}$ lb.	2.75
334-V	50$\mu\mu$ f	10$\mu\mu$ f	$3\frac{3}{4}$ x $3\frac{3}{4}$ x $3\frac{3}{4}$ in.	$\frac{5}{8}$ lb.	2.50

Watch *QST* next month for an announcement of a new 500-$\mu\mu$ f transmitting condenser.

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274 BRANNAN STREET, SAN FRANCISCO

QST

The Official Organ of the A·R·R·L

VOLUME XIV — MAY, 1930 — NUMBER 5

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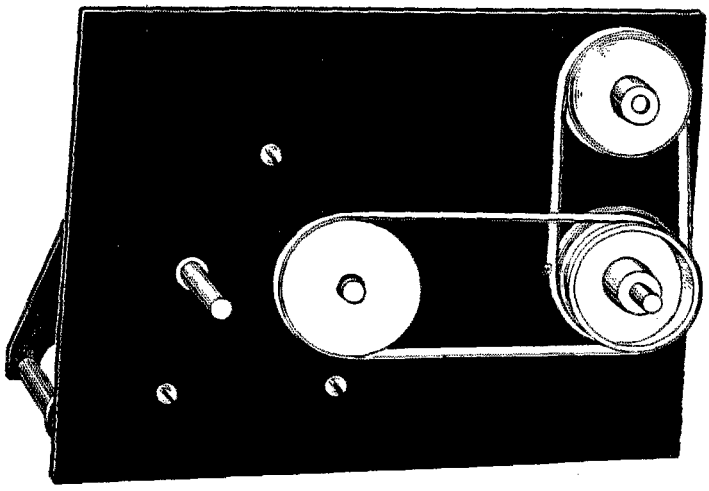
Hoffman & Mix, the well known short-wave experts, *are the designers of this tuner*

AERO SHORT-WAVE AUTOMATIC TUNING UNIT

(Protected by patents pending.)



Features

Automatic range, 15 to 90 meters; full range, up to 200 meters.

No plug-in coils used in automatic range.

Easiest tuning device known.

Tunes even more slowly than broadcast receiver.

Special attachment enables it to reach 200 meters.

Anyone can operate it.

The days of fooling with plug-in coils are over. Amateurs can now have a real thrill by this new automatic tuning device. Read the complete story in February *QST* and then mail your order to Aero Products for the complete built-up unit. Be first to use this remarkable short-wave apparatus.

A Marvelous Improvement

NO PLUG-IN COILS

Range 15 to 90 meters. Easiest tuning short-wave receiver known. The tuning unit consists of two controls. The right-hand control, which will be termed the shift control, and the left-hand control, the actual tuning device. In addition to these two controls it will, of course, be necessary to have a regeneration control.

For those who desire to employ it for television or the upper phone band, a special attachment may be secured.

OPERATION

The tuner is operated in the following manner. As a specific example, with the right-hand dial set at nine degrees, revolving the left-hand dial through 180 degrees, you will cover from 19.1 to 22.6 meters. The next step will be to move the shift dial to 13 and tuning over 180 degrees, as before, this time covering from 21.9 to 25.7 meters. This process is continued through 180 degrees on the shift dial until you have reached the maximum automatic wave length, which is 90 meters.

You will note that the tuning dial, in the first instance, when tuned through 180 degrees, covers only 3½ meters, whereas ordinarily when using plug-in coils your tuner, when passing through 180 degrees, generally covers at a minimum of 25 meters. This same speed of tuning is maintained throughout the entire short-wave spectrum, and it is for this reason that this tuning arrangement surpasses any known method.

This unit is furnished completely assembled to the amateur, and may be built into either a short-wave converter or receiver.

For those desiring to go from 90 to 200 meters a special device may be had, making its range then from 15 to 200 meters.

A general chart is furnished with each unit, specifying the settings for the shift dial, which will enable you to approximate the wave length for each setting on the shift dial.

This tuner is not sold through the usual trade channels, but is sold to amateurs only direct from factory at special low net price. Be sure to send post office or express money order for $19.50 with your order. Shipments will be made in the order received. Be first to order. Attach your money-order to coupon below and mail today — NOW!

PRICE ONLY $19.50 NET

AERO PRODUCTS, INC.
4611 E. Ravenswood Ave., Dept. 330, Chicago, U.S.A.

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I want to be one of the first to secure the new Aero Short-Wave Automatic Tuning Unit. Enclosed is money order for $19.50 which is your low opening net price to amateurs only.

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The American Radio Relay League

The American Radio Relay League, Inc., is a non-commercial association of radio amateurs, bonded for the promotion of interest in amateur radio communication and experimentation, for the relaying of messages by radio, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is non-commercial and no one commercially engaged in the manufacture, sale or rental of radio apparatus is eligible to membership on its board.

"Of, by and for the amateur," it numbers within its ranks practically every worth-while amateur in the world and has a history of glorious achievement as the standard-bearer in amateur affairs.

Inquiries regarding membership are solicited. A bona fide interest in amateur radio is the only essential qualification; ownership of a transmitting station and knowledge of the code are not prerequisite. Correspondence should be addressed to the Secretary.

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EDITORIALS

IN middle March the Federal Radio Commission held a conference to discuss general revision of the amateur regulations. Although primarily an informal conference between the Government and representatives of the American Radio Relay League, public announcement of the meeting had been made and general invitations issued, and when we amateur representatives walked into the little conference room it was pretty well filled with representatives from many a government agency and a few commercial activities.

Apparently it was going to be a bigger show than we had thought. "What are all these people doing at an informal conference between A.R.R.L. and the radio authorities?" we thought. Then the meeting got under way and we began to see. Would you believe it? — every last one of them had come over to that meeting prepared to give aid to the amateur, because they had heard that there was to be a public meeting and they suspected somebody might be on hand to start something. But there was nobody to fight, so the meeting ran smoothly and "a good time was had by all." To us it was another convincing illustration of the strong position occupied by our amateur radio.

It is very probable that when new regulations are issued they will require the use of adequately-filtered d.c. plate supply in self-excited circuits. There is now an overwhelming general amateur sentiment against a.c. plate supply in such transmitters, whether it's "raw a.c.," "bum r.a.c.," or even full-wave self-rectifying of the ordinary species — and all of this whether it's 25 cycles, 60 cycles, or 500. Although our Technical Development Program showed that the skilled amateur could achieve satisfactory results with such power sources if he observed extreme care, we all know that in practice it doesn't happen and that such plate supplies on ordinary transmitters are the cause of the broad and selfish signals that infest our bands. Such signals suffer from "wobbulation" — frequency modulation — and the time has come, as it did to Spark, when they must go. Of course if the "wobbulating" can be avoided, the outputs from modulated plate supplies suffer only from side-bands, which isn't nearly as serious an ailment. For instance, it should be and doubtless will be perfectly permissible to use such unfiltered power supply on the *amplifier* stages of crystal-controlled transmitters. But kiss it goodbye on such transmitters as one-tube Hartleys (or does one say "Hartlies"?) and prepare to use the genuine pure d.c.

While we're talking about the regulations: the Radio Division tells us that there are still amateurs who think a station license conveys the right to operate a station wherever they happen to move. It doesn't. It is a license for a definite and specified location. When you move it's all off. Write your Supervisor for new blanks — you'll retain your old call and stay out of jail.

IS anybody interested in amateur facsimile transmission? It's authorized in our 1715–2000-kc. and 56-mc. bands, but we've never heard of any amateurs experimenting with it. If some inexpensive apparatus could be devised, it seems to us it would offer opportunity for a new form of amateur communication: drawing pictures at the other fellow. We've thought ourselves of the possibility of avoiding cylinders and gears and photo-electric cells by an amateur makeshift that might use wide adding-machine tape in rolls and scan it in short strokes across the tape. Pick up your fountain pen, write

your message in carbon ink, stick the end of the tape in your transmitter, and watch it buzz off. Much amateur conversation relates to the pet hook-up in use or to the habits of some circuit. What more to the point than the ability to draw the circuit, possibly with a big arrow running to the part under discussion and appropriate marginal notes on the relative absence of intelligence in one's correspondent?

One of the biggest problems in television and picture transmission is synchronization. Left to chance, the result is hopeless. The few methods that have been devised for accomplishing it via radio are both complex and expensive, so much so that they practically prohibit amateur participation. We have a thought we want to submit on that. If 60-cycle juice were the same everywhere, the problem wouldn't exist. Synchronous motors would assure synchronism. Why have we no national standard for "60 cycles"? This, it seems to us, is a job for the Bureau of Standards. They have the national standards of weight and measure, from which all our working standards are derived. This 60-cycle standard is a little different. It exists only as it oscillates. It's in the class with the standard-frequency signals. It ought to be a standard-frequency signal. There we have it! Why shouldn't the government establish one or more radio stations which would run continuously and whose outputs would be modulated at the national standard for 60 cycles, to serve as a standard not only for periodicity but also *for phase?* These signals could be received everywhere and all the power companies could use them to govern their output. Thus all the 60-cycle outputs in the country would be in synchronism and in phase, time-keeping would be automatic, and synchronization would disappear as a problem in television and picture transmission.

K. B. W.

A.R.R.L. Headquarters to Have an Accurate Frequency Standard

THE requirements for precision frequency measurement in this day and age of amateur radio are considerably higher than those of the not-far-distant past, and frequency-measuring equipment that was good enough for us a year or so ago is hopelessly inadequate today. That the A.R.R.L. may keep abreast of the times in frequency measurement, the Executive Committee has approved the acquisition of an authoritative secondary frequency standard for Headquarters and the equipment is now in the process of construction by the General Radio Company, at Cambridge, Mass.

The official A.R.R.L. Frequency Standard will be of the piezo-controlled type. The standard crystal will have a frequency of 100 kc., and will be mounted in a heater box with accurate temperature control. In order that useful harmonics in all the amateur bands can be obtained, the output of the oscillator will be fed into a multivibrator unit which can be adjusted for operation at either 50 or 100 kc. This will provide useful harmonics throughout all the amateur bands at 50- or 100-kc. intervals. A complete description of the official standard will be published in *QST* at a later date.

The accuracy of the standard will be better than 0.01%, and it will be calibrated against the National Standard at the Bureau of Standards, Washington, D. C., before it is installed at Headquarters. With this equipment it will be possible to make frequency measurements to an accuracy of better than 1 part in 10,000. This means that a frequency can be checked to within approximately 1000 cycles at 14,000 kc.

Besides being used for the calibration of auxiliary frequency measuring equipment, the standard will be employed in checking the frequencies of commercials which sometimes wander into our bands as well as for measuring the frequencies of amateur stations who wander outside the bands. The transmissions of W1MK will be monitored at frequent intervals, and it is probable that W1MK will soon be transmitting band-marking frequencies monitored by the standard as a supplementary service to the present A.R.R.L. standard frequency transmissions of W1AXV and W9XL.

League members can well be proud of their Official Frequency Standard, since its accuracy will be exceeded only by that of the best primary standards, and they may rest assured that its utility will be extended to serve the fraternity at large in every way practically possible.

—*J. J. L.*

Airplane Radiophone Communication Experiments

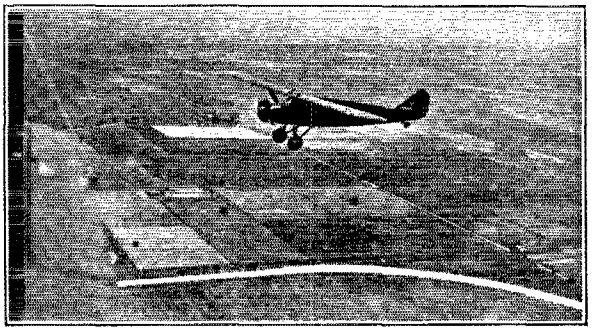
By C. H. Vincent*

DURING the past five years it has been my privilege to do quite a lot of experimental radiophone work and when the attempts — successful and unsuccessful — to use radio telegraph on transatlantic 'planes were read of, it was natural to wonder how high frequency radiophone signals would work out under such conditions. About this time an opportunity to listen in on some of the early super-sensitive 900-meter receivers was offered and, after standing the terrible punishment from static crashes for a short time, it was decided that such low frequencies would never do for airplane radiophone work unless both the ground station and the airplane station could have very high power. Also, it seemed that the long antenna necessary for such low frequencies would be a decided drawback, unless the 'plane was a very large one with an operator constantly on duty, in which case radio telegraph communication could be used just as well.

About the first of November, 1928, this matter was discussed with Captain L. M. Woolson, Aviation Engineer for the Packard Motor Car Company, and it was agreed that a 'plane powered with the Diesel type engine — then being developed under his supervision — would be exceptionally useful in making preliminary surveys, since that arch-enemy of high frequency reception, the electrical ignition system, would not have to be considered. Upon taking the matter up with the Packard management they advised that they would be glad to coöperate in any such undertaking for the betterment of aviation providing it did not interfere too much with the engine development program which demanded first consideration. This arrangement was agreed upon and it is a pleasure to state that they have more than lived up to their promise.

Applications for experimental licenses to carry on test work on various frequencies between 1600 and 10,000 kilocycles were made on November 15, 1928. After giving the matter due consideration, the Federal Radio Commission granted these licenses, specifying certain frequencies, including 1608, 2302, 3076, 4108, 6155 and 8650 kilocycles.

Pending receipt of the experimental licenses, a preliminary survey was started with a simple but highly efficient two-tube receiver in a 'plane, and a ground station using Army frequencies with an Army call which the Signal Corps very kindly provided. These preliminary tests gave us a chance to find out approximately how much power would be required at the ground station and enabled us to try out the various types of receiving antennas which might be used. Incidentally the antenna worked out at that time as best for reception has also proven the best radiator for transmission.



THE PACKARD-DIESEL POWERED RADIO TEST 'PLANE IN FLIGHT OVER THE PACKARD PROVING GROUNDS

Using a fixed doublet antenna and a 7.5-watt transmitter on the Stinson-Detroiter 'plane, two-way telephone communication with the ground station has been effected over ranges of 200 miles and more. High-frequency reception on the 'plane is possible because the motor has no electrical ignition system to cause interference.

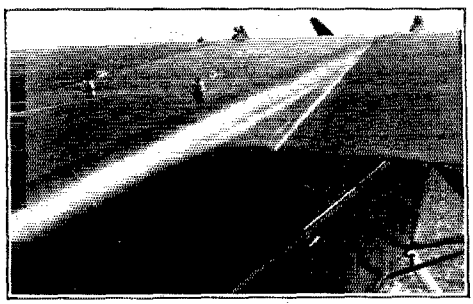
Upon receipt of experimental station licenses, the ground station was enlarged to 250 watts (with 40- to 60-percent modulation) and the antenna system improved. A small portable transmitter-receiver was purchased from the Radio Engineering Laboratories and rebuilt to suit airplane work. The first successful two-way radiophone communication took place June 3, 1929.

The airplane station at that time was operating on 8650 kilocycles and although excellent reports were received from points 300 to 400 miles distant, the local "understandable" range was only 10 to 25 miles, depending upon the altitude

* W8XB-W8RD, Packard Proving Grounds, Route 1, Utica, Mich.

of the 'plane; between this range and 125 miles or more, skip distance was effective.

During the next six months or up to December 16, 1929, tests were run off at every opportunity but no regular schedule could be followed since the Diesel engine development work took up much of the pilots' time and it was necessary to accommodate the radio work to their convenience. At best, however, such surveys require a great deal of time since the limited space in the ordinary 'plane, plus the vibration and noise together with changing altitude and the limitations as to plate power and antenna location, all tend to confuse the results.



PYREX LEAD-IN BOWLS ARE MOUNTED ON THE ROOF OF THE CABIN

Stay-wires to the mounting blocks on the front edge of the wings relieve the lead-in insulators of mechanical strain.

During the winter just past, weather conditions were very severe, the flying field being covered with deep snow most of the time and high winds prevailing. The test pilots, therefore, did most of their flying in a Waco sport 'plane (equipped with skis) instead of the larger Stinson-Detroiter in which the transmitter was installed. Advantage was taken of this enforced idleness, however, to revamp the transmitter-receiver for the airplane station, increasing its output about 10 percent and the receiver sensitivity about 500 percent. The rebuilt transmitter uses one Type '10 oscillator in a loose-coupled high-C Hartley circuit and one UX-842 modulator.

To date it has been impossible to secure a satisfactory "anti-noise" microphone that will pass speech frequencies without general background noise, but this has been overcome to a considerable extent by providing a speech-input gain control. In practice the operator keeps the gain rather low and compensates by talking quite loudly — a very natural thing to do when riding in a noisy 'plane with the head incased in a heavy helmet.

Commercial aircraft will, of course, have sound proof cabins for such work — in fact I recently rode in a 'plane where conversation could be carried on at ordinary voice levels, even with the motor pulling at full power.

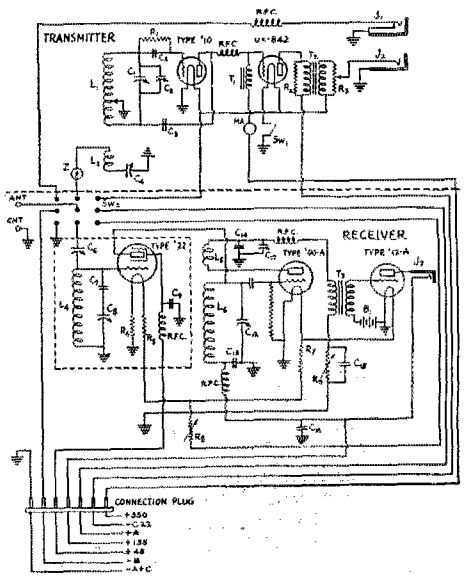


FIG. 1. — THE CIRCUIT DIAGRAM OF THE AIRPLANE TRANSMITTER-RECEIVER

"Grounds" indicate connections to the shielding.

The Transmitter:

L_1, L_2 — REL plug-in tank and antenna inductance.
C_1, C_4 — Cardwell 300-μμfd. variable condensers.
C_2 — 3-plate Hammarlund midget condenser.
C_3, C_5 — .002-μfd. Sangamo fixed condensers.
R_1 — 5000-ohm grid leak.
R_2 — 4-megohm grid leak.
R_3 — 400-ohm Centralab potentiometer.
RFC — REL radio-frequency chokes.
T_1 — Modulation choke, 6-henry 150-ma.
T_2 — Acme A-3 microphone transformer.
Z — Lamp resonance indicator.
J_1 — Telephone jack.
J_2 — Microphone jack.
MA — 0 to 150-milliamp. milliammeter.
SW_1 — Modulator filament switch.
SW_2 — Main control switch.

The oscillator tube is a Type '10 and the modulator is an UX-842. A Type '50 tube could be used instead of the UX-842.

The Receiver:

L_4, L_5, L_6 — Aero plug-in inductances.
C_6 — 7-plate Hammarlund midget condenser.
C_7, C_9, C_{13} — .005-μfd. Sangamo fixed condensers.
C_8, C_{12} — 150-μμfd. Amsco variable condensers.
C_{10}, C_{15}, C_{16} — 1-μfd. by-pass condensers.
C_{11} — 75-μμfd. grid coupling condenser.
C_{14} — 150-μμfd. Sangamo fixed condenser.
C_{17} — 100-μμfd. Hammarlund midget condenser.
R_4 — 15-ohm fixed filament resistor.
R_5 — 10-ohm fixed filament resistor.
R_6 — 4-megohm grid leak.
R_7 — 0.5-amp. ballast resistor.
R_8 — 12-ohm filament rheostat.
R_9 — 100,000-ohm Centralab variable resistor.
RFC — High-frequency r.f. chokes.
B_1 — 7.5-volt "C" battery.
T_3 — All-American audio-frequency transformer.
J_3 — Telephone jack.

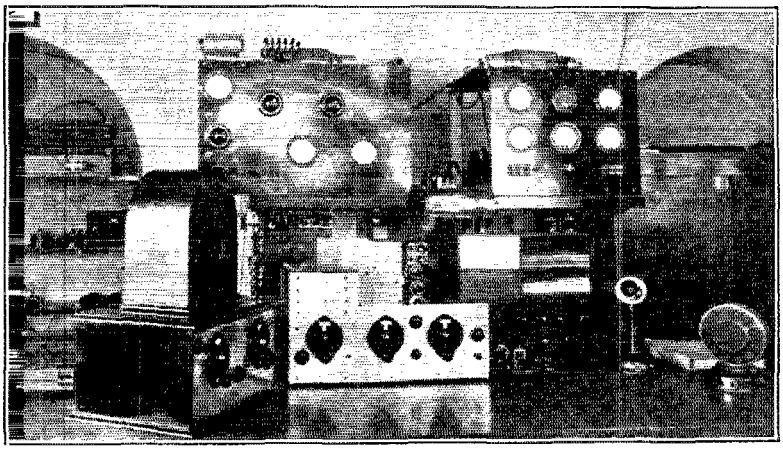
The r.f. tube is a Type '22, the detector a Type '00-A and the audio tube a Type '12-A.

THE AIRCRAFT TRANSMITTER-RECEIVER

The receiver part of the set contains one highly efficient stage of tuned radio frequency, supersensitive detector, and one stage of audio amplification. Because of the rather restricted space in which all the receiving apparatus had to be installed, some trouble was experienced with excessive feed-back, but this was brought under control after a bit of juggling and the unit now operates very smoothly. Change-over from "send" to "receive" is very simple as will be noted by a glance at the diagram given in Fig. 1. In fact, change-over requires only about one second. Plug-in coils are used for both transmitter and receiver.

The complete transmitter-receiver unit (which is thoroughly shielded) is slung between eight sets of rubber bands as a protection against vibration. Such a mounting requires more room than desirable but is necessary if standard apparatus, designed for ground service, is to be used.

The receiver sensitivity is considered about the maximum that can be used to advantage in a 'plane where vibration and unbonded metal parts tend to produce considerable QRN. Incidentally, this matter of unbonded metal is a very important one which should be given closer attention by airplane designers, since any loose metal (not electrically connected to the main mast) is likely to cause serious interference when a sensitive receiver is used and under certain conditions may often modulate the output of the transmitter.



THE GROUND STATION EQUIPMENT AT W8XB-W8RD

This station is well known to amateurs the world over. The 250-watt c.w. and 'phone transmitter is on the shelf above the operating table. The panel to the left is that of the oscillator and the modulator unit is at the right. The convenient and neat arrangement of the equipment shows careful planning.

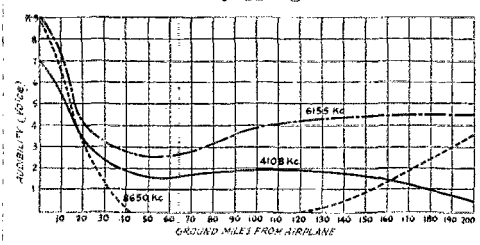


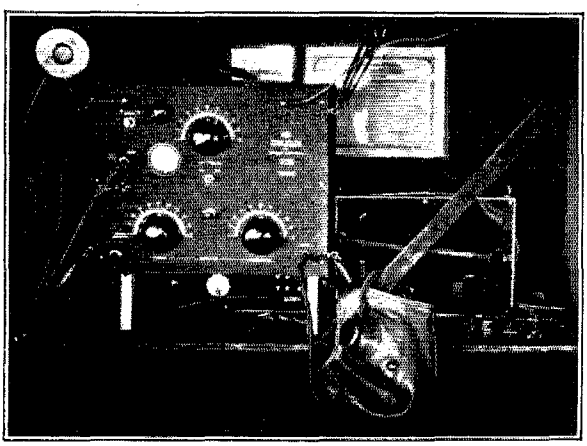
FIG. 2. — AUDIBILITY OF THE 'PLANE'S SIGNALS PLOTTED AGAINST DISTANCE FOR THREE CARRIER FREQUENCIES

The most consistently audible frequency is 6155 kc., the 8650-kc. signals disappearing completely over a considerable range.

During the past few weeks weather conditions have improved sufficiently to permit considerable flying and sufficient data are now on hand to plot reasonably accurate curves showing comparative efficiency of three different frequencies at an altitude of three thousand feet. These curves are given in Fig. 2. In this connection, although numerous flights of 50 to 250 and one flight of 650 miles and return have been made, it would not have been possible to plot curves at this time except for the coöperation of numerous amateur and experimental stations which have logged our signals from time to time, thus giving a much more complete picture than could have been obtained from the two stations alone. In selecting these coöperating stations the attempt was made to pick out those operated by men who had considerable experience with radiophone communication and which were located at 25 to 350 miles from the ground station. At intervals throughout this period of testing other stations in different parts of the country (but at approximately the same distances) were requested to make observations, thus broadening the field of activity and reducing the chance for error. Other experimental aircraft stations were

coöperated with from time to time by logging signals from their transmitters on similar frequencies.

At present the ground station is using 200 to 250 watts (modulated approximately 55 percent) and the airplane is using approximately ten watts (modulated approximately 45 percent).



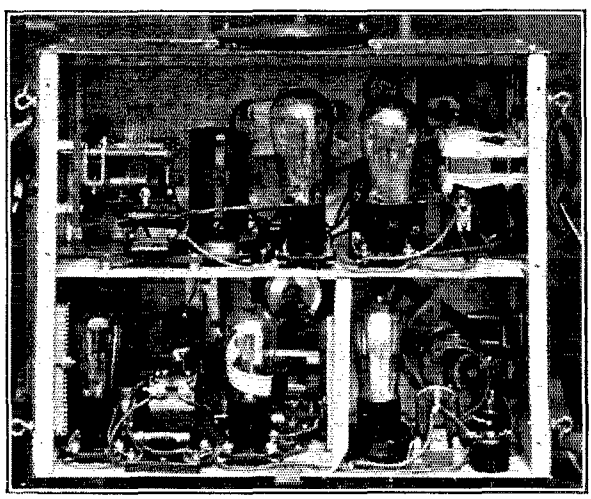
THE 'PLANE TRANSMITTER-RECEIVER INSTALLED IN THE SHIP'S CABIN

The remodeled REL unit is suspended on heavy rubber strands to reduce vibration.

The plate supply for the 'plane transmitter comes from a block of Burgess "B" batteries and the filaments are heated from the regular airplane 12-volt storage battery. As a matter of interest the low power of the 'plane transmitter — although increasing the reception difficulties at the ground stations — has been a real advantage in comparing antenna or frequency results since any tendency to swing or fade is much more noticeable when the voice is just on the verge of understandable audibility.

Both transmitters, for the sake of flexibility, use simple self-excited high-C circuits and the ground station is arranged for quick QSY (approximately 30 seconds) to any previously logged frequency available, thus allowing quick comparisons to be made in the 'plane. Accurate frequency results are obtained on these quick change-overs by making the plug-in inductances very rigid and sturdy. In addition all other parts of the oscillator are mounted in such a way that there can be no vibration. The main Cardwell tank-circuit condenser is provided with an eight-inch disc which has notches cut in its outer edge at the desired positions. A positive lock (spring retained) drops into these notches, which are easily located by rotating the shaft until the dial shows the approximate position previously logged. To change from one frequency to another, therefore, it is only necessary to slip in the proper inductance; set the tank circuit and antenna condensers; plug in the r.f. choke — and turn on the power. If the frequency meter shows the carrier to be slightly off frequency, a touch on the small tank circuit vernier condenser quickly corrects it. Perhaps satisfaction with this outfit can be expressed best by explaining that it has been operated on five different high frequencies right in a nest of commercials for the past nine months without a single complaint of interference.

So far it has not been advantageous to operate the ground station on one frequency and the 'plane on another, but this might be desirable if the ground station power were increased to, say, one thousand watts, in which case a frequency might be selected that would function satisfactorily both day and night. The aircraft receiver could then be locked to the frequency, with only a small vernier for minor corrections in tuning adjustment.



THE TRANSMITTER-RECEIVER WITH ITS BACK COVER REMOVED

The transmitter occupies the upper deck, the tube to the left being the oscillator and that to the right the modulator. The compartment at the lower right contains the tuned r.f. stage. The detector and single stage of audio-frequency amplification are in the lower left compartment. Plate and filament power for both units is supplied by batteries.

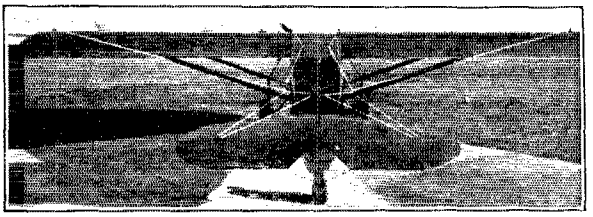
THE ANTENNAS

The ground station main antenna is a nearly straight wire 340 feet long and 52 feet high at

each end. It is fed in the exact center and operates efficiently on five different frequencies, only one of which requires a loading coil. The airplane antenna used in most of these tests is of the fixed type and gives excellent results both on the ground and in the air.

Just what type of fixed antenna system will prove most successful in the end cannot be predicted at this time, but the doublet type shown in the photograph and Fig. 3 has proven most satisfactory. Fading in particular is at a minimum with this design.

The mounting of a fixed type antenna is quite a problem where 'planes have been designed without regard to radio. Our method has been to mount a short stub mast, block, or bracket, on the main wing spar as near the end as possible and then lead the wire back toward the tail and forward to the Pyrex bowl insulators which carry thru to the interior of the cabin. If the wings are short, in obtaining the required antenna length it may be necessary to have the wire run back and forward much more closely than good practice dictates, but this method is preferred to the use of loading coils required with shorter antennas. Unless the cabin roof is quite strong where the lead-in bowls go through, it will be necessary to provide strain wires and insulators to carry the load. Such an arrangement is illustrated.



THE ANTENNA AND STAY-WIRE ARRANGEMENT ON THE CABIN SHIP

The antenna wire is phospher-bronze. The lead-in insulators are mounted on the cabin roof between the wings. Fig. 3 illustrates the antenna arrangement schematically.

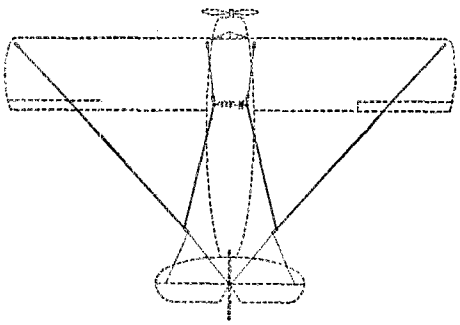


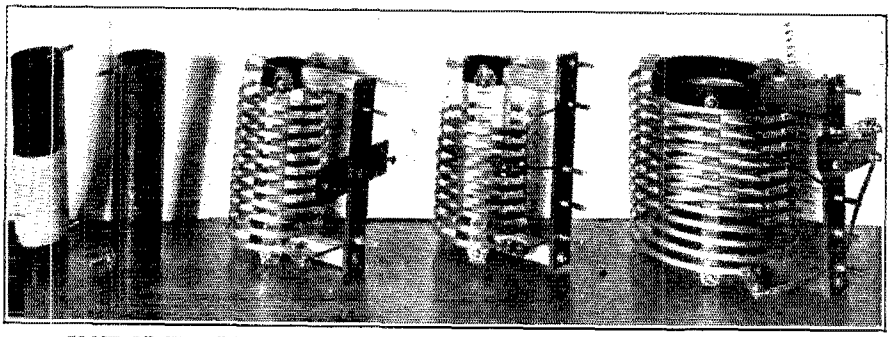
FIG. 3. — DIAGRAM OF THE DOUBLET TYPE ANTENNA USED ON THE STINSON-DETROITER CABIN 'PLANE

Stay-wires are useful in preventing excessive vibration of the antenna wire and also take the mechanical strain off the lead-in insulators.

Copper wire cannot be used, of course, and copper clad steel seems to break too easily after a kink. Phosphor bronze, however, makes a good job which will stay tight for thousands of miles, providing the natural period of vibration of the wire doesn't happen to coincide with that of the propeller blast or slip stream. It is a good idea to provide a turnbuckle at the rear end for take-up.

Trailing type antennas have been tried at various times and proven themselves absolutely unsuited to high-frequency work. In addition to the difficulty of putting out a steady signal from such a radiator, reception has always been accompanied by extreme fading, and the constant danger of losing a "fish" while over a thickly populated territory makes pilots almost unanimous in opposing such a device.

Short vertical antennas of the type now used for weather report and beacon signal reception might be used with less directive effect, but the inefficiency of such a radiator would certainly



SOME OF THE PLUG-IN INDUCTANCES FOR THE 250-WATT TRANSMITTER

The necessity for rapid and accurate frequency changes is met by inductances of this type. Note that the plugs are connected in pairs wherever required to carry heavy r.f. current.

call for a great deal more power than we have been using.

The ground station receiver most generally used contains two ganged stages of tuned radio frequency, a super-sensitive detector, and two stages of audio feeding a loud speaker through the usual output filter. Headphone reception may be had (with either one or two stages of audio) by throwing a switch. The extra receiver uses one Type '24 as a coupling tube from antenna to supersensitive detector, with two stages of audio. Fixed capacities of different values may be placed in parallel with the tuning capacity by rotating a seven point switch, thus greatly increasing the tuning range of this receiver.

The curves shown are for average field strength (as judged by audibility) at different distances from the airplane while the ship was flying at approximately 3000 feet. The photographs show the airplane, the ground station and some details of the 'plane's transmitter-receiver. The schematic diagrams cover the circuits used.

As yet, we have very little data on night flying but it seems safe to predict that the same or better results can be obtained at night with frequencies around 3000 kilocycles. In plotting the curves, the old amateur "R" system has been used to indicate audibility since it seems more suitable in this case than the new "QSA" system.

To sum up: daylight airplane radiophone communication seems reasonably practical and reliable on frequencies between 4500 and 6000 kilocycles at distances up to 200 miles or more.

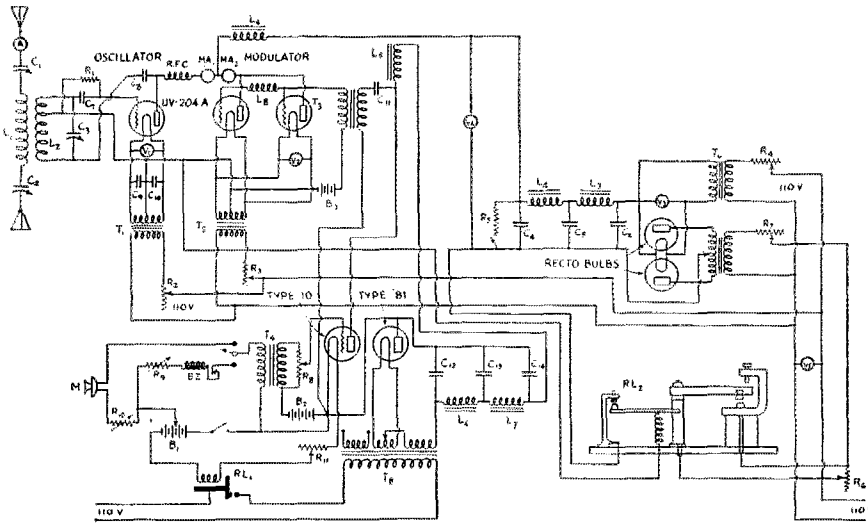


FIG. 4 — THE CIRCUIT OF THE 250-WATT GROUND-STATION TRANSMITTER, W8XB-W8RD

A — 0 to 8-ampere thermo-ammeter.
B$_1$ — 8-volt storage battery with 6-volt tap.
B$_2$ — 35-volt "C" battery.
B$_3$ — 78-volt "C" battery.
C$_1$ — 500-μμfd. antenna series condenser.
C$_2$ — 500-μμfd. antenna series condenser.
C$_3$ — 650-μμfd. tuning condenser.
C$_4$ — 6-μfd. 2000-volt fixed condenser.
C$_5$, *C*$_6$ — 2-μfd. 2000-volt fixed condensers.
C$_7$, *C*$_8$ — 2000-μμfd. 5000-volt mica-insulated condensers.
C$_9$, *C*$_{10}$ — 2000-μμfd. 2000-volt mica-insulated condensers.
C$_{11}$ — 1-μfd. 1000-volt condenser.
C$_{12}$ — 2-μfd. 1000-volt condenser.
C$_{13}$ — 2-μfd. 600-volt condenser.
C$_{14}$ — ½-μfd. 600-volt condenser.
L$_1$, *L*$_2$ — Flat-wound plug-in type inductance.
L$_3$ — Choke, 30-henry 300-milliampere.
L$_4$ — Choke, 30-henry 500-milliampere.
L$_5$, *L*$_6$, *L*$_7$ — Choke, 30-henry 80-milliampere.
L$_8$ — 18 turns, No. 30 d.s.c. wire on 1" tube.
MA$_1$, *MA*$_2$ — 0-300 d.c. milliammeter.
R$_1$ — 200-watt 11,000-ohm tapped resistor.
R$_2$, *R*$_3$, *R*$_4$ — Allen-Bradley type 210 Radiostats.
R$_5$ — 200-watt 20,000-ohm resistor.
R$_6$ — 80-watt 20-ohm rheostat.
R$_7$ — 200-watt 80-ohm rheostat.
R$_8$ — 500,000-ohm potentiometer.
R$_9$ — 50-ohm rheostat.
R$_{10}$ — 200-ohm rheostat.
R$_{11}$ — 6-ohm rheostat.
RL$_1$ — 6-volt switch-relay.
RL$_2$ — Double-contact relay.
RFC — Radio-frequency choke coil.
T$_1$ — 150-watt filament transformer.
T$_2$ — 1-kw. 2300-volt plate transformer.
T$_3$ — Audio transformer.
T$_4$ — Acme A-3 microphone transformer.
T$_5$ — 150-watt filament transformer.
T$_6$ — 150-watt filament transformer.
T$_8$ — Filament and plate transformer.
V$_1$, *V*$_2$, *V*$_3$ — 0-15 a.c. voltmeter.
V$_4$ — 0-2000 d.c. voltmeter.
V$_5$ — 0-150 a.c. voltmeter.

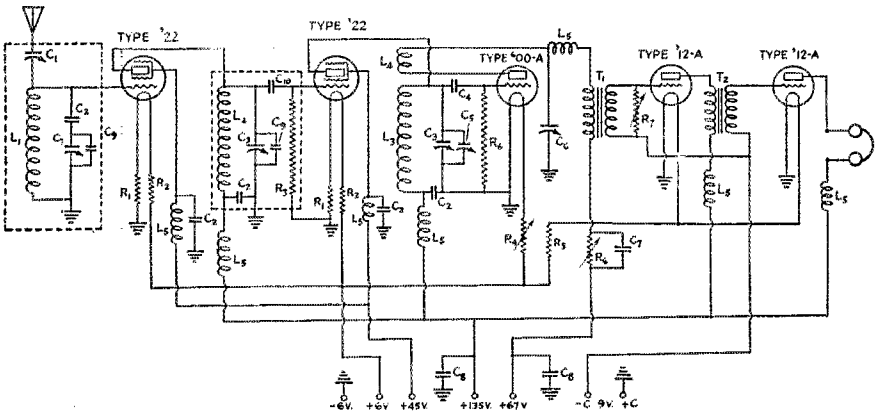


FIG. 5.—WIRING DIAGRAM OF THE RECEIVER AT W8RD-W8XB

C_1 — 65-μμfd. coupling condenser.
C_2 — 5000-μμfd. fixed condenser.
C_3 — 150-μμfd. tuning condenser.
C_4 — 150-μμfd. grid coupling condenser.
C_5 — 100-μμfd. balancing condenser.
C_6 — 250-μμfd. regeneration control condenser.
C_7 — 1-μfd. by-pass condenser.
C_8 — 5-μfd. by-pass condenser.
C_9 — 45-μμfd. trimmer condenser.
C_{10} — 175-μμfd. coupling condenser.
L_1, L_2, L_3, L_4 — Aero plug-in tuning coils.
L_5 — Radio-frequency choke coils.
R_1 — 10-ohm fixed resistor.
R_2 — 15-ohm fixed resistor.
R_3 — 1- to 10-megohm grid leak.
R_4 — 20-ohm rheostat.
R_5 — 0.5-ampere ballast resistor.
R_6 — 50,000-ohm variable resistor.
R_7 — 1- to 10-megohm volume control.
T_1 — 6 to 1 audio transformer.
T_2 — 3 to 1 audio transformer.
"Grounds" indicate connections to shielding.

It is my opinion, however, that the airplane transmitter should have an output of approximately 100 watts and the ground station 250 to 1000 watts, both with a fairly high percentage of modulation. To obtain desirable frequency stability, self-controlled or crystal-controlled oscillator-amplifier circuits should be best for the airplane transmitter and the ground station should also be crystal controlled.

Our results have been much easier of attainment because the Packard-Diesel engine (with which the 'planes have been powered) produced no ignition disturbances to complicate the job. 'Planes powered with gasoline engines would require very complete shielding of the ignition apparatus, including magnetos, wiring and spark plugs, if similar results were to be expected.

Staff Changes

WE have pleasure in announcing the appointment of Mr. George Grammer, W1DF, as assistant technical editor of *QST*. Mr. Grammer, formerly W3AIH at Audubon, N. J., joined the headquarters staff last fall to take charge of the A.R.R.L. Technical Information Service. In the intervening months not only has he written the usual number of "how-many-turns" letters to members but he has found time to write several very helpful articles for our pages, so he comes as no stranger to our readers. He is a graduate of Drexel Institute and a *bona fide* amateur by every test.

Mr. Clyde J. Houldson, W1AKW, of Springfield, Mass., inherits the Information Service in succession to Mr. Grammer. Mr. Houldson joins us from Westinghouse. A graduate of Morton College, he is an Illinoian by birth, having operated 9DQB and 9EDM in Mt. Carmel and the last-named call in Chicago, too.

As the cause of these changes, we regret to announce the resignation of Mr. Beverly Dudley, our assistant technical editor, to become assistant secretary of the Institute of Radio Engineers. Of course whenever the I.R.E. runs out of secretaries it comes up to Hartford and looks over the best radio aggregation in semi-captivity. John Clayton and Harold Westman were both formerly *QST* men. With Clayton's recent resignation from

(Continued on page 72)

Strays

W8AHN suggests that for low loss construction where a glass base "board" is used, rubber vacuum feet such as those used on cigarette ash trays for automobiles could be used to mount coils, and condensers on the glass. This would eliminate drilling the glass, and would enable the experimenter to change the circuit or arrangement of parts at will.

Our Regulations Are Revised

Commission Revision Solidifies Our Position—Improved Plate Supplies Required—28-mc. Band Made Exclusively Amateur—Compulsory Logs

By K. B. Warner, *A.R.R.L. Secretary-Editor*

THE United States amateur regulations have been revised by the Federal Radio Commission, effective April 5th. For the first time we have a complete set of regulations which proceed in orderly and logical fashion under the 1927 law. We have now, we believe, a better and more understandable set of regulations than exists for any other class of stations in this country. In the revision, much has been done to clarify language and to make more exact specifications. There are also now introduced into the regulations many minor specifications which previously had been covered by special instructions of some sort but never codified and included in the actual "regs" themselves.

FEW CHANGES

There are few changes of importance. The most important one is the requirement that all amateur stations use adequately-filtered d.c. supply or arrangements such that inferior supplies will not produce "wobbulation." We shall discuss this in detail later. The 28- to 30-mc. and the 56- to 60-mc. bands are made exclusive amateur assignments in this country, which is a big gain. Station logs are made compulsory. Quiet hours are better defined. In fact it may be said that the big merit of the new regulations is the definiteness with which they outline the whole field of amateur radio in this country. The older regulations contained many phrases which were subject to varying interpretation and which in fact were variously interpreted in many quarters. Much of the regulation of amateur radio was simply "agreed practice," never formally reduced to writing, and there has been considerable lack of uniformity in enforcement in the different districts. The new text, it may be hoped, will go far in overcoming these faults.

HOW IT HAPPENED

The authorities at Washington have felt for some time the necessity for overhauling our regulations, but pressure of duties has delayed the job until recently. On March 21st the Commission held an informal conference on the subject at Washington, primarily between its legal and engineering divisions, the Radio Division of the Department of Commerce, and the American Radio Relay League, but also attended by many others. (See this month's editorials, written before the adoption of the new regulations.) Mr. W. D. Terrell, chief of the Radio Division, presided at the request of the Commission, and A.R.R.L. was represented by Mr. Charles H. Stewart, its vice-president, Mr. Paul M. Segal, its general counsel, and the writer, its secretary. After a full day of discussion the major features were agreed upon, and the following week a drafting committee, on which we were also represented, undertook to reduce the agreements to formal writing. The finished document is largely the work of Mr. Arthur W. Scharfeld of the legal division of the Commission.

THE TEXT

The conference's work was then reported to the Commission by Mr. Terrell, and the Commission by a general order set aside its previous amateur orders and substituted the new regulations. And there we are.

We now present the complete text of the new regulations, which are *now in effect*, and follow it with a discussion of the intention and effect of the various provisions.

REVISED AMATEUR REGULATIONS

Under the provisions of Section 4 of the Radio Act of 1927, as amended, the Federal Radio Commission establishes the following regulations for amateur radio stations:

Section I. *Definitions:* As used in these regulations,

(a) An amateur is a person interested in radio technique solely with a personal aim and without pecuniary interest;

(b) An amateur operator is a person holding a valid license from the Secretary of Commerce as a radio operator who is authorized under the regulations of the Secretary of Commerce to operate amateur radio stations;

(c) An amateur station is all the apparatus controlled from one location used for amateur radio communication; [1]

[1] As a matter of licensing procedure, in all cases of remotely-controlled transmitters the location of the station shall be assumed to be that of the control point, save that where such control point is more than five miles from the radiating antenna the location shall be assumed to be that of the radiating antenna.

(d) Amateur radio communication is radio communication between amateur radio stations by telegraph, telephone, facsimile, or television solely with a personal aim and without pecuniary interest;

(e) A fixed station is a station permanently located;

(f) A portable station is a station so constructed that it may conveniently be moved about from place to place for communication and is in fact so moved about from time to time, but not ordinarily used while in motion.

(g) A mobile station is a station permanently located upon a mobile unit and ordinarily used while in motion.

Section II. *Classification of Amateur Stations:* The public interest, convenience and necessity will be served by the operation of amateur stations. Save as restricted by and subject to the provisions of, treaty, law or regulations of the Commission and with the exception of individual cases where the public interest, convenience or necessity requires otherwise, all applications from amateurs for amateur station licenses will be granted.

Section III. *Prescription of the Nature of Service to be Rendered:*

(a) For the present, amateur mobile stations will not be licensed.

(b) Amateur stations are to communicate only with similar stations. In emergencies or for testing purposes they may communicate with commercial or government stations. They may also communicate with mobile craft and expeditions which do not have general public service licenses and which may have difficulty in establishing communication with commercial or government stations.

(c) Amateur stations shall not broadcast news, music, lectures, sermons, or any form of entertainment to the general public.

(d) Amateur stations shall not transmit or receive messages for hire nor engage in any communication for material compensation, direct or indirect, paid or promised.

(e) Except as otherwise herein provided, amateur radio stations shall be used only for amateur radio communication, as defined in Section I, paragraph (d) above.

Section IV. *Assignment of Bands of Frequencies:*

(a) The following bands of frequencies are assigned exclusively to amateur stations:

1,715 to	2,000	kilocycles
3,500 to	4,000	"
7,000 to	7,300	"
14,000 to	14,400	"
28,000 to	30,000	"
56,000 to	60,000	"
400,000 to	401,000	"

(b) All bands of frequencies so assigned may be used for continuous wave telegraphy.

(c) The following bands of frequencies may also be used for radio telephony:

1,715 to	2,000	kilocycles
3,500 to	3,550	"
56,000 to	60,000	"

(d) Upon application, amateurs who hold operators' licenses from the Secretary of Commerce of the Extra First Class Amateur grade, or higher, or who show special technical qualifications, satisfactory to the licensing authority, will also be licensed for radio telephony in the band of frequencies:

14,100 to 14,300 kilocycles

(e) The following bands of frequencies may also be used for television, facsimile and picture transmission:

1,715 to	2,000	kilocycles
56,000 to	60,000	"

(f) Licenses to individual amateur stations shall permit the use of all frequencies within the service bands above assigned which the licensee may be entitled to use and shall not specify individual frequencies.

Section V. *Location:* An amateur radio station shall not be located upon premises controlled by an alien.

Section VI. *Regulations Concerning the Kind of Apparatus to be used with Reference to its External Effects:*

(a) Amateur stations shall not use apparatus transmitting damped waves.

(b) The frequency of the waves emitted by amateur stations must be as constant and as free from harmonics as the state of the art permits. For this purpose they must use circuits loosely coupled to the radiating system or devices that will produce equivalent effects to minimize keying impacts and harmonics. Conductive coupling to the radiating antenna, even though loose, is not permitted but this restriction does not apply against the employment of transmission-line feeder systems to Hertzian antennas.

(c) Amateur stations must use adequately filtered direct current power supply or arrangements that produce equivalent effects to minimize frequency modulation and prevent the emission of broad signals.[2]

[2] E.g., the use of unrectified alternating current power supply will be considered satisfactory in the amplifier stages of an oscillator-amplifier transmitter so arranged that variations in plate voltage cannot affect the frequency of the oscillator.

(d) Amateur stations are authorized to use a maximum power input into the last stage of a transmitter of one kilowatt.

Section VII. *Regulations Deemed Necessary to Prevent Interference:*

(a) In the event that the operation of an amateur station causes general interference with broadcast reception on receiving apparatus of modern design, that amateur station shall not operate during the hours from eight o'clock p.m. to ten-thirty p.m., and on Sundays from ten-thirty a.m. until one p.m., local time, upon such frequency or frequencies as cause such interference.

(b) An amateur station shall transmit its assigned call at the end of each transmission but in any event at least once during each fifteen minutes of operation.

Section VIII. *Other Regulations:*

(a) Amateur station licenses shall be issued only to persons who are amateurs, as defined in Section I, paragraph (a) above.

(b) Amateur station licenses shall be issued only to persons who are amateur operators, as defined in Section I, paragraph (b) above, provided, however, that if an applicant is not such an operator, an amateur station license shall be issued him upon the presentation of affirmative evidence that the station, when licensed, will be operated by an amateur operator.

(c) Amateur station licenses shall not be issued to corporations or associations, provided, however, that in the case of a bona fide amateur radio society, a license may be issued to an authorized official of such society as trustee therefor.

(d) The licensee of a portable station shall give advance notice to the Supervisor of Radio in the district where application was made for said portable station license, of all locations at which the station will be operated.

(e) The licensee of an amateur station shall keep an accurate log of station operation, in which shall be recorded the time of each transmission, the station called, the input power to the last stage of the transmitter, and the frequency band used.

Section IX. *Administration:* For the purpose of administering these regulations and under the findings of public interest, convenience and necessity herein made, all ministerial and routine duties in connection with the licensing of amateur radio stations will be performed by the Radio Division of the Department of Commerce. That Division will issue, on behalf of and in the name of the Commission, all licenses, the applications for which disclose no question involving discretion and which require no determination of controverted questions of fact. All applications tendering such questions shall be referred by the Radio Division to the Commission.

EXAMINING THE REGS

Let us now examine our new regulations and see what their effect is.

Section I starts off with definitions. Important as this is in any set of regulations, in ours the definitions are particularly important because of the protection they give us. They establish our status definitely. An amateur is this particular kind of a person, and his communication is of the type defined. Other people who have not this interest may not obtain the right to our privileges. We are definitely protected against invasion by commercials who might seek amateur licenses, for they have not "a personal aim" and on the other hand are not "without pecuniary interest."

A distinction is made between an amateur and an amateur operator to fit in with the licensing regulations in Section VIII.

There is much confusion in other branches of radio as to what constitutes a "station." In the commercial world each transmitter is frequently considered a separate station and given a call of its own. It became questionable whether amateurs had the right to build separate transmitters for different bands. Paragraph (c) disposes of this and makes one station out of all the apparatus controlled by one amateur — in 999 out of a thousand cases. Note 1 covers the other case. An amateur station must be identifiable, in case of interference — its call must indicate its location. If one transmitter of a multiple-transmitter amateur station were too far away it might create entirely different interference conditions not identified with the remainder of the apparatus. Thus Note 1 has a twofold effect. If a single transmitter is controlled from a distance of over five miles, the location of the station is specified as that of the radiator; otherwise it is specified as that of the control point. If a station has one or more transmitters close by and one controlled over a distance of five miles or more, the ones close by constitute one station, with one call, with its location that of the control point, while the distant transmitter becomes known as another station and must be the subject of a separate license, with another call to identify it and distinguish it (because of its separation) from the other transmitters.

Section II. The Commission is forbidden by law to issue any license not found to be in the public interest, convenience or necessity. To avoid holding a special hearing on every amateur application, the Commission here reaffirms its present policy of declaring that the granting of licenses to bona fide amateurs is in the public

interest, convenience or necessity, and that in the absence of exceptional circumstances the license will issue.

Section III. The first paragraph of this section, denying licenses to amateur mobile stations, is nothing new; they have never been licensed. A few amateurs owning yachts have sought such a license but always, so far as we know, for more or less utilitarian communication and hardly because of interest in radio technique. If the bars were ever let down we would be invaded by hordes of non-amateur boat owners who would represent themselves as amateurs in order to obtain utilitarian private communication for themselves. It would swamp us. For instance, in the port of New York alone there are small power-driven pleasure craft registered to the number of 32,000! This would not be a bona fide amateur use, and the present regulation protects us. Where a small private craft has need for radio, it may hope to obtain a marine license to use the h.f. marine channels; the Secretary of Commerce has discretion to permit the operation of such apparatus under an amateur *operator's* license; and Section III (b) would permit such craft to communicate with amateurs.

Amateurs should draw a careful distinction between mobile and portable stations. See paragraphs (e), (f) and (g) of Section 1. Portables are still to be licensed, but may not be used while in motion. If amateurs rigged a station on an automobile, as the Podunk Hollow Radio Club did on our last cover, they may obtain a license for it as a portable station, to operate while not in motion and at fixed locations previously reported as required in Section VIII (d), but they may not obtain a license to operate while in motion because there are no amateur mobile stations.

Paragraph (b) is a rewording of a similar old paragraph, with clarification of the language. Paragraph (c) is an old friend. Paragraphs (d) and (e) define the kind of communications that may be handled and, while giving further protection against commercial enterprises masquerading as amateurs, put in much plainer language the accepted prohibition of compensation by amateurs and eliminate the misunderstandings which always surrounded the old language.

In *Section IV* there is nothing new except the important fact that the bands 28,000 to 30,000 kc. and 56,000 to 60,000 kc. (our 10-meter and 5-meter bands) are now assigned exclusively to amateur stations instead of jointly to amateur and experimental stations. There is plenty of space in this part of the spectrum. There are only a couple of non-amateur licenses in existence for these bands, and they are temporary. The telephony assignments have been repeated without change.

Section V is a new regulation. Aliens are denied station licenses, and it is plainly the intent of the basic law to prevent their control of a station. The law has been circumvented in the past, occasionally, by organizing a club and having the club station located in the home of its alien organizer who, as an operator, then enjoyed all the privileges of a citizen. The new regulation must be regarded as in accord with the Radio Act.

In *Section VI*, paragraph (a) prohibits the use not only of spark but of all other forms of Class B waves "consisting of successive trains in which the amplitude of the oscillations, after having reached a maximum, decreases gradually." (I.R.C., 1927.) Although the use of "continuous waves modulated at audible frequency" (Type A2) is not barred by this paragraph, it does definitely prohibit *interrupted* c.w. ("I.C.W.") as obtained by chopper or buzzer or any other mechanical method of interrupting a radio-frequency circuit.

Paragraphs (b) and (d) represent no change from existing practice. Paragraph (c) and its attending Note 2, however, are a departure and an important one. Their intent, in general, is to do away with a.c. signals and substitute d.c. signals for them. In the case of self-excited transmitters it will take a d.c. power supply to do this, in almost every case. Ingenuity must not be stifled, however, and if an amateur can show, for example, that he has a new-fangled tank-circuit arrangement of his own which, although supplied with a.c., is free of "wobbulation" and produces a d.c. signal modulated at the supply frequency instead of producing the usual infamous "spray" of frequencies, he will be permitted to use it. This is admittedly an extreme case. In general, it is only oscillator-amplifier transmitters (crystal-controlled or self-excited oscillators) that can hope to get under the wire and be permitted to use a.c. plate supply, and even they only under the provisions (1) that they have a buffer stage so that the changing plate voltage on the amplifier has no opportunity to get back into the oscillator and affect its frequency and (2) that the oscillator and buffer stage are, of course, fed with d.c. Putting all of this into ham language, modulated signals are still permitted but "wobbulated" signals are now prohibited, and the transmitter which uses other than d.c. supply must be built like a good 'phone set.

It is high time that we had such a regulation. Every other country which licenses amateurs has long had such a requirement, but we in North America have merrily continued with the selfish signals that eat out great chunks of the band. And we the most numerous, the most congested! There has been much amateur agitation the last two years to oblige the selfish signal to take a course of treatment and transform itself into what was first known as a "1929 signal." When spark finally went, years too late, there were still a few disappointed lads, and we suppose there will be a

few who will object to making the effort to better their plate supplies. It must be done, though, for our own good — that is the overwhelming majority sentiment of the League.

Barring the use of a.c. on the amplifier stages of oscillator-amplifier transmitters, or similar arrangements, every power supply must now have a filter, even the motor-generator supply, although of course it won't take a large filter for that. The chap with a rectifier but no filter must add the filter. The owner of a self-excited transmitter using "raw a.c., self-rectifying" is under the obligation of installing both a rectifier and a filter or of making some other provision for d.c. The owners of "full-wave back-to-back self-rectifying" a.c. transmitters would probably be best advised to provide a d.c. supply and convert the oscillator to push-pull at radio frequency, a rather simple constructional job — unless they can demonstrate to the Supervisor that they have one of those possible but extremely rare jobs where "wobbulation" is practically absent. The owners of "1929 type" transmitters with d.c. supplies have nothing to worry about.

Section VII contains a much more definite statement of the silent-period regulation than we have had in the past, although making no change from the accepted interpretation of it. It remains impossible, of course, to state minutely in regulations just when quiet hours must be observed. The terms "general interference" and "modern design" express the desired thought, but, unfortunately, are still subject to human interpretation. It should be noted that when a Supervisor of Radio informs an amateur that he should observe quiet hours it is not because the Department of Commerce has authority to fix the hours of operation (for it has not), but because this paragraph (a) is a Commission regulation which becomes operative if and when general interference ensues. The Supervisor informs the amateur of the fact; the provision then applies. If the amateur and the Supervisor disagree on the facts, only a Commission hearing can properly decide the case. Fortunately this is an academic issue nowadays.

One big improvement in this regulation is the definite specification of the Sunday morning silent period (when one must be observed) as from 10:30 a.m. until 1 p.m. The old regulation said "Sundays during local church services." In some cities, what with early masses and afternoon services, church services are in progress all day long. Obviously the regulation cannot refer to local broadcasting. Its intent is to give special protection to religious broadcasts for people who desire to worship thereby instead of attending church in person, and the present wording extends such protection during the hours that persons normally assemble for worship. The evening silent period applies on Sunday too, of course, for stations which have the quiet-hours obligation. It should be noted that if one frequency band causes local interference but another band does not, the station remains free to operate on the bands that do not cause interference, or even on the other end of the same band if interference is thereby avoided.

Paragraph (b), about signing, is a logical provision. All stations are under the obligation of indicating their identity frequently.

In *Section VIII* the first two paragraphs are further protection to us that the right to the amateur bands shall be extended only to amateurs and used only for amateur purposes. Paragraph (b) solves a troublesome problem in a satisfactory way which is self-explanatory. In pursuance of this same thought of protection it has been necessary, in (c), to provide that club licenses must also be issued to individuals as trustees for the club. Club licenses in the past have all too frequently been blinds for persons who were not entitled, as individuals, to station licenses. A bona fide amateur club owning an amateur station will have no difficulty in securing a license, but some official must be delegated to assume full responsibility under the law for the station's operation. Examples: W1MK, F. E. Handy, Communications Manager, trustee for American Radio Relay League, Brainard Field, Hartford, Conn.; W9ABCD, John K. Smith, President, trustee for Sunflower Radio Club, 98 S. Main St., Sumwarin, Kansas. Listings in the call book will thus properly show that the station is the station of a society and not individually owned.

Paragraph (d) has the effect of wiping out the old Department of Commerce regulations establishing two kinds of portable stations and provides that every portable station must confine its operation to points for which an itinerary has been filed in advance with the home Supervisor. The Government, of course, has every right to know the location and identity of every transmitting station.

Partly in this vein and partly because every station ought to do it anyhow, paragraph (e) makes compulsory the keeping of a simple station log. The Radio Act requires that the records of a station must be made available to the radio authorities upon demand. The log, then, becomes available to the Supervisor in investigating interference cases, etc., and will assist in showing what frequencies and what powers interfere, what do not, and so on. Note that the input power (to the last stage of the transmitter) must be specified for every transmission. This is a compromise provision. Some of the Government people believed that amateurs should keep an accurate description of their station on file, reporting every change; some even believed that a new application should be filed for every important change. We felt that the amateur station should

(Continued on page 72)

International Communication on 28 Megacycles

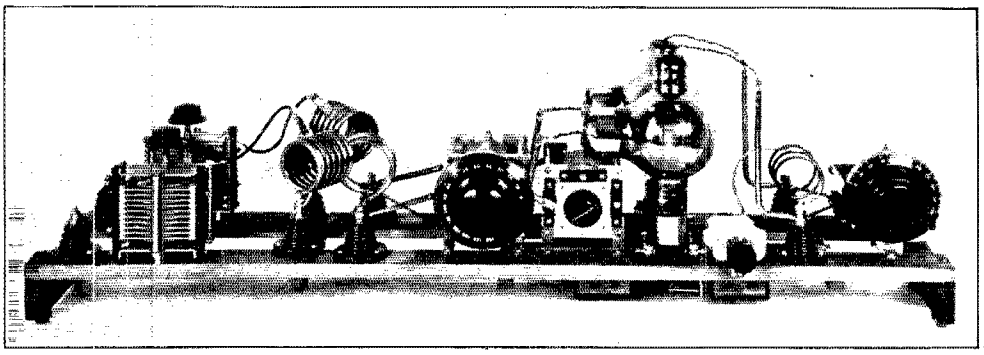
New Records Set Up—All Continents Active—Excellent Reception —Foreign Stations Crave More U. S. A. Activity

By **Clark C. Rodimon,** *Assistant Editor*

THE heretofore dormant 28-megacycle band has certainly been strutting forth since the first of the year and rewarding all those who have been active on that band.

Ross Hull and Jim Lamb came back from Wianno, Cape Cod, Mass., last year after experimenting with beam antennas at W1CCZ, with thrilling tales of signal strength unheard of on any other frequency. They had a circuit open with W6UF, 2500 miles away, that was sure-fire from 9:15 a.m. until 4 p.m.—seven hours of contact with no interference of any sort and extremely loud signals at both ends. The work at W1CCZ of necessity had to close down after a week of experimentation.

Until just recently 28 megacycles has been holding forth its laurels to mighty few stations, notably W2JN in this country. Since the first of the year stations in U. S. A. have worked back and forth; Europe has worked Africa, U. S. A., and is testing with Australia, besides working various countries within European boundaries; China has contacted with Australia and heard U. S. A. signals; W stations have heard and worked all continents with exception of Asia. However, this should be gone into in detail and we shall record what has been digested from reports received.



A 150-WATT 28-MC. TRANSMITTER IN DEVELOPMENT AT A.R.R.L. HQ.

This transmitter, which will be described in detail next month, has several novel circuit features. During the tests it will be used in conjunction with a directive antenna. This is only one of the transmitters that will be operated on 28 mc. here in Hartford.

GREAT BRITAIN

The R.S.G.B. sponsored tests during four week-ends in March, and at this time we are awaiting details on the work that was done.

Many British stations have been active, and among the most notable are: G5ML, G6LL, G5WK, G6NF, G2OD, G6QZ, G5BY, G5DH, G2CJ and BRS25. These stations, with the exception of BRS25, have been heard in this country and most of them have been worked. W2NM, W2JN, W9BYC, W1BJD, W1AQD, W9EF, W8AXA, W2ACN, W2BG, W1COW and W2AIS have been reported more than once in England. W9BYC, in Colorado, seems to be the best DX the British stations have heard from U. S. A. A few PY stations are reported.

G5WK contacted ZS5C and ZS4M for first contact on 28 mc. between England and South Africa.

FINLAND

OH2NM, with a crystal-controlled transmitter of 20 watts input, worked FM8GKC and FM8BG, in North Algeria, Africa. OH2NM has also worked ZS4M. OH2NV, OH2OP, OH1NH and OH1NT are other active stations in Finland.

DENMARK

OZ7Y and OZ7T are both active, 7Y being

reported by many U. S. A. stations. ZS4M worked 7T for the first Danish-South African QSO. 7Y was QSO W2JN on New Year's Day for first W-OZ contact.

FRANCE

About the only active station that we know of in France is F8CT. F8CT has worked W2JN frequently.

SOUTH AFRICA

ZT6K, ZS4A, ZS4M and ZS5C seem to be the active stations in S. A. ZS4M has done excellent work, being reported by many stations in Europe as well as Eastern and Central U. S. A. 4M holds the honor of first ZS-OZ, W-ZS and ZS-G (shared with 5C) contacts. Mighty fine work, OM Hill. Extracts of a letter from ZS4M, Mr. C. H. Hill, 4 Fischer Street, Bloemfontein, Orange Free State, South Africa, to W2JN (who was the W

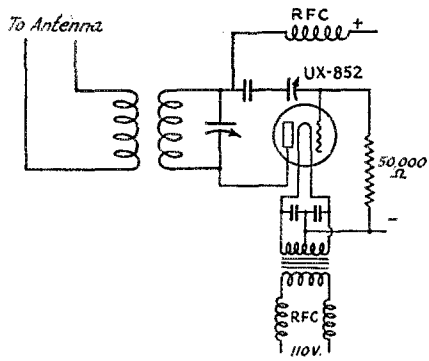


FIG. 1 TRANSMITTER USED AT W6BAX

station in the first ZS-W contact) explains the discouragements that were encountered at the South African end. This will interest those of us who have failed first crack. We are quoting part of Mr. Hill's letter:

"I want to say that practically all the credit for performance of ZS4M belongs to ZS4E who built, designed and perfected this station. We commenced our work on ten meters about the beginning of 1929 with a bread-board hay-wire transmitter. The aerial used was a horizontal full-wave Hertz and we kept going on this for two months, and as we neither were heard, nor heard anything, we scrapped it and rebuilt.

"This time we had a very FB transmitter using a twin voltage-feed Zepp, but again ND.

"We stuck to this for some months before we finally scrapped it. With these two transmitters we used about 120 watts input. We decided the location must be at fault, so we adjourned to ZS4E's shack. We could not take any gear with us as it was needed for 20- and 40-meter rigs, so we rebuilt entirely, this time using 50 watts. We reckon this was the most efficient transmitter we had constructed so far. In this test we used a single-wire voltage-feed antenna and theoretically speaking everything was just 'it.' Still ND.

"About this time our friend ZS5C had his first QSO on low power, so we did our best with a 1929 Hartley using 20 watts and with a twin-feed Zepp. (This twin-feed Zepp Mr. Hill is referring to we think is what we term a regular Zepp feeder or 2-wire feed. — *Editor.*) Once again, ND.

"You can see that we have reduced power each transmitter. We decided that it would be in order to QRO. Accordingly we converted our 250-watter (20-meter transmitter) into a 10-meter transmitter and hit the breeze. Still ND, and no reports.

"However, we were not beat yet, as we still had the 500-watter in reserve. Hi! About a fortnight ago we decided to convert our big noise to ten and see if anything doing. (Looks as though the 40-meter transmitter is about to lose its bottle of r.f. energy. — *Editor.*) So our 40-meter transmitter was partly dismantled and away we went, but again ND. (Things must have looked desperate at this stage of the game with nary a workable transmitter at ZS4M. — *Editor.*)

"Considerable thought led us to the conclusion that we must be suffering from resistance losses to and in the aerial, so the last day in 1929 we scrapped all our experimental antennas, numbering about five in all, and set to work to construct something solid — and here's the dope.

"The aerial proper consists of $\frac{3}{8}$" diameter copper tubing 16 feet long. This is fed by a single copper tube $\frac{1}{4}$" diameter and about 10 feet long, firmly soldered onto a 2-turn coil made of $\frac{3}{8}$" copper tubing. Practically all leads to the transmitter are of heavy copper tubing, so we reckoned we had minimized resistance losses. We listened locally and the signal emanating from this antenna was very strong. We listened as far away as ten miles, and the strength of the signal was still r9. This was good enough, and we decided we were ready for the fray. That we were not wrong was conclusively proved yesterday when we broke all records, first by two QSO's in one day and then second by working W2JN in America."

Isn't that a story of real perseverance without a single spark of encouragement in the way of reports? We know that ZS4M is going to be a busy station week-ends from now on — and he certainly rates it. The power input at this station is 700 watts and it has been reported r7 by W2JN.

CHINA

Rodman, former AI2KT, has located in China. Old AI2KT made many W stations "Wackers," and when it was dismantled we missed a fine Asian contact. Then we start hearing a call "XU2UU" on 28 megacycles. It is from China, and is the station of Rodman, who has been

transferred to the Far East. XU2UU was heard calling W6BAX by ZL2AC. We have just received a report announcing the first VK-XU contact. This work was between Max Howden, VK3BQ and XU2UU. Who in U. S. A. is going to snag 2UU for the first Asian contact? Or are things coming so fast that it already has been done?

CANADA

Alphy Blais, VE2CA, has done considerable pioneering on 28 megacycles and has sent in many reports to *QST* covering solid week-ends of practically no reception of signals. However, reports from this station in March show a tendency of British stations and W9 and V4 stations to break through. VE4BQ was reported by W1AZW and W2JN. VE4HR, VE4EL and VE4GQ were reported by W2JN.

AUSTRALIA

VK3BQ, VK3PM, VK4RB, VK3HK, VK3WG and VK7DX are all active on 28 megacycles. VK stations report West Coast U. S. A. signals r8 and r9! No QRM or QRN!

VK3BQ has a schedule with G2OD for contact between VK and Europe, but so far NC (no contact).

We understand that there are about 30 VK stations active on 28 mc.

NETHERLANDS

PA0DW reports hearing signals from four U. S. A. districts and Africa. We hope that DW will have a transmitter on for the tests and that will mean more new records.

NEW ZEALAND

ZL2AC and ZL1AN seem to be the active stations from New Zealand.

U. S. A.

Many stations in this country report reception of other U. S. A. stations on the 28-mc. band (harmonics and fundamental). We will not attempt to list these stations completely, but mention the outstanding results coming to our attention as encouragement to all who work on the 28-mc. band.

W2AIS has sent in several reports on 28-mc. work. This station has been hearing W6 stations as well as local transmitters. W2AIS has a transmitter using "250 volts d.c. from light mains and a Burgess B Battery" for plate supply to a Type '10 tube in t.p.t.g. circuit. W9EF worked several British stations as well as OZ7Y on February 9th. W9EF was reported r7–r8 by all but one station. W4AA–W4NG has an m.o.p.a. transmitter on 28.4 mc. W6BAX worked several VK and ZL stations during March and reports hearing others. W6BAX has been heard by XU2UU and has worked stations on the east coast of U. S. A. Fig. 1 shows the transmitting circuit being used at this station. The antenna used is 90′ long and the feeders are ¾ wave long.

W1BGK has had a transmitter on 28 megacycles since the middle of November, 1928. Nothing had been worked although other stations were heard until recently when reports came through from Europe. February 9th was a good day for W1BGK when he was QSO England and Denmark. W1BJD has been reported at G5ML with terrific signal strength. W1BGK uses an ultra-audion transmitting circuit and a full-wave 28-mc. antenna with single wire feed.

W2AHT has a transmitter on 28 mc. W6BTO has been reported on the east coast, U. S. A. W2NM and W2ACN have been doing good work on 28 mc. with d.c. crystal-controlled transmitters. W9BYC, Boulder, Colo., has done some excellent work with his Type '10 transmitter

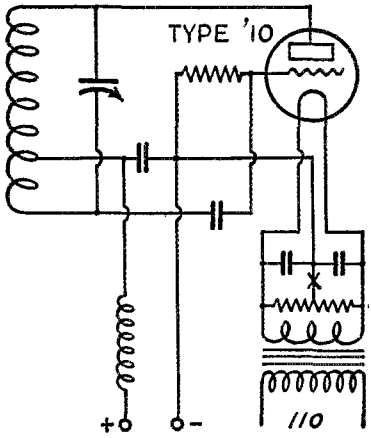


FIG. 2. — OSCILLATOR CIRCUIT AT W9BYC

working everything active as far east as England. Many stations report working or hearing W9BYC. We will endeavor to obtain a photograph of this station for display in this report, but if unsuccessful we will have it next month.

Our old friend on any new band of frequencies, NKF, using a large directive antenna,* is not without its share of reports. Reported heard from California to Europe, NKF is hampered in reception on 28 mc. by commercial harmonics. It might be well to state here to those who have not tried reception on 28 mc. that HJG is a commercial station with a loud harmonic on 27,260 kc. (11.05 meters) — just one long meter north of ten! His harmonic is r7 here in Hartford, and we usually find that when we can hear it, 28mc. amateur signals will also come through. HJG's harmonic is a good marker — and indicator of 28-mc. conditions in this part of the world.

*Read dope on the antenna in April *QST*, pp. 9–18. — EDITOR.

W2JN

W2JN, the station of Mr. C. K. Atwater, 340 N. Fullerton Avenue, Upper Montclair, N. J., has been hammering away at 28 megacycles for two years. We have received reports from Mr. Atwater from time to time and W2JN, with a d.c. crystal signal, is to be commended for the untiring work done in an effort to make a "go" of communication on this band, apparently so elusive to the faint heart and unpersevering.

W2JN's exploits really rate a separate head. In a high percentage of foreign reports W2JN is rated as the most consistent station heard. W2JN holds the laurels for first W-ZS and W-OZ contacts, both of these records being made on January 1, 1930 — quite an ideal way to start off the new year. There are so many items of interest to note regarding this station that it is hard to know what to use and what not to and we have other announcements to make. W2JN has the honor of verifying the first two-way transatlantic contact. This record was made April 29, 1928 with F8CT in France. We have just received full description of W2JN and will publish it next month.

GENERAL

That is certainly an imposing amount of communication. Records will probably be made every week-end from now on. Summer is coming. Our lower frequency bands will be racked with bursts of Old Man Static. Apparently 28 megacycles is free from this. W1DF, while testing with W1CEI during a lightning storm, noted that there was no sign of static. Power leaks appear to be at a minimum on this band. The only trouble from interference noted is from automobile ignition, and directive receiving antennas probably would reduce this to a minimum. Fading seems to be present on 28 mc., but it is not the quick fading noted on 14 mc.; it is gradual and of comparatively small degree. When a signal finally does fade out, however, the receiving operator left holding the sack might just as well close up shack for that day, since the fading station will not reappear until the next day. We have no definite information on time of day for best contact with various foreign localities, but generally note that things start to happen about 1400 G.C.T. and continue for four hours. We hope to be able to present more definite information on this phase of 28-mc. communication next month.

W2JN reports that signals from Europe are steadier and have greater signal strength on 28 mc. than on any other band. G5ML seems to have the same to say about U. S. A. signals, reporting that they have "terrific strength."

At present, activity is keen on week-ends. After more work is done and best times of contact are realized, this band will be more popular during the week. What is needed is accurate information on all phases of 28-mc. communication.

The transmitting circuits used by successful stations on 28 mc. vary from crystal d.c. down to a.c. Hartley. Our advice on transmitters is to use the circuit you are most familiar with, have apparatus for, can connect up most efficiently; and above all have the note as clean and steady as you never had it before. This 28-mc. band is 2000 kc. wide but we do not want any crowding!

When we visualize the possibilities of this 28-mc. band our fond dreams of an ideal band seem to be realized. This 28-mc. band is just tricky enough to whet the appetite of the most *blasé* of amateurs. Any amateur successfully making contacts on this band of frequencies can well feel satisfied with a task well done.

Think how our antennas are going to be simplified. A half-wave 28-mc. antenna is about 16.5 feet long. The feeder is another 8, 24 or 48 feet — suit yourself. At this point we want to stress the importance of directive antennas. Possibly many of the stations who are having unusually good communication on 28 mc., unknowingly have directive radiating systems with reflectors in the form of steel buildings, metal walls, gutter pipes or a piece of unused antenna wire properly spaced from the intended antenna to give a low-angle concentration of the radiated energy. It is rather too bad that we haven't a two-letter word to substitute for "directive antenna," for amateurs seem to shy away at the mention of such creatures. We suspect they have in mind the complicated 200-foot high Marconi reflectors or some of the structures at Rocky Point with mile after mile of Beverage antenna; nothing of the sort. Hang up a piece of wire (same length as the antenna) a quarter wave (8.2 to 8.77 feet) away from the horizontal antenna, either "behind" or "in front" of it and you have your directive antenna system. Simple? You will find that you have increased your low angle radiation, which is the *only* part of your total radiated energy that is effective. This will make the 7.5-watt transmitter have as much signal strength as a transmitter several times as powerful with a non-directive antenna. This is not only theory; it is a practiced fact and works out better in practice than theory.

We must be pardoned for spurting forth with so much enthusiasm. We cannot say any more without letting it out of the bag, and we cannot hold off any longer. Twenty-eight megacycles is ripe and *we are going to have some tests.* We have not time to correspond with foreign sections and be assured of their coöperation but they will have advance notice—and it will probably be done on 28 megacycles. We will spend our week-ends at W2JN relieving Atwater if necessary, but we will get the news across to all impor-

tant outlying sections of the I.A.R.U. These forthcoming tests—wait, we need a little display here,

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will be held in June. They will be on May 31–June 1, June 7–8, June 14–15, June 21–22 and June 28 and 29. All active and interested amateur stations are invited to get in on these tests. What active amateur can resist the lure of this band that is at last holding forth some of its rewards?

Right here we want to compliment those amateur stations, all over the world, who have pioneered for over two years, for their "stick-to-itiveness." The least that the rest of us can do is to hide our shame and move to this higher strata of amateur frequencies—and do it in these tests! We have had a new batch of classy WAC certificates made up and the pen is wet, waiting to see who will be the first to rate a WAC for ten meters. You will have competition, too. G5BY is active on this band, but so far has not put the stunt over. And W2JN has the jump on many of us too, but one little 7.5-watter with a 16-foot antenna and reflector with 8-foot feeder may snag XU2UU just at the right time and leave the rest of us in the dust. Just time enough to get everything shipshape. What say, fellows, let's make QRM on 28,- to 30,000 kc. during June.

Roanoke Division Convention

AT the close of the 1930 annual Roanoke Division Convention held at Charlotte, N. C., March 21 and 22, all delegates unanimously declared this the best and biggest convention the Division had ever witnessed. The liberal and varied assortment of entertainment features assured the full enjoyment of everyone in attendance from the newest brasspounder to the most sophisticated "final authority." Plenty of excellent information was available to all classes of amateurs at the several technical sessions. This was no ordinary convention. Every event started on time as scheduled! While there was ample chance to renew acquaintances with old friends and delegates in the course of trips and lunch hour periods, there was none of the tiresome "standing around" waiting for the program to begin seen at some amateur affairs. Entertainment a plenty was interspersed with technical and traffic discussions, movies, inspection trips and contests, some of which were humorous, interesting and educational at the same time — not to mention the valuable prizes for those who took part.

Friday morning dawned fair and bright and a record first day registration resulted. First on the program was a 15-mile automobile trip and visit to the 110,000 KVA Riverbend steam power plant of the Duke Power Company where coal is pulverized until it can be burned like oil. Following a theater party at the Carolina Theater, the delegates adjourned to the Chamber of Commerce for a traffic meeting and discussion of "frequency observance" conducted by F. E. Handy, Communications Manager, of A.R.R.L. Headquarters. Division Director W. T. Gravely was in evidence early and at this meeting ascertained the views of those assembled on the extension or further restriction of the 3500- to 3550-kc. radiophone band and on other matters of general concern. Not until after discussions lasting well into Saturday morning, however, did the majority of those assembled "call it a day."

Radio Supervisors L. C. Herndon and George Lewellyn conducted examinations Saturday morning for over 35 candidates. Following the official welcome of Chairman Gluck, Lieut. R. E. Wilson, U. S. N. (C.) R. from the Naval Base at Newport News, Va. and Captain H. G. Fairbanks of the Army Engineers, most ably representing the C. A. S. O., explained in turn the Naval Reserve and the Army Amateur Radio System. We were glad to observe later that a good number of those present accepted the opportunity to file applications and line up with one or both these services. A number of technical contests were held. Dr. E. C. Woodruff, r. f. choke specialist and A.R.R.L. Director, was persuaded to disclose some of his latest apparatus. His explanation on the famous "T.N.T." transmitter held close attention until the lunch hour, after which the technical discussion was resumed and continued with specifications on receivers, monitors, field meters, chokes or what have you from W8CMP's bag of tricks.

A trip to the new A. T. &. T. repeater station was the next order of the day. One hundred fellows were on deck for the big banquet which started right on the dot after a brief intermission. Director W. T. Gravely was Master of Ceremonies. Amos 'n' Andy favored the banquet with their presence (via WBT). Then came varied (We wonder if this includes "Oh, You Lucky Little Devil," sung for our C.M.—EDITOR) entertainment from headliners at a local theater and group and individual dance numbers gracefully executed by Charlotte young ladies. Speech making was limited to five minutes, a plan which enabled all to be heard and resulted in universal satisfaction. Liars contests, Q-code spelling bees, a search for the ugliest ham, the one with the biggest feet and many other events were followed by more first class entertainment. Card tricks, water and wine experiments, sleight of hand stunts and many unusual appearances and disappearances were made possible by black magic under the capable direction of a professional; F. L. Bunker, ex4CE, Greensboro, N. C. Chair--

(*Continued on page 80*)

SAY, SON—

put away the Wouff Hong and the Rettysnitch a minute. I read something in the paper the other day that's worth considering by all hands. Somebody's mother wrote it. You can see Mother sticking out of it on all sides. It surely does make every one who reads it think of that little old lady with the soft look in her eyes when we used to take our troubles to her. No doubt about it, son, there is nothing in all this big world of ours that comes up to Mother. She's the one that is always back of us all, through thick and thin. She's the one that can be counted upon to stay to the end, no matter what that end may be.

It reminds me of a well-known picture, and dog-goned if *QST* would make a mistake printing a copy of it. Mother figures so big in amateur radio, with her jelly glasses and her glass towel rods and whatnots out of the kitchen, that she rates having her picture in *QST*. We ought to adopt it as our Radio Mother. The picture shows a big husky traffic cop, holding high in the air his brawny arm, stopping all the big trucks, busses, cars and horses, while a little old lady crosses the street in safety. Under his big sheltering arm she looks very little. The title of the picture is the biggest thing about it. It is, "Somebody's Mother." Hard-boiled old beachcomber that I am, I have to swallow a couple of times every time I look at it and read the title.

It could easily be the little Radio Mother's picture, she who wrote to the paper. This Radio Mother writes something like this:

"In case any one wants to know what it means to be the mother of an A.R.R.L. member, I shall itemize. R.M. prepares the hot cereal for early morning breakfasts. R.M. provides the milk and cake for the late snack before bedtime. R.M. types reports, removes precious family pictures from their frames so the latter can be used for licenses and certificates. R.M. pays for the new lead-in wires, new antenna and other wires. R.M. answers the 'phone and the door bell. R.M. soothes the neighbors when signals get out of their proper channels and ruin broadcast reception. While not as important as the dry batteries, R.M. is a useful adjunct to the amateur station."

Just you bet your life she is a useful adjunct to every ham who ever lived. She's about the most useful adjunct any man ever has, though he live to be a million. And say! Pipe the way the mother spirit shines out in that little epic.

She says in another place: "If I had any lingering doubts about the wisdom of sacrificing old pictures for new licenses and permits, they were all swept away one wonderful Sunday morning when I came down to my kitchen to find a very much elated young man who exclaimed, 'I worked WFA!' At 11:30 he had picked up the signals of WFA. Followed hours of patient waiting while the operator in the Antarctic delivered messages and news to various parts of the country." Then a CQ from WFA, and the thrilling contact was made.

Listen here, you young squirts who have not yet been able to appreciate what Mother means, make a note of the way Mother came through with the picture frames. She was glad to do it. She's always glad to do anything for you. When you get spliced, make a note that the little wife will put up a scrap that will make a bob-cat and dog fight look like a disarmament conference, when you suggest that she can the old family stuff and let you have the frames for your licenses. You will only venture the suggestion once.

But Mother is different. When you filch her jelly glasses to make a rectifier she says, "Were jelly glasses, I ask you, ever put to better use?" Wife will not say that. She will snatch you baldheaded. A wife is a useful adjunct too, all right, but she's for putting the kids first and letting the old man shift for himself if it's a question between the two.

This Mother who wrote the article in the paper is some ham's mother all right, and here's hoping he appreciates her. Let him treat her kindly, for he will not always have her. When she is gone there never will be anybody to take her place. She tops everything in the station, boys. She's always in resonance, her wave is always pure, her note is the one and only perfect D.C., she never wobbulates the slightest fraction, she never fades and she never fails to answer your QSL card. Come on, lads, hats off and all up! Here's to the finest thing in the amateur radio station — MOTHER.

The Old Man.

An International 'Phone Dilemma

By The Alaskan

THE year of 1928 brought the first commercial use of radio telephones for communication between craft on the fishing grounds of Alaska. At that time they were in use on three cannery tenders and one floating cannery, all owned by one company, and operating in the vicinity of Kodiak Island where interference was negligible.

In the spring of 1929 several packing concerns became interested in radio telephony as a means of communicating between their boats and from the boats to the canneries. At the start of that year's fishing season there were about twelve boats and twelve shore stations equipped to operate on almost the same wavelength, and special permission was granted by the Radio Commission to operate these installations (boats only) without licensed operators. It fell to the lot of an engineer or the skipper of each of these boats to operate his ship's radio.

Let us turn back to a day in the latter part of July, 1929 — and see what might have happened.

Here is the Scandinavian skipper of the *Windward* calling another company boat, the *Joan W.*

"Hallo *Vindvard*, hallo *Vindvard!* Das is Veegan on *Yone Wubble-joo* calling you. Hallo *Vindvard*. Alright now, you hare me now coom back and Aye turn on for you."

Then the voice of John Jacobsen, engineer of the *Windward:*

"Halloo, halloo, halloo. Vun two tree foor, vun two tree foor. Halloo. Yah sure, Aye hare you, you bet. And Chris (skipper of the *Windward*) say he lak to know why in ——— you don't qvit loafing around and shake your legs. He say you haf been tree foor day yust laying ofer dare vaiting foor das fog to lift and ve trying to patch up das hare trap and not gatting novares qvick. Chris say he spose you vant him to come ofer dare and show you vay ofer hare. Vell, fog is lifting hare now and Aye can see half mile out from das Blake Rocks trap so no use why you can't come ofer hare now. Alright, good-bye, go ahead."

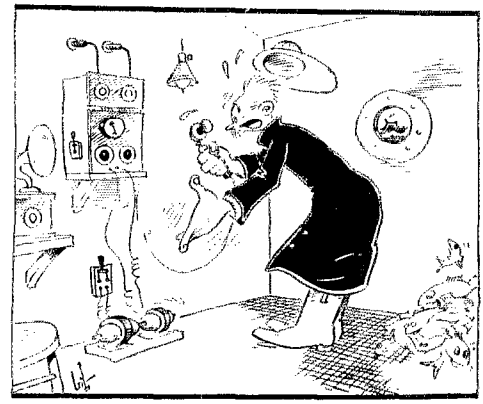
At which Wiggen gets duly excited and comes back like this:

"Yah, yah, for two tree day now all Aye hare is 'Chris say dis' and 'Chris say dat.' All das crazy faller Chris know how to do is call me on dis vireless yigger and say halp me do dis and halp me do dat. Yah. But he alvays get you to say it for him. Yah, Aye show him dat Aye can coom ofer dare and fix dose Cape Fox trap myself and Chris can go yoomp ofer board if Aye care. Ve be dare in two hour. Coom ahead."

"O K Veegan. Yah, Aye gat you. But ven da *Yone* coom das far in two hour you bet den Aye skal eat my hat. Aye will lissen foor you in two hour. Good-bye now, good-bye."

Wiggen answers him and OK's, but we can see they are too busy bawling each other out to make sure of the *Windward's* position. Blake Rocks is ten miles farther from the *Joan W.* than Cape Fox and Wiggen would steer a course direct for Cape Fox thinking the fog had risen there. And if it has not — well, let's wait two hours and see what happens. Let's jump the two hours; it's too long to wait.

"Hallo *Vindvard*. Hallo *Vindvard*. Hallo Yon. Veegan calling you from da *Yone Wubble-joo*. Ok you get me now? Go in."



All das crazy faller Chris know how to do is call me on dis vireless jigger . . .

"Yah, yah, sure Aye gat you. You yell so hard Aye don't need raddio sets for hare you. Vell, vot Aye tal you? You be hare in two hour you say. Vell Aye don't see you and Aye can see a mile out now. You tink *Yone* is flying machine you get here to qvick? Alright, good-bye, go ahead."

"Hallo, hallo. You sure am crasy. Ve can't be mile from Cape Fox right now and fog is tick as your brains. Ve can't see das bow of das hare boat now. You tal dat crasy Svede skipper to blow his vhistle so — Ouch! Pfs-s-st!" The *Joan's* carrier wave stops. Something wrong!

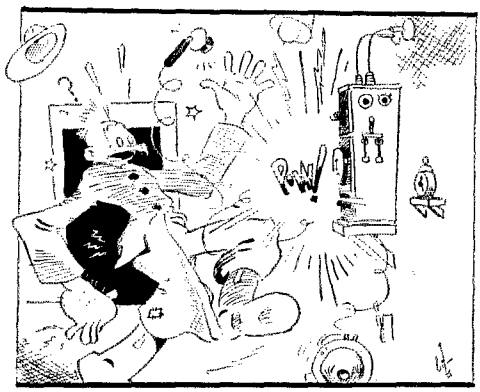
John, on the *Windward*, keeps calling but with no luck. Finally the *Joan* starts up again.

"Hallo, hallo Yon. Are you dare? You gat me? Coom ahead."

John seems excited now as he comes back.

"Yah, yah, yee hviz vy you don't answer me? You tink Aye stay hare all day to lis-ten for Skoovy skipper vot can't say his own name right? Aye try tal you ve not at Cape Fox. Ve at Blake Rocks. *Blake Rocks.* You gat me? Alvays you lie how fast you go. Aye thought you know ve at Blake Rocks. Alright, coom ahead."

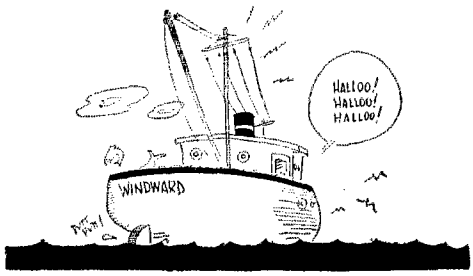
"Hallo Yohn. Yah, you smart faller and yentleman and das anodder lie. Yah, you can't say Blake Rocks so gude faller can understood it. Ve vas going along fine and you say no fog in a mile of you and Aye tink ve vay out in da clear and Aye leave her go fool speed. Den boomp,



Den boomp, boomp! We hit someting.

boomp. Ve hit someting. May hand he hit das hare little clock vot say 'miles-Aye-am-per' on dis vireless yigger and Aye catch a kick in my pants vot feels like Aye haf rumatics in my arm. Das hare vireless ting vit Yerman lights and crasy clocks and Irish telephone too much foolishness for me and Aye tooch das hare clock with das Mike's 'phone and it makes flash of fire and clock stops viggling so Aye shut down das fool ting vile Aye look around vot happened.

"And hare ve are half out of vater on da beach at Cape Fox light ven you say dare is no fog! So Aye am going to qvit das hare crasy boat



vit the vireless gear and Aye go back to Sveden vare no Norske liars tal you it is sun shine ven it is tick as pea soup and Aye vill not even lissen for you so coom up hare and pool us off das hare rock and bring das Chris vit you, by yee!" . . .

The "A" battery is dying out so let's turn our receiver off!

QST Adopts a System of Uniform Tube Designation

THE evolution of a system for uniformly designating tubes of the same type which are manufactured by a number of concerns has always been an editorial puzzler. The attempt to designate tubes by general type alone not only introduces editorial complications but also may sometimes result in ambiguity. However, the simple system we have adopted appears to escape most of the pitfalls, and those we have not seen in advance will be met as they occur.

The method in general is to use the last two figures of the manufacturers' type number preceded by the capitalized word "Type" and an apostrophe. If a letter follows the last two figures of the type number, it will be added with a hyphen intervening. Here are a few illustrations:

Radiotron UX-210 becomes Type '10. De-Forest Audion 422 is designated Type '22. Ever-eady-Raytheon ER-224 is generalized as Type '24. The Zetka Z-250 under this system is Type '50. Cunningham's C-300-A is now Type '00-A; and so on through the whole list of tube types which have the last two numerals of their type numbers in common.

There are a few tube types which have the last two figures of their type numbers identically alike, although the tubes differ widely in characteristics, and this pitfall must be avoided. Type '45 might refer to Arcturus' 145, a receiver power output tube — or the UV-845, RCA's 50-watt modulator tube! In such cases, therefore, the general type designation will indicate the more common receiving tube. The power tube will require further identifications.

In addition to this difficulty, there is yet another. All tubes of the same general type do not have identical characteristics. Many Type '10 tubes are designed and specified by their makers for use as audio tubes only, and are not intended for use as high-frequency oscillators. If an oscillator tube is designated in a *QST* article as Type '10, therefore, the designation is for only those Type '10 tubes which are specified as oscillators by their manufacturers.

Again, there may be instances of tubes of a certain make but of a general type — which have characteristics sufficiently different from other tubes of that general type to make them particularly applicable to a special purpose. If the Whatnot Tube Company produces a Type '10 which has an asbestos-wrapped filament and a fire-brick envelope, *QST* reserves the privilege of specifying the Whatnot 910 for oscillators to be operated at 56 mc. in blast furnaces.

— *J. J. L.*

A.R.R.L. Coöperates With the "Arctic Patrol" in Mid-winter Maneuvers

Work With Army Air Corps Successful

By F. E. Handy, *Communications Manager*

"Thank you and your organization for the splendid support you gave the First Pursuit Group Maneuvers in connection with short wave radio communication. I am perfectly amazed at the results produced by your enthusiastic and able members."
— F. Trubee Davison, Assistant Secretary of War, In Charge of Army Aviation.

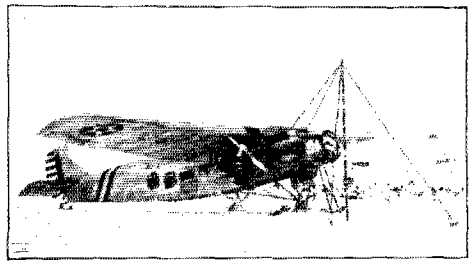
"In behalf of the fliers, I want to say we greatly appreciate the coöperation of the members of the A.R.R.L. Their aid greatly helped the progress of the flight." — Major Ralph Royce, Commanding, First Pursuit Group.

"The Air Corps is very grateful. Some of the amateurs did exceptional work. The Washington Radio Club is a live organization and a distinct credit to the A.R.R.L. The flight was long drawn out and called for an extension of effort beyond that previously contemplated. Let me express my sincere appreciation for your help and thank you, and through you, the headquarters station at Hartford which assisted in such a helpful manner." — Captain H. M. McClelland, Office of the Chief of the Air Corps.

"Thanks for your splendid coöperation. Hope we can try another test under the same conditions, 73." — Staff Sergeant K. D. Wilson, W3GT, operator AB6.

"With the little time to prepare, amateurs did well. W1MK was copied nightly and the news relayed to the officers of the Field who appreciated it, for telegrams were at times much slower. Six operators here always will be ready to coöperate with the A.R.R.L. in anything." — E. Walter Gray, WYE, Selfridge Field, Michigan.

EIGHTEEN pursuit 'planes and two army transports under the command of Major Royce took off from Selfridge Field, Michigan, on January 10th for a flight to Spokane, Washington, and return. All the 'planes were equipped with skiis instead of landing wheels, for this flight over the plains and through the mountains was undertaken in the very dead of winter as a test of the personnel and equipment under such special conditions. One of the cargo 'planes was furnished with high frequency radio apparatus to determine the practical utility of such equipment during long distance flights to remote sections. Arrangements for amateur coöperation were completed in late December and active amateur stations along the entire line of flight were chosen from our A.R.R.L. records and informed of preliminary flight communication plans by special bulletin. The flight of the First Pursuit Group is now a matter of history. The record is one of flights made in the face of blizzards and sleet marshalled by King Winter. It is a story of tussles with low temperatures, high winds, low visibility due to mountains and fog, of perseverance and victory in the daily task of starting twenty motors chilled by long exposure in the open. Temperatures reached 32 degrees below zero at Great Falls, Montana. A temperature of 20-below was not uncommon for Minot, North Dakota, and other points en route. There were no heated hangars or garages to help. The pursuit 'planes were faster than the heavily laden transports so that the special heaters carried for the motors, a complement of mechanics and also the radio 'plane and operator, were out-distanced. The Group, therefore, suffered from the lack of some aids to cold weather navigation and in consequence met with some unexpected difficulties. The fact remains that the First Pursuit Group surmounted all obstacles and gained ample experience in flying and handling 'planes under adverse conditions. The Group covered 3500 miles, making its objective, then returning to its base, Selfridge Field, arriving there on the evening of January 29. The personnel of the expedition numbered forty-three and there is little doubt that every one of these men looks back on the Spokane Flight as the experience of a lifetime.



THE FORD TRI-MOTOR TRANSPORT 'PLANE
The temporary antenna support as used in Minneapolis is shown. The antenna runs to lead-in under the floor.

Although several of the pilots were chilled or rendered *hors de combat* by frozen faces and frozen hands and feet, there were no serious accidents. Of course, there were a few broken axles and damaged skiis and wings but those must be expected in piloting a score of 'planes over a 3500-mile course with so many natural handicaps. One pilot was forced down fifty miles from the nearest telegraph line or railroad with a broken piston. One 'plane was damaged beyond repair near Beach, N. D., when the pilot crashed in a bliz-

zard. Fortunately, his injuries were not serious. Plumbers firepots, blow torches, live steam, hot oil and Prestone were used to aid in starting the 'planes at different times. But it is not the purpose of this article to repeat the detailed story of flight difficulties. Most amateurs are sufficiently familiar with the daily press stories which included all details.

The communication story will most interest amateurs, however. For three weeks (January 8 to 29), amateur stations all over the U. S. A. stood by to assist in the flight communications. There were three important aspects of the coöperation of the League with the Army fliers: (1) A route to and from the fliers over which reports, messages, orders or press dispatches might be handled by amateur stations must be established and maintained to function as speedily and accurately as possible — and at least once daily. (2) Daily press messages were to be filed by Major Royce, relayed to a message center at Hartford or Detroit and Washington, there to be addressed to newspapers in every city, town and hamlet; sent by stations at the message centers, to be picked up and copied by amateurs all over the country and delivered to local newspapers with the Army Air Corps request for publication. (3) Daylight coöperation of amateur operators was desired in monitoring the frequency of the fliers continuously to intercept possible distress signals, reports of grounded 'planes, needed supplies or other dispatches relating to the safety or welfare of the Group during flying hours (8 a.m. to 4 p.m.).

It was realized, due to the nature of amateur radio work, that but a limited number of amateurs along the line of flight could help by manning stations or listening posts in the daytime. Affiliated club stations manned by several operators were able to arrange continuous watches to help in a number of cases and are to be commended on their efforts. The General Electric Company kept watch the first few minutes of every hour for daylight emergency communications. Selected stations of the Army Signal Corps Net were also on the job (during daylight hours) to supplement the amateur work and insure the safety of the fliers. These stations were relatively remote from the line of flight as compared to some of the amateur stations, however. It is necessary to state at this point that since the 'plane carrying the high frequency equipment was seriously delayed, the plans for this third aspect of the coöperation were of little practical value after the first day, since the transport carrying the radio operator was unable to follow the pursuit planes closely enough to communicate intelligently regarding their movements. Nevertheless, much was learned that should prove of value in planning such communications contact for the future.

The itinerary of the flight is indicated by the map which accompanies this report, the northern route being followed on the trip west to Spokane and the southern route taken for the return trip. The expedition originally planned to take off January 8th, but was delayed two days by an unexpected sleet storm which coated the planes with tons of ice and made departure inadvisable. Four days were allowed for each half of the trip, but conditions made a change from the original time schedule necessary.

ADVANCE PLANS

Following a request for coöperation, a conference was arranged for two days before Christmas. H. J. Adamson, representing the Air Corps, discussed the proposed flight of the First Pursuit Group with the writer. Details concerning the high frequency equipment to be taken on the flight were unknown at the time. Nevertheless a tentative agreement was reached. After the holiday, more definite plans were formulated and rushed into final form. The time was short. The "Spokane" route was laid out after some research to determine the reliable and active reporting stations from our A.R.R.L. records. A skeleton route consisted of the reliable stations located at points where the Group would pause at noonday or rest at nightfall. Intermediate stations near to the line of flight in addition to those on the main route also received special advance bulletins and were asked to help. But there was little or no time for preliminary tests. A number of messages was sent out with a view to perfecting and testing the line-up at the same time. Each station in the chain was asked to make schedules with the points east and west next removed with which reliable contact could be effected as well as to prepare for work with the message centers.

Next in importance to our route were the plans for transmission and delivery of the press dispatches expected daily from the fliers. Two-way work between amateurs and the radio-transport 'plane was contemplated throughout the flight. Press dispatches relayed to Washington and Hartford must be retransmitted to amateurs all over the U. S. A., copied and delivered locally in every community. Arrangements were next completed for transmission of dispatches to the papers from Washington, Detroit and Hartford stations three times nightly (10:00 p.m., midnight and 1:00 a.m. E.S.T.) during the flight on 7150 and 3575 kc. C. J. Walter, W3AWM, Secretary of the Washington Radio Club coördinated the work of all the Washington, D. C., stations in the flight coöperation in addition to work from his own station. Section Manager Wise, W8CEP, handled necessary organization arrangements on the Detroit end. W1MK operation was arranged to take care of the official and press broadcasts nightly except Wednesday, these transmissions to be sent simultaneously on the two frequencies mentioned by use of two separate transmitters.

On Wednesday nights W3ASO, W3BWT, W8CEP and W8DMS arranged to fill the gap and transmit on 3575 kc. W3LA, W3GT (W3LX and W3CDQ operating) and W8DMS would send the dispatches on 7150 kc. Later, at the request of Section Manager Quement, the dispatches were sent on the 14-mc. band from W3AI, W5QL and W1SZ for the benefit of west coast amateurs.

At least six weeks' time must be allowed for preparation, publication and distribution of information through *QST*, so that course of making plans known was out of the question. However, the existing A.R.R.L. field organization with 1500 active and reliable Official Relay Stations well distributed nationally, always ready for an important and worthwhile job regardless of difficulties involved, could be notified of the flight communications arrangements. There was barely time for mail notices to be duplicated to all after the message centers had been lined up. Club and C.D. officials in each locality coördinated the work of local amateurs to prevent unnecessary duplication of effort. Informal meetings and telephone conferences were held to the end that we might offer the Air Corps the most effective performance possible in the second and third aspects of our coöperation. Thus in the short space of two weeks' time arrangements were established for handling dispatches two ways with the First Pursuit Group through its telegraph plane or by way of amateur stations en route, for taking press dispatches for relay eastward, for the retransmission of these dispatches to all stations and papers on definite schedules so they might be delivered in all cities, for watches during flight to intercept emergency traffic. At all times before and between the schedules for transmissions to all amateurs, the stations at the message centers and along the flight route were held in readiness for the relaying of flight traffic. To avoid delays, arrangements were made for the telegraph 'plane to broadcast its dispatches and for the message centers to broadcast traffic at definite times if and when two way contact could not be established quickly.

W1MK's operating hours are between 7 p.m. and 3 a.m. usually. Additional afternoon operation was arranged to further the purposes of the flight. In addition to regular watches kept by RP, extra shifts were taken care of by EV and FH. Hourly stand-by schedules were arranged with Washington stations to facilitate the ready exchange of information and necessary transfers of messages for the First Pursuit Group without delays. In order to devote full time to the flight work, it was necessary for W1MK to cancel all regular traffic schedules temporarily.

While these arrangements were in the making, Staff Sergeant K. D. Wilson of Bolling Field (W3GT) was sent to Dayton, Ohio, to complete the installation of the radio equipment on the transport 'plane and make preliminary tests during the flight to Selfridge Field to join the First Pursuit Group. The telegraph 'plane was assigned the call signal AB6. An oscillator-amplifier transmitter using Type '10 tubes and capable of working on either 9370 kc. (32 meters) or 5552 kc. (54 meters) was installed. Wilson was able to receive amateurs through a high noise level only

STAFF SERGEANT K. D. WILSON, AB6, (W3GT)

in the 7000-kc. band. A 400-volt plate supply was available. Storage cells charged while the 'plane was in flight were the prime source of power. These were good for about three hours when fully charged. Different antennas were tried out and 5552 kc. chosen as the best all around working frequency. But as we shall see, the best of preliminary arrangements must be modified by circumstances. The excellent and thoroughly tested initial installation, with such an experienced amateur as Wilson at the key, insured the success of the radio operation. But the fact that the Ford transport on which the installation was made could not keep up with the faster pursuit 'planes and that it became further delayed when a forced landing was made in deep snow under unfavorable circumstances necessarily isolated AB6 and made the telegraph 'plane useless during the latter part of the flight insofar as communication with the main body of the First Pursuit Group was concerned. Nevertheless, excellent communication was established and maintained with amateur operators by Wilson operating AB6. But this part of the story is appropriately told by the man behind the station.

AB6

By Staff Sergeant K. D. Wilson, *Operator*

IT takes a sense of humor to write the flight of the First Pursuit Group along the Canadian border during January in sub-zero weather while down in the southwest corner of Mexico (Tapachula) with the temperature close to 100 waiting for repair parts for our plane. (Wilson flew with AB6 from Miami, Florida to Colon,

Panama, February 20 non-stop in 11 hours 20 minutes.)

Arriving at Dayton December 28, a m.o.p.a. transmitter and a receiver were installed on a tri-motored Ford transport. A maximum of 1.2 amperes in the antenna on both 32 and 54 meters was obtained while in flight but only .5 or .6 ampere while on the ground. The antenna used on the ground was the same as the one used in flight except that it was held up by an 18-foot jointed pole. This could be adjusted to work on the first or third harmonic, the adjustment for resonance being obtained by winding or unwinding the antenna reel. W8DBK, W8DSN and W8QU were active Dayton hams. On January 4 on the trip to Selfridge Field, contact was established with WAR (Washington), WVS (Ft. Benj. Harrison, Ind.) and WVT (Chicago) on 54 meters and maintained until the arrival at Detroit.

The first ground test for the benefit of amateurs was made at 7 p.m. January 6. Exactly at 7:15 p.m., our old friend W3LA (Washington) answered my CQ. Contact both ways was perfect. At the same time January 8, W3LA and AB6 exchanged three messages and quickly after hooked W9DRR, W9CVG, WVZ (Columbus), W4HK and W9COS in turn, receiving one message from the last named station. All signals had a wallop that night.

On January 9 messages were again exchanged during the contact with W3LA, reception and transmission conditions being perfect in spite of very heavy snow. W9COS, WVZ, W2BAE, W1WV and W1MK were contacted in the hour that followed. All signals were very steady. Later this same night the shielding on the ignition wires of the center motor caught fire and was destroyed making reception during flight impossible except for extremely loud signals. That night also the transport started to sink through the ice and several hours' work was required to get it to land.

On the morning of January 10 the First Pursuit Group took off and although delayed, we started for St. Ignace, 200 miles to the north, at 2:10 p.m., hoping to catch up with the Group which was ahead of us. We flew at a height of about 1000 feet, averaging 110 miles per hour. The position was broadcast at Vassar, Bay City, Campbell, and Mackinaw City, Michigan. We landed at St. Ignace at 4:55 p.m. W3LA was unable to copy AB6 due to a high noise level. W9DXP was contacted. A message was sent via WVZ. W9COS was worked. A message was sent W9FZM. Two were received from W1MK with difficulty. All signals were fading very badly.

The Group had made Duluth the previous night. We left early next morning with that as our destination and right away our troubles started in earnest. At 9:30 a.m., we passed Patterson, Michigan, reporting our position. At 9:45 we ran into a heavy snowstorm at Manistique and were forced to land. I set up an antenna, tested, and at 11:55 a.m. established communication with W9EHI at Duluth. From him I received the weather report and three messages from Washington. A number of messages were sent, and let me say that his wonderful cooperation was appreciated. At 1:35 p.m. he gave us a favorable weather report and we took off immediately. We ran into fog and snow over Amasa, Michigan, and were forced down a second time at 4:20 p.m., landing in a small field. At 4:23 p.m. I hooked Laurium, Michigan. W9EGF sent a message which was relayed to Washington via W8CNR and received one originating at Spokane (W7ACH, via W7AIZ). At 4:33 p.m. I worked W9AXE (Marquette) who had schedules with Duluth amateurs, giving him our location and handling traffic. That night I found we were in one of those famous dead spots in the iron ore country or perhaps partly due to the heavy snow. All signals were weak and swinging and I was hardly able to work W1MK. WVZ was only strength one.

January 12 to 15 a blizzard raged, roads being impassable. I walked three miles on the night of the 12th to the 'plane, communicating with W9EHI at Duluth, but signals died down rapidly due to the fact that the battery had frozen. Anyone who has never started an air-cooled motor at twenty below zero will be unable to realize what we went through on January fifteenth and sixteenth. Finally we got away from Amasa at 2:30 p.m. on the 16th, arriving at Wausau, Wisconsin at 3:35 p.m. That evening at 7:30 p.m., W8QU (Dayton, Ohio) came through very weakly. This was followed by a contact with W2AOF. It was 31 below, endangering the operators' ears and hands so after copying some traffic "QST" from Hartford, W1MK, AB6 signed off. Next morning (January 17) W9DRR at Marquette and later W9GKR of the same city, contacted AB6 and learned of our plans to take off for Minneapolis. W1MK was contacted at 8:22 p.m. However, we lost one of the motors due to the oil lines freezing and so were forced to remain in Wausau for some time. Little radio work was done until January 25, due to the uselessness of the batteries that had been frozen. The storage cells were fully charged but lasted only about an hour on test.

On January 25 the batteries were installed again at AB6, and at the usual time (8:30 p.m.) I raised W1MK sending three messages. Later W8WO at Detroit was contacted. At last, on January 26, we got under way for Minneapolis, getting hold of W9EFK and W9BVH that evening. Two or three flying hours had enabled me to charge the battery partially and the charging was continued while the center motor was being overhauled. Our plan was to proceed west along the "return route" to rejoin Major Royce and the Group as early as possible but instructions

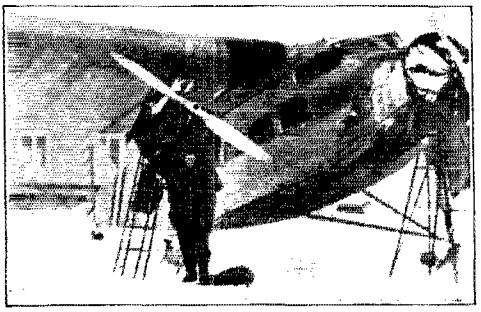
were received to await the arrival of the Group at Minneapolis. On the 27th W2XAC exchanged messages with AB6 and later the same night W9DRR, WVZ and W9BVH were worked. The spirit and hospitality of the Twin City hams was wonderful and I visited quite a number of the local stations. At the key of W9BVH's home I worked W9COS, W9AIR and a number of other old friends. Later, back at AB6, W9AIR was worked again, QST's sent and messages cleared.

As soon as we joined the entire Group at noon on January 28, we left for Wausau. On arrival I worked W9GKR (Marquette), giving him the time of arrival of the twenty planes. We went to the banquet that night, so AB6 was quiet. The following day we left for Detroit via Bay City, sending position reports at intervals. After the battery failed, no more work was done. The transport arrived back at Selfridge Field January 30, thus completing a thrilling flight. I am sorry that we were not able to stay with the Group all the way to Spokane. I will say that we were more than pleased with the response and the coöperation of the amateurs in spite of our limited operating conditions due to power supply, isolation from the Group and intense cold. Stations in every district in the U. S. A. and Canada were copied but no log kept of this. Here is the list of stations worked from AB6 during the flight in the order of the amount of traffic handled by each:

W9EHI	W9BVH	W9FZM	W8WO	W4HK
W1MK	W9COS	W9AXE	W9EFK	W9DYS
W3LA	W9EGF	W8QU	W9AIR	W2BAE W9DXP
W2XAC	W9DRR	W2AOF	W9GKR	W1WV

Of course there are many additional reports of different ways in which amateurs helped in the relaying of messages from AB6 or other coöperation with the fliers which cannot be indicated in the log of the telegraph 'plane. The excellent advance coöperation in transmitting advance weather reports from W9FZM (St. Ignace) to WYE (Selfridge Field) was extremely helpful, for example. W9BN, W9BCM, W9DFG and many others broadcast position reports and information at different times. Reports broadcast and messages sent to Hartford and Washington from W8SB (Bay City), W9FHU (Wausau), and W9DYS (Ishpeming) enabled all coöperating amateurs* to tell promptly when the 'plane passed over Bay City, when it arrived at Wausau and the like. W9EQV, Dollar Bay, as well as others, broadcast Duluth flying weather and other reports at the start. W9CSI, while under doctors' orders, delivered a great deal of traffic relayed from W1MK while the telegraph 'plane, was in trouble at Amasa, keeping schedules and relaying by telephone while AB6 was off the air, until forced to discontinue his work by influenza. W9BHH, W9AIR, W9CE, W9DYS, W9EHI, W1CGR, W1MK, W9BCM, W9EHX, W9FBJ, W9EBO, W9EJQ, W9CTW, W9DXZ, W8EY, W8CRT, W9EGU, W9COS, W4FT, W9DRR, W9EBO, W9GGA, W9DGS and others unrecorded helped in relaying and delivering AB6 traffic. Hundreds of amateurs were logged calling AB6 whenever the 'plane went on the air. Of course it was impossible to contact all. Amateurs both near and far from the line of flight listened direct to the progress reports. All reported AB6 very steady. The frequency remained fixed from day to day; 54 meters was used for all work. The note was reported as "near d.c." by W1AD (Bellows Falls, Vt.) and others who sent reports to Headquarters after the flight.

During the final stage of the flight when the telegraph 'plane was over Lake Michigan, W9AIR, Sleepy Eye, Minn., intercepted the position reports sent when passing Beaver Island and other points hourly during the trip, retransmitting the information to all amateurs and the message centers.



A CLOSE-UP VIEW OF TRANSPORT 'PLANE AND OPERATOR

An idea of 'plane size may be had by comparison with the individual (Opr. Wilson). This photo was taken in Minneapolis.

AMATEUR CONTACT WITH THE MAIN GROUP

As we have seen, the telegraph 'plane was quickly left behind and was not available for handling Major Royce's communications from day to day. It was necessary for him to adopt the next alternative, to avail himself of the services volunteered by amateurs all along the prearranged route for filing press dispatches, messages and reports.

On the first day of the flight the main Group reached Duluth. Lounsberry of W9EHI, W9DOQ, W9GKO and others were very much on the job.

* In an undertaking of this size it is impossible to credit all the coöperation given in the several phases of service rendered. Bulky logs, yards of newspaper clippings, reports on AB6 including comment on the arranging of continuous watches, special messages relayed here and there in connection with the flight and the like, have been received from many sources. Many reports are missing either due to negligence or because some amateurs are modest to a fault or thought that what they enjoyed doing was of little moment. We have tried to classify all. If there are mistakes or omissions we can only ask your patience and consideration of these things.

But an unexpected difficulty turned up here. In the short time for making arrangements in advance of the flight, one detail had been neglected. Without credentials, it was practically impossible to get in touch with any of the fliers, least of all the Commanding Officer of the Group, due to the great public interest. W1MK had previously contacted W9EHI and was eagerly calling for messages and dispatches. Hours sped by. W9EHI was unheard. The operator was still trying to "crash the banquet" to get the essential information to keep the wheels turning. Finally at a late hour, W9EFK (Minneapolis) was worked. He 'phoned Major Royce at the banquet, and was successful in getting the first dispatch which was promptly transmitted to Washington and Hartford. W9EHI scheduled W9BPM and received useful advance weather reports for the Group.

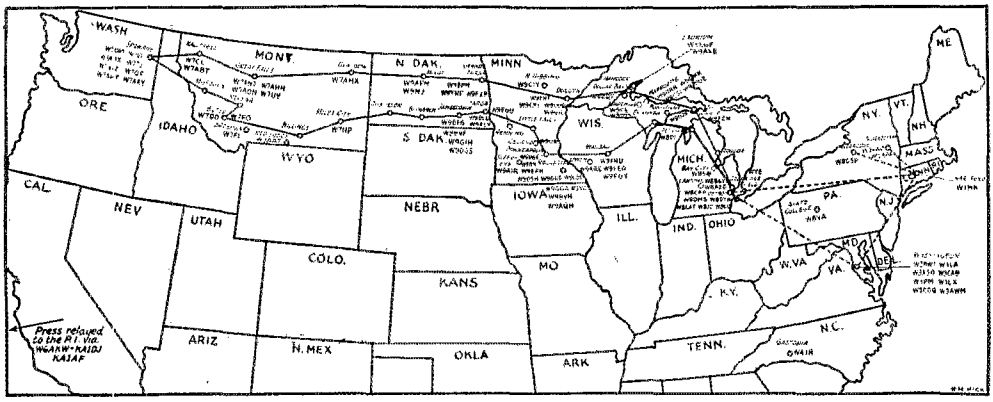
The flight moved westward rapidly. Due to the length of the dispatches, it was necessary to have reliable contacts and also to move the messages over as great distances as possible to save time spent in unnecessary relaying. It became necessary almost at once to look for reliable "halfway" stations to work directly with the eastern message centers. The greatest credit is due to stations W9DFG (Wellesley Beeman, Jamestown, N. D.) and W9BPM (University of North Dakota, Grand Forks, N. D.) operated chiefly by E. A. Garard. Night after night these two stations stood by in readiness to relay the press and traffic. Without this aid, the advance plans for dissemination of the press dispatches would have failed on a number of occasions and all amateurs standing-by for the broadcasts would have been "let down." When the Group arrived at Grand Forks, Bob Moore, W9FHP, went to the airport, got traffic and passed it to Barker, W9EGU, before the 'planes left at noon. Later in the afternoon, a second message was filed and passed promptly to W9AQH at Minneapolis. On the second night of the flight, when Major Royce reached Minot, N. D., it was W9DFG who got in touch with the Commanding Officer and transmitted the press eastward. This station helped by keeping the East informed of news received through the local press, also handling eighteen separate press dispatches at different times during the flight. The third night (January 12) the Group was somewhat delayed. The long official dispatch from Major Royce came in from W9AFM (Minot, N. D.) through Garard, W9BPM, on this night, a fine bit of operating. W9FZP and W9FHP assisted in the general work at W9BPM. The record shows a message from the Group via W8YA, and W1MK to WYE at Selfridge. On the fourth night, W9BPM had the official dispatch again. Incidental coöperation was received from W9GIH. January 14, W9GKR, W9BPM and W9EHI were all helping but no official dispatch was received. The next day was Wednesday. W8DMS and W8BGY were on the job and the broadcasts went out from Washington and Detroit on schedule. The Group had a hectic day with 32-below-zero weather at Great Falls. The press came through very late on January 16 via W7AAT and W9BVF. W7FO, M. R. Cooper and L. G. Davies, (W7JX) of the Butte Radio Club, kept a continuous 24-hour watch from the beginning of the flight until January 24 and was instrumental in the handling of our next dispatch. The weather bulletins supplied from W7FO were much appreciated. First official news of the arrival at Spokane was received from W7AFO of that city with the incidental coöperation of W7AAT, W7DD, W7FO and via W9DFG-W9BPM. The following dispatch from Spokane was copied in part from W7AHO by W4JR and also by W9BPM. W1MK got the fragmentary report from both and was able to weld it into one complete report in time for the scheduled transmissions. The dispatch of January 20 came in from W7AHT, Spokane, via W9CND and W2AWU but this was delayed by the stations handling and was received too late to be useful. Unofficial press reported by stations along the "Spokane Route" was used in compiling information to fill the gap. Dozens of stations stood by to help in calling Spokane and the real reasons for omissions or delays on a few reports from the far end of the route are not yet known.

The first long and official report to come through on the return flight was sent "QST" from Miles City, W7HP, on January 23 and copied direct at W1MK without prearrangement. The two following days W9DFG got it in. Major Royce heard that the Ford transport and telegraph 'plane was en route to meet him and word was passed along via W9DFG and W1MK to inform the officer in charge of this 'plane to remain at Minneapolis. Just as soon as the Group arrived at Fargo, N. D., the information was broadcast from W9DEL and this also was copied at W1MK. Later W9DEL was contacted and the official dispatch received. W9DGE transmitted the report from Minneapolis. Information of the arrival at Wausau was received via W9BVH, W9GKR, W9CTW and W9DGE. The honor of handling the last and final press fell to W8AZD at Detroit on the arrival there January 29.

WORK AT THE MESSAGE CENTERS

In general the stations lined up for special work at Washington, Detroit, and Hartford functioned just as planned in advance. Captain McClelland and Lieut. Ennis of the Army Air Corps "sat in" at different amateur stations in Washington and followed the story of communication with and progress of the flight at first hand. An hourly schedule with different Washington stations was arranged by W1MK for the exchange of information with the Headquarters of the Air Corps, to facilitate prompt transmission of mes-

sages, etc. W3PM, W3LA, W3ASO (operated also by W3CDQ and W3LX), W3CAB and W3BWT took turns in holding down the Washington end between 4 p.m. and 2 a.m. daily. All deserve the greatest credit for being on the job storms. The flight work was put over by personal sacrifice, a substitute being obtained to teach in Stephenson's place nights during the flight. Before Wilson took off, a group of the Detroit men visited him at Selfridge.



THIS MAP SHOWS THE ROUTE TAKEN BY THE ARMY PATROL AND STATIONS WHICH COÖPERATED
The northern route was followed going westward and the southern route shows the return flight

and sticking to the schedules through thick and thin. W3LA was most successful of all the Washington stations in contacting AB6, moving traffic easily — more credit to his two paralleled 210's and crystal d.c.

The chief difficulty in keeping Washington schedules resulted from the fact that W1MK was heavily overloaded at certain hours so that certain schedules could not function. The A.R.R.L. station had to bend every effort toward reception of press dispatches for the nightly transmissions.

The official and special broadcasts required precedence over everything else since all participating League members were concerned. Daily afternoon schedules were kept with Schenectady. W2AOF, W2XAC and W8DSP also were worked for exchange of information with Schenectady. In general, contact with Washington, Detroit and Schenectady was satisfactory. The 3575-kc. transmitter proved most useful for late evening work after the fade-out on the higher frequency. Another transmitter and operator functioning simultaneously with the regular equipment at W1MK would have considerably facilitated the exchange of information during the hours of peak traffic load at this station.

In Detroit, W8DMS, W8CEP, W8DYH and W8AZD kept things moving, likewise. S.C.M. Wise organized the local stations and in addition undertook to send the scheduled press messages on 3604 kc. Wednesdays. Stephenson, W8DMS, devoted much time to daily broadcasting of flight reports and in Hartford, we copied Wednesday night press from this station which was also widely reported from other sections. Some trouble was experienced with antenna failures in heavy sleet

RECEPTION OF DISPATCHES

Now just a word about the success of the scheduled transmissions from the message centers. These were widely copied. Many amateurs off the line of flight depended on getting the latest information from W1MK or the other stations engaged in sending the addressed news. All the messages carried a preamble requesting that they be retransmitted by stations copying them. W9DQN, W9CTW, W8CEO, W9APY, W4WE and many other amateurs unrecorded assisted in the general program in this manner.

QRM made copy "spotty" on 7150 kc. and off-frequency amateur 'phones sometimes broke it up on 3575 kc. When possible at W1MK, dispatches were repeated between scheduled transmissions to enable amateurs to make "fills" where necessary in their copy. On the longer broadcasts, it was necessary for listeners to wait for a later transmission schedule if something was missed. Time did not permit all to be repeated. In some cases rebroadcasting by member-stations was still in progress at 4 and 5 a.m. and it is unfortunate that reports are not complete so that we may inform loyal operators of the good work they accomplish in this way. According to reports, most dependence was placed in reception direct from W1MK, even on the west coast. The utility of the 14-mc. broadcasts arranged at the request of west coast amateurs is unknown.

A number of amateurs was discouraged by the lack of interest of hard boiled newspaper men in the addressed dispatches and in the flight. Of course, wire services covered the activities of the Group from all large cities en route. The telegraph 'plane was down at Amasa so we had no

"exclusive news" from remote points. In one eastern city, papers used little of the material their own wire services had to offer. A major emergency might have altered this attitude quickly but we are thankful that it did not happen. In consideration of unanticipated handicaps, wonderful results were obtained in a large number of cities. The clippings turned in from all sources make a stack several inches high after press association and War Department releases are discarded and if laid end to end — but we haven't time to try that. Anyway, the Spokane flight reports make a mighty impressive exhibit!

No doubt there are operators who were discouraged by meeting with difficulty in getting the first "copy" printed. Some successful operators forgot to report or sending in clippings too because they thought the degree of success too small to mention. Modesty or a desire to keep the clippings can be blamed. Many sections where we feel sure good work was done were not heard from. We wish it were possible to make a correct estimate of the amount of work it was impossible to credit in our tabulation. Thanks are due every amateur who followed instructions in copying and delivering dispatches and in thus helping the

PRESS REPORTS (BY DISTRICTS)

Station	*Paper*	*Column Inches*	*Remarks*
W1AQL	Bangor Daily News	12	See Note B.
W1CTI	Norwalk Hour	6½	
W1MK	Hartford Courant	78½	Morning paper.
	Hartford Times	29	Evening paper.
W1WV	Boston Post	9	See Note A. It is also of note that little press ass'n material on the flight was used in Boston papers.
W2AA	Merrick (N. Y.) Courier	2	Garbled by paper. Also see Note A.
W2ATT, W2AYM	Brooklyn (N. Y.) Daily Eagle		Three delivered. None used.
W2BGO	Bronx Home News	12	QST copied from 8 to 4:10 a.m.
W3CAB, W3BWT	Washington Herald	7¼	
W3ASO, W3LX, W3CDQ	Washington Morning Post	22	With station photograph.
W4HK, W4FX, W4SP	Knoxville New Sentinel	80	Fine, well organized work here. FB.
W6AAZ	San Jose California	60	All copied from W1MK 7150 kc. See Note B.
W6AKW	Lancaster Ledger-Gazette	28	Weekly paper. W8DMS worked Jan. 8th; W8CU Jan. 9th—16 dispatches copied direct from W1MK, one from W9DEL, two from W8DMS. Four relayed to KA1AF. Eight to KA1DJ!!!!! Splendid work.
W6BZU	Concord Beacon	24	All press direct from W1MK through QRM.
	Martinez Daily Standard	7	
W6EDK	Oakland Post-Enquirer	20	
W7FO	Butte Montana	20½	
W7HP	Miles City Montana	1½	No final report from W7HP.
W8AMA (Wagner)	Erie Dispatch Herald	20	Erie Amateur Radio Club Secretary. No daily reports copied.
W8AWO	Scranton Republican	8	See Note A.
	The Scrantonian		
W8CEO	Pittsburgh Sun Telegraph	29	Full daily reports supplied.
(McAuly)	Pittsburgh Press	19	See Note B.
W8DBK	Dayton Daily News	12	
W8DME	The Auburn Citizen	36	See Note A. Papers busy with local sensations.
W8DMS	Detroit Free Press	..	Delivered each evening and used in early edition.
W8OA	Niagara Falls Gazette	68	Good coöperation.
W8SB	The Daily Mining Journal	10	
W9ACU	Illinois State Register (Springfield)	60	Also relayed to W9QI.
W9AXE	The Laurium "News"	4	Editor refused to use press.
W9BN, W9DSH, W9EFK, W9BVH, W9DGE	Minneapolis Journal	25	See Note A. Every paper was 'phoned daily and given press by at least one Twin City station.
W9BPM	Grand Forks, N. D.	75	
W9CE	The Daily Mining Journal (Marquette)	20	
W9DEL, W9FWO, W9DIC	Fargo, N. D.	9	Drew, Payne, Newton and Hetland of WDAY also coöperating in flight.
W9FHP, W9FZP	Grand Forks, N. D.	25	
W9FLG, W9DEB	The Topeka Daily	30	Reported by Sec'y Tiffany, Kaw Valley Radio Club.
Hathaway	Chicago Daily News	15	Reported by W9PA.
W9QI	Daily Illinois Star (Beardstown)	60	
KA1AF	The Manila Daily Bulletin	30	Relayed from W6AKW.
KA1DJ	The Manila Daily Bulletin	40	Relayed from W6AKW.

NOTE A. — Delivered to three other papers that gave no coöperation.

NOTE B. — Delivered every night but the paper gave preference to wire services and did not use it every time.

Air Corps and the cause of amateur radio. Those who met with difficulties deserve all the more credit for their efforts to surmount difficulties. As you may judge from the comments of the officers of the Air Corps which have been placed at the beginning of this article, the results were considered well worth while by those for whom our effort was made. The public recognition accorded our work has an importance that cannot be discounted, too.

As proof of the fact that many stations were delinquent in reporting, let us point to the fact that few of the coöperating stations on the western end of the route came through with even a postal reporting the part played by their stations. The facts regarding such participation are missing from this report except in cases where we have been able to dig them out of the logs of some of the fellows in the central part of the country. Routine communications department reports show some additional information. W9EVE, W1RV and W1NI handled a 365-word flight message from Spokane, W7AHT. W8HK handled press from the Army fliers. W9EAT was offered evening press when he worked W7ANT, Great Falls, on 3500-kc. 'phone, but since he couldn't relay it, W7ANT passed it to W9DXO, Bancroft, Iowa. W9EVE and W9ERM handled Army traffic from W9AIR. Viers, W7AAT, worked W6BET, lining up a route from Red Lodge, Montana, to Spokane. W7NY was in touch with W7ABO and W7HP trying to get press for W9DFG.

W9AH, Duluth, gave lots of the press dispatches to the local papers. W8LI, Akron, copied the news from Headquarters and got his name in the paper every night. W7AAW, Bonner, Montana, handled Army flight traffic. W1BD copied press and delivered it to the papers. W9FFD and W5QL were on the job copying and rebroadcasting the dispatches. W5RH-W5BBF copied all the W1MK broadcasts on the flight for the papers. W7ACS, Tacoma, Washington, did his part, copying W1MK through fierce QRM. These among other similar reports make us sure that the coöperation was much more widespread and effective than indicated exclusively by specific reports.

Organized activity was particularly evident over the eastern half of the "Spokane route." Many schedules were arranged by radio to meet the requirements of the First Pursuit Group as it progressed from day to day. At many points amateurs (W9FZM, W9DFG, W7HP, etc.) obtained the necessary permission from the Radio Division to move stations to local airports to better coöperate in receiving weather reports and establishing communication with the outside on arrival of the First Pursuit Group.

Minneapolis amateurs were very active, as well as those we have mentioned in Wisconsin and Michigan. W9EFK and W9EFJ were on watch all but three days of the flight. Brooke of W9DSH had things well lined up for continuous watches from W9BN and W9DGE as well as his own station when the telegraph plane was in flight. Good contact maintained with WYE, Selfridge, and W9EHI, Duluth. Gerlich of W9BN has a log of which any station might be proud, seven operators coöperating in the communica-

Photo Courtesy "Detroit Times" via W8DMS

SGT. K. D. WILSON AT CONTROLS OF AB6

This photo shows the operating room aboard the transport 'plane.

The oscillator-amplifier transmitter is shown above the receiver.

tion work, and results of value were obtained. Adams, Soules, Gerlich, Leach, Cottam, Mears and Smith operate W9BN. W9BVH did most excellent flight work and was in touch with W9EGU. W9XI, W9EYL, W9BHB, W9CCX, W9CIY and W9GGA all took an active part. Wilson visited W9BVH, W9EFK and W9BN while at Minneapolis.

North Dakota stations kept schedules with the East consistently and bore the burden of attempting to get the press from those "wide open spaces" in Montana. Much of the great success of the flight work must be credited to the efforts of W9DFG, W9BPM, W9AFM and W9DEL. The operators at Grand Forks coördinated their efforts so that as complete a watch as possible was maintained. E. A. Garard worked W9BPM keeping schedules with W9EHI for all the latest reports from Duluth. Bob Moore operated W9FHP keeping daily schedules with W9DGS at Jamestown for the whole period of the flight. Bob Dettman did his part at W9FZP. Davy of W9AFM handled nine messages from the Group not including the press. These were all passed east through the schedules with W9BPM. W9AFM deserves a lot of credit for the work of this station was carried on while the operator was confined to his bed with mumps. Newspapers and local offi-

cials at Minot received first information on departure of the Group from Grand Forks through W9AFM and W9BPM.

The James River Radio Club arranged Jamestown coöperation so that there was at least one station on the air at all times. W9BVF contacted Spokane direct and got the press on the night when the first three fliers arrived there. W9DFG gave an excellent account of himself as already shown. He got details of the accident at Beach and reasons for the flight being forced down there on the return trip. W9DGS spent hours watching progress and sending broadcasts whenever late information came in. At Fargo a meeting of the Radio Club was held at the State College and arranged a schedule of shifts for a sixteen-hour watch. Payne (W9DEL), Smithson and Drew (W9DIC), Olson (W9FWO), Hetland and Newton (W9DAY–W9ALY) and Hall, Schulz and Sweet of the club were on duty, copying AB6, keeping the papers informed, handling press and traffic. Smithson, W9DIC, took his vacation at this time so he could be on duty all day. The well organized work proved very effective and Headquarters is grateful for the part played by each operator as well as for the very full reports.

In Montana W7FO was the outstandingly active station, operating continuously for 21 days, relaying much traffic and obtaining the coöperation of the Montana Power Company and the Electric and Radio Company for the flight work. For some reason, the Montana stations did not seem to connect on schedule with points east and west. While individual work was attempted by some of the stations shown on our route map, the only detailed report was received from W7FO.

At Spokane W7ABX, W7TJ, W7QF, W7AIZ and W7VL were informed and ready to coöperate. W7AAY reported in to the message centers promptly when he thought the fliers had arrived. Official dispatches at Spokane were started from W7AHO and W7AHT.

But little remains to be told. The experiences of those who took part were most valuable. Much was learned of value to the Air Corps and to the A.R.R.L. in this coöperation. In general, amateur contact work was an enthusiastic success. It may be regarded as unfortunate that the telegraph plane was not able to stay with the Group throughout the flight, but in spite of that, our efforts were modified to meet the situation and with the success that we have indicated. There was an element of personal sacrifice. Amateurs suffered many individual inconveniences that communications might be put through successfully. There was also the reward that comes to operators who have given unselfishly of their best efforts in the knowledge of work well done.

The progress of the flight was followed with intense interest by all hams on the air at the time, whether able to take part in "Spokane route" work. The slogan at W1MK and the half-way stations was "get that press" and half the country stood by or called on Spokane or Montana to help us over the hard spots. Many operators who had planned to enter the Sweepstakes contest gave this up in order to continue active participation in the Air Corps communication. There were hundreds of opportunities to put over brilliant relays, to work AB6 and win fame and to do worthwhile things. It is estimated that over a thousand stations assisted in some phase of the work at different times. Some remarkable and interesting logs were sent in with reports, notably from W9AIR, W9BN, W8CEO, W6EDK and W9BPM. For example, W9AIR's log covers 22 closely typed pages, without margins. It is a recital that will make an interesting memento of this work for years to come. A unique receiving arrangement with two detectors and tuning units interchangeable at will by the throwing of a four-pole double-throw switch made it possible for W9AIR to follow both sides of contacts with AB6 (or communication between any two other stations for that matter) at will.

A few quotations from typical letters and reports will suffice to indicate the deep enjoyment and general interest in this communication problem.

"Although not the original T.O.M., I am 65 years old, and interested in land line operating from the age of 15. The transmitter is kept in order for emergency use so I jumped into the game and got a great kick out of it. Worked AB6 and handled several messages to and from W1MK. Got the best kick when W9DFG had press and could not get W1MK. Gave W1MK a 'QRZ W9DFG' and they clicked five seconds after." — *Robert S. Rose, W9DRR, Marquette, Mich.*

"Had wonderful coöperation from W7AAT at Red Lodge, Mont., who gave me information and press on schedule. Reports were given to the Signal Officer via WVY (San Francisco). This was a very wonderful experience and the work was mighty interesting. Long hours have been kept with the occasional help of W6ATC. With my Army net and my A.R.R.L. ORS skeds I was in fine shape for this event." — *Edward Kohls, W6EDK, Berkeley, Calif.*

"Thanks for a good time. I would certainly enjoy another such expedition. Give RP of W1MK my congrats and 73. He deserves special mention on his fine operating." — *Herman Radloff, W9AIR, Sleepy Eye, Minn.*

"As for the flight coöperation in general, it sure was lots of fun and I got a great kick out of it. This work was instrumental in leading me to send in that application for ORS appointment. I've resolved to be a real traffic man! Here's to our activities and coöperation and to a bigger and better A.R.R.L." — *Bob Moore, W9FHP, Grand Forks, N. D.*

An All-Service Portable Receiver*

By Howard Allan Chinn**

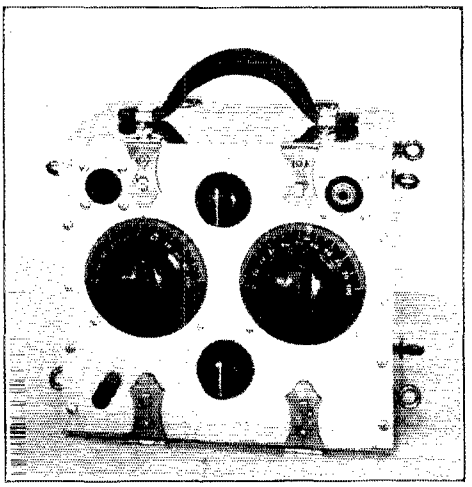
THE receiver herein described was constructed for use as a portable short-wave receiver serviceable in the laboratory, in the field, in an automobile or in aircraft. It is light in weight, compact, completely shielded, covers a wide band of frequencies, is very easily portable and is entirely self-contained, ready for operation wherever it is placed.

The complete receiver, including the necessary batteries, weighs twelve pounds and the aluminum case measures 5 x 8 x 9 inches. Aluminum was chosen for the cabinet because of its light weight combined with strength and because of the shielding properties of a metal case. Sheet aluminum 1/16-inch thick was used and the resulting cabinet is as sturdy, if not more so, than one made of ½-inch wood. Inasmuch as the volume of the wood necessary would have been eight times that of the aluminum (assuming ½-inch wood and 1/16-inch aluminum), the metal case is lighter than one made of white pine, oak, mahogany or any of the other common woods. The weight per cubic foot of aluminum is 167 pounds, of white pine 30 pounds, oak and mahogany about 50 pounds. A ¼-inch cabinet of wood would, therefore, have approximately the same weight, but would by no means be able to withstand abuse as well as the aluminum case. Furthermore, a cabinet of ½-inch wood adds almost an inch to all dimensions if the same volume inside the cabinet is to be obtained.

The top and the bottom of the case are hinged in place with a hooked hinge which permits their complete removal, if desired, when changing the plug-in coils or the batteries. The sides and back are of one piece of aluminum bent to shape and with a flange bent on the front edges to provide a means of bolting the front panel in place. This one piece back and sides makes it unnecessary to use angle aluminum to hold the cabinet itself together, thus saving weight and considerably simplifying the construction since it is not necessary to lay out, drill, and tap numerous angle pieces for the corners. The only mounting screws necessary are those bolting the front panel in place.

Hooks are mounted from the eight corners to permit the usual spring suspension which is essential when the set is to be mounted in an automobile or airplane. The leather handle (which is easily removed when not required) is of convenience when the receiver is being used in the laboratory or is to be carried by hand.

As the set, including all batteries, is well shielded, there is little interference from the stray disturbances caused by the ignition system



THIS PORTABLE RECEIVER IS ADAPTABLE TO ALL SERVICES, INCLUDING AVIATION

It was used as an aircraft receiver during the summer of 1929 on the dirigible "Mayflower" while the ship was at the disposal of the Massachusetts Institute of Technology through the courtesy of the Goodyear-Zeppelin Corporation. The receiver weighs but 12 pounds, ready for service.

of the motor. The only energy of any consequence that can reach the set is that collected by the antenna which, when carefully placed in the car or 'plane, will pick up very little ignition noise.

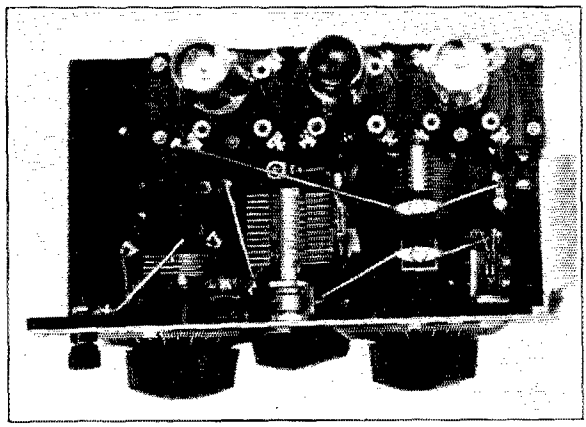
The circuit used is the conventional regenerative detector and two-stage transformer-coupled amplifier. Tuning is accomplished by a small variable condenser shunted by a larger one. This arrangement permits open tuning scales; that is, tuning that is not difficult or critical and yet permits the coverage of a wide band of frequencies without resort to dozens of plug-in coils. The large tuning condenser C_2 has four positions, minimum, maximum and two intermediate positions which are determined experimentally. The intermediate positions are so chosen that the tuning ranges overlap. That is, a signal that is heard with C_2 at a minimum (position 1) and C_1 at 100° can also be heard with C_2 on the first intermediate position (2) and C_1 at the lower end of the scale. Four positions of C_2 permits the adjustment of the

* Contribution from the Round Hill Research (1AXV-1XV).

** Massachusetts Institute of Technology, Cambridge, Mass.

secondary tuning capacity for any value between the combined minimum of C_1 and C_2 and their combined maximum capacity.

The secondary tuning condenser, C_1, is on the left looking at the front panel; the throttle condenser, C_3, is on the right. The auxiliary secondary condenser, C_2, is the upper center knob.



THE EQUIPMENT ABOVE THE SUB-BASE

From left to right, the variable condensers are secondary tuning (C_1), range-shift (C_2) and regeneration control (C_3). The detector tube is the one next to the inductance.

The filament rheostat at the lower center of the panel is in the negative filament lead in order that the voltage drop across this resistor (1½ volts when the "A" batteries are new) may be used as a "C" bias for the amplifier tubes. This detail of wiring provides a "C" bias of very nearly the desired value which greatly decreases the drain on the "B" batteries and gives better amplification. A filament rheostat permits the use of the "A" batteries until the terminal voltage under load has dropped to three volts (the rated voltage of the tubes used) and is, therefore, to be preferred in place of a filament ballast resistor. The filament control jack, which is mounted on a piece of bakelite to insulate it from the panel, is quite essential, as it has been found that during transportation of the receiver it is very easy for the filament rheostat to become turned on, thus causing an undesired drain on the batteries were the circuit not opened by the jack contacts.

When wiring the set it must be borne in mind that one side of the rheostat is probably grounded and must be connected accordingly. Although many points of the circuit are connected to ground or the metal panel, wire connections must actually be made and reliance must not be made on contact through the panel such as is provided for the rotors of the variable condensers. The radio-frequency circuits were wired with heavy bus-bar wire in order that there would be no movement of the wires caused by vibration if the set were being moved while in operation. This precaution is very necessary since the least movement of these wires would cause the signal to waver both in frequency and intensity.

The grid leak must be connected as shown if the desirable positive bias is to be had for the detector grid. This method of connection could be avoided by connecting the aluminum case and ground to "A plus" instead of "A minus" as shown, but it is good practice for uniformity to always connect the "A minus," "B minus" and "C plus" together and ground this point. This standard practice avoids considerable confusion when numerous receivers and oscillators are in use since it is then known that the battery connections and the polarity of the shields are always alike. It is most annoying to have a shield connected to the "plus A" come in contact with one connected to the "minus A" when a common battery is being used. Connecting the "B minus" to the "A minus" and grounding this point avoids the danger of blowing the tubes should the "B plus" become grounded (the battery is shorted but the filaments are safe).

The tube sockets are mounted on a piece of bakelite the same width as the sockets and just long enough to hold three. The center portion of this shelf was removed to save weight and to provide a space for the connecting leads to pass

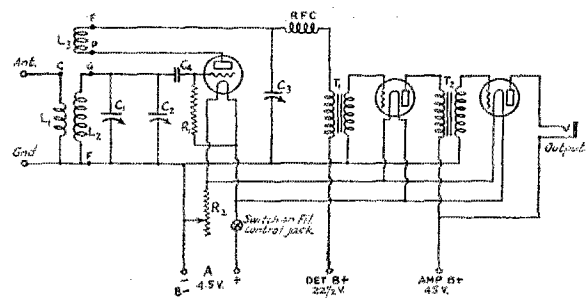


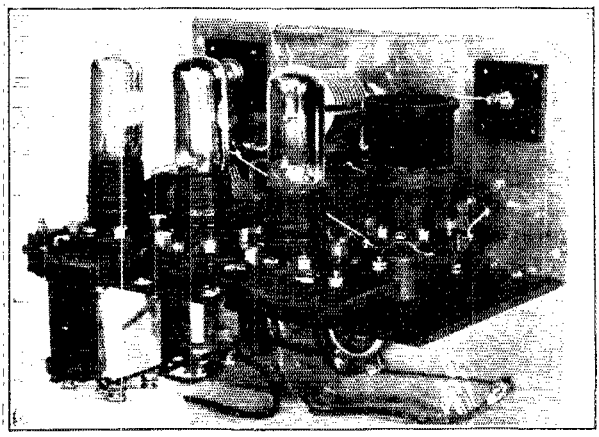
FIG. 1. — THE CIRCUIT OF THE ALL-PURPOSE PORTABLE RECEIVER

L_1, L_2, L_3 — See text and coil table.
C_1 — General Radio 50-μμfd. midget condenser.
C_2 and C_3 — Hammarlund 100-μμfd. midget condensers.
C_4 — Sangamo 250-μμfd. grid condenser with grid-leak clips.
R_1 — 8-meg. grid leak.
R_2 — 45-ohm Carter "Imp" rheostat.
RFC — Samson type 85 radio-frequency choke.
T_1 and T_2 — Thordarson Type R-151 audio transformers.
The bakelite sub-panel is 5" x 8½" x 3/16" and the bakelite tube-shelf is 2" x 5½" x 3/16".

to the sockets. The tube socket shelf is supported at the ends by sponge rubber which fastens to the under side of the tube shelf and is held clear of the main shelf by small bakelite strips. Connection is made to all the socket terminals by means of small copper braid. This means of mounting and making connections insures the sockets being cushioned from shocks which the carrying case receives.

The ground binding post is mounted directly on the aluminum panel, but a wire connection is made directly to it from the proper part of the circuit. The antenna binding post and 'phone jack are mounted on a piece of one-inch square bakelite and a ¾-inch hole in the panel is made to clear these parts.

Three 4½-volt "C" batteries are connected in parallel to supply the filaments of the tubes. This "A"-battery supply will give approximately 100 hours of service before the terminal voltage of the batteries drops below three volts. The "B"-voltage is obtained from two of the small sized (one pound class) "B" batteries. The five batteries just fit into the space under the sub-panel that is not taken up by the amplifying transformer.



THE RECEIVER SANS CABINET

Every inch of available space is utilized. The batteries fit beneath the sub-panel beside the amplifying transformers.

Silver-Marshall type 130-T coil forms are used for the tuning inductances. The constants are as follows:

COIL	A	B	C
Diameter.....	1½"	1½"	1½"
Primary:			
No. turns. .	4	6	8
Wire size	No. 28 d.s.c.	No. 28 d.s.c.	No. 28 d.s.c.
Length of winding..	⅛ inch	3/16 inch	¼ inch
Secondary:			
No. turns. .	8	16½	40½
Wire size.	No. 20 d.s.c.	No. 28 d.s.c.	No. 28 d.s.c.
Length of winding..	⅜ inch	½ inch	1¼ inch
Tickler:			
No. turns	10	15	20
Wire size ..	No. 28 d.s.c.	No. 28 d.s.c.	No. 28 d.s.c.
Length of winding..	In slot	In slot	In slot

FREQUENCY RANGE (KILOCYCLES)

C1 in Position 1	12,500–10,000	770–5260	4280–2830
" " 2	10,700–8100	5460–4350	2910–2310
" " 3	8820–7320	4410–3850	2340–1985
" " 4	7700–6670	3850–3410	2040–1795

Midwest Division Convention

Ames, Iowa, May 9th and 10th

ON to Ames, gang — on to Ames! The Midwest Division A.R.R.L. Official Convention and Ninth Radio Amateurs' Short Course, under the auspices of Iowa State College, will be held this year as usual at Ames on the 9th and 10th of May. Technical talks on all phases of amateur work will be given by one of the editors of *QST*, and F. E. Handy, Communications Manager, A.R.R.L., and author of the Radio Amateur's Handbook. F. H. Schnell, "the Ace of Radio" and Chief of Staff for the Radio & Television Institute of Chicago, will also be one of the principal speakers — and he always has something good to say. Other prominent speakers will be Prof. Carl Menzer, University of Iowa; Prof. J. K. McNeely of Iowa State College; Prof. C. M. Jansky, Jr., of Washington, D. C.; Mr. P. C. Rawls of the Technical Equipment Co., Des Moines, as well as Messrs. J. W. Doty and A. E. Rydberg of KOIL, Council Bluffs.

Registration will begin at 9:00 a.m. on Friday in the Engineering Building, Iowa State College. A change is being made this year — and that is the banquet will be held on Saturday evening, and boy! it's going to be some explosion. On to Ames, gang — on to Ames!

Hudson Division Convention

New York City, May 23 and 24

HEAR ye, Hudson Division "Hams," the call for our annual convention, to be held at the Hotel Pennsylvania, New York City, on May 23rd and 24th. Director Walsh is sponsoring the affair and has appointed Mr. A. B. O'Hara, Chairman, and Mr. Dave Talley, Treasurer. As in the past there will be plenty of good talks and entertainment during the two days, ending with a banquet on Saturday night which will satisfy everybody. Drop a line to Director A. L. Walsh, 220 West 42nd Street, New York City, and make your reservation.

Official Frequency System

THE Official Frequency Station Committee, a part of the Experimenters' Section of the A.R.R.L., has arranged the services described below for the benefit of the members of the League and others who may wish to use them.

1. Standard Frequency Transmissions are sent by the Standard Frequency Stations W9XL and W1AXV (known as O.F.S.-S.F.) on definite schedules with a high degree of accuracy. All the principal amateur bands are covered, several points being given in each so that frequency meters may be accurately calibrated.[1]

These transmissions are based on piezo-electric frequency standards. The standard used by W9XL is checked at intervals by the Bureau of Standards at Washington. That used at W1AXV is checked against the standard time interval in the M. I. T. laboratory at Round Hill.

2. Official Frequency Transmissions are sent by Official Frequency Stations (known as O.F.S.) at a somewhat lesser degree of accuracy. These stations do not transmit on regular schedules but announce their frequency at the end of at least every other transmission during their regular amateur operation. Such stations will measure the frequency of your transmission upon request.

Practical suggestions are always welcome and should be sent to the proper member of the Committee which is composed of the following: Don C. Wallace, W6AM, Chairman in charge of O.F.S., Room 410, 209 Pine Ave., Long Beach, Calif.; Prof. C. M. Jansky, Jr., care of University of Minnesota, Minneapolis, Minn.; and Killian V. R. Lansingh, W6QX, in charge of O.F.S.-S.F., Box 666, Hollywood, Calif.

STANDARD FREQUENCY SCHEDULES

Friday Evening Schedules				*Friday and Sunday Afternoon Schedules*				
Time (p.m.)	Frequency, kc.			Time (p.m.)			Time (p.m.)	
	A	B	AB		BB	C		CD
8:00	3500	7000	7000	4:00	7000	14,000	3:00	28,000
8:12	3550	7100	7100	4:12	7100	14,100	3:12	29,000
8:24	3600	7200	7200	4:24	7200	14,200	3:24	30,000
8:36	3700	7300	7300	4:36	7300	14,300	3:36	14,000
8:48	3800	....	3500	4:48	....	14,400	3:48	14,200
9:00	3900	....	3650				4:00	14,400
9:12	4000	....	3850					
9:24	....	....	4000					

The time is the local standard time at the transmitting station. 8:00 P.M. at W1AXV is 0100 G.C.T. and 8:00 P.M. at W9XL is 0200 G.C.T. Similarly, 4:00 P.M. at W1AXV is 2100 G.C.T. and 4:00 P.M. at W9XL is 2200 G.C.T.

[1] See "Utilizing Standard Frequency Transmissions," *QST*, Sept., 1929.

DATES OF TRANSMISSION

Date	*Schedule*	*Station*
May 2, Friday	A	W1AXV
" 4, Sunday	CD	W9XL
" 9, Friday	BB	W1AXV
" 9, Friday	AB	W9XL
" 16, Friday	B	W1AXV
" 23, Friday	AB	W9XL
" 25, Sunday	C	W1AXV
June 6, Friday	A	W1AXV
" 13, Friday	BB	W1AXV
" 20, Friday	B	W1AXV
" 29, Sunday	C	W1AXV

As explained elsewhere in this issue of *QST*, W9XL will not transmit schedules during June.

Schedule "BB" sent at 2100 G.C.T. on one Friday of each month is transmitted at that hour for the particular benefit of European stations. If sufficient reports on its reception are not received, it will be discontinued.

THE STATIONS

W1AXV: Massachusetts Institute of Technology, Communications Department Experiment Station, Round Hill, Dartmouth, Mass., H. A. Chinn in charge. Uses Eastern Standard Time and characteristic letter "G."

W9XL: Northwestern Broadcasting, Inc., R. F. D. No. 3, Anoka, Minn., H. S. McCartney in charge, assisted by Lyall K. Smith, Ivan H. Anderson and George Collier. Uses Central Standard Time and characteristic letter "D."

DIVISION OF TIME

A total of 12 minutes is allotted to each transmission divided as follows:

4 minutes — QST QST QST de (call letters).

3 minutes — Characteristic letter ("G" or "D") sent very slowly and broken by call letters each half minute.

1 minute — Statement of frequency in kilocycles to nearest integral figure.

4 minutes — Time allowed to change to next frequency.

ACCURACY

The transmissions of both stations will be within 1/10 of 1% of the frequencies herein announced, which is considerably better than the accuracy to which the average good amateur frequency meter can be calibrated and maintained constant. During each transmission by W1AXV the integral frequency nearest its exact frequency within 1/100 of 1% will be announced for the benefit of those able to use such accuracy, but for all general amateur purposes the frequency of transmission of both stations may be assumed equal to the figures as herein given.

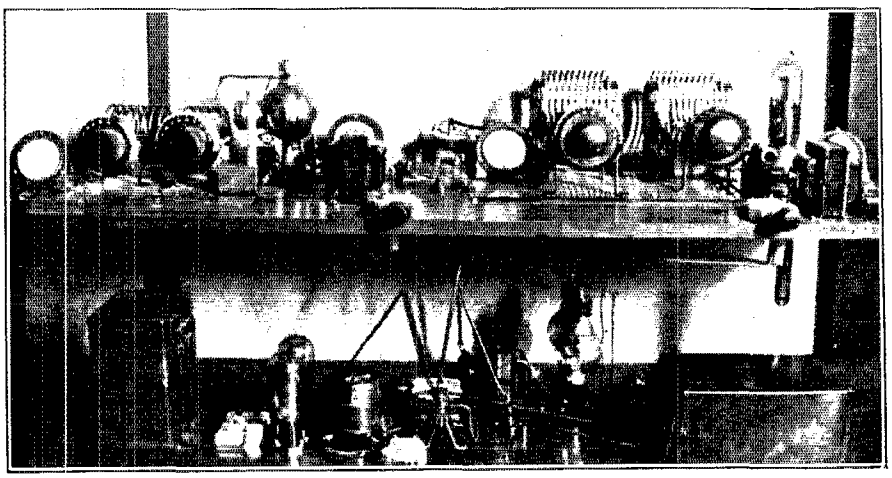
(*Continued on page 74*)

The All-Section Sweepstakes Contest

By E. L. Battey, Assistant to the Communications Manager

WITH shouts of, "On ye Brave; Who rush to glory, or the grave!" the starting pistol was fired at 0000 G. C. T. on January 18, and the All-Section Sweepstakes Contest was under way. The participants looked to the two weeks ahead of them and wondered. . . . They knew of the great possibilities of the contest; they knew of the possible high scores; they knew of those three unique trophies set aside for the leaders; they knew of the very attractive brown lithographed certificates awaiting the winners in the sixty-eight A.R.R.L. sections; they knew . . . but let us glance at the rules of the contest as outlined in December *QST*. . . .

The Sweepstakes Contest, which was, in effect, the first National Relay Contest, was open to all amateurs in each of the 68 A.R.R.L. sections throughout the United States and Canada, and including Hawaii, Alaska, P. I., Porto Rico, Cuba, etc. Participants were allowed to exchange but one message each way with a station for credit in the contest, but were permitted to exchange messages with as many stations as possible. Messages had to be transmitted in complete form with city of origin, station of origin, number, date, address, text, and signature, the text being of no less than ten words (plain language count). Messages that did not comply with this rule were designated incomplete, and likewise the QSO on which they were exchanged was eliminated from the contest. Each received message counted one point, and each transmitted message one point, making a score of two points for each QSO, if a message had been successfully transmitted and received. It was possible, therefore, to score *two* for every QSO, but the scoring did not stop there. Whatever total score was made by exchanging messages was multiplied by the *number of sections* with which messages had been exchanged. As there are 68 sections, there was a possible multiplier of 68. Think what that meant!! There was no limit to the possible scores!



W1ADW, WINNER OF SWEEPSTAKES CONTEST

And now the two weeks of the contest are a memory, the award committee has completed its tedious task of checking over the logs submitted, and we are ready to present the results. W1ADW made the "clean sweep" with his score of *13,158*, and wins first prize!! He swept the air with a signal from a Hi-C Hartley, using an 852 part time, and a UV-203-A for the remainder of the contest. Messages were exchanged with 153 stations in 43 sections on the 3500-, 7000- and 14,000-kc. bands. We secretly suspect that W1ADW is now making up a little lost sleep after that splendid piece of work! W9DEX claims the second prize by virtue of exchanging messages with 142 stations in 43 sections for a score of *12,212!* Work at W9DEX was carried out with a single Type '10 on the 3500- and 14,000-kc. bands. It is interesting to note that both W1ADW and W9DEX succeeded in chalking up *43 sections* to

their credit. Close on W9DEX's heels is W2BAI with a score of *12,090* made by swapping messages with 155 stations in 39 sections! W2BAI did not enter the contest until January 24, a week after the start, but he worked hard, and the third prize is his. He used the 7000- and 14,000-kc. bands. W1ADW, W9DEX and W2BAI are all one-man stations and in view of this we realize how the operators must have stepped to run up the scores they did. Our hats are off to them!

At this point let us review the contest from the participants' angle and discuss the various points brought out by those who took part. The outstanding difficulty encountered by all was the educating of other amateurs in the whys and wherefores of the contest. Practically every contestant who made any comment at all on the competition mentioned that he found it pretty tough sledding to get a message out of most stations. In about three out of every five cases it was necessary to explain what the contest was all about, what was necessary before points could be counted, that it was not necessary to enter beforehand, etc., etc., and much time was lost by all this explaining. But why all the doubt and uncertainty and seeming ignorance of the existence of the contest? Surely it was not because it had come unheralded. The December issue of *QST* contained a complete explanation and list of rules, and the January number announced the trophies and certificates to be awarded to the winning stations. So much was said in *QST* that every amateur should have had at least a *fair* conception of the contest. Why then . . . ?? Yes, you have hit the nail on the head — "Amateurs do not properly read *QST*." This newest complaint, mentioned in the I.A.R.U. Section of January *QST*, has been confirmed to the "*n*th" degree in the Sweepstakes Contest. It is truly astounding to learn how many fellows, who say that they "read *QST*," are found absolutely "in the dark" when a contest such as we are recounting comes along. But let's move on and see what else we can find out about the contest. There was a certain group, but fortunately a much smaller one than the "non-readers," that took a rather indifferent attitude toward the whole affair. Not being actively engaged in or interested in contest work themselves, they had to be persuaded a lot before they would come through with a message. Many actually refused to have anything to do with the contest. Did those fellows stop to think that five minutes spent in an exchange of messages would help the other man in his efforts to run up a good score, and at the same time make the QSO more interesting, and give both operators practise in message handling, which by the way, is what most of the "indifferent" amateurs need?! W1WV sums up the poor spirit of the "indifferent group" quite effectively when he says, "In looking back over all the various experiences I had in the Contest, I couldn't help but think what a millennium it would be if all amateurs would practise the Golden Rule."

Then there were the fellows who were perfectly willing to exchange messages but, when asked to, were lost because they had no idea of how to properly send even a simple message. We won't say anything further about this group. They know their faults! All in all the contest certainly showed up many shortcomings in operating and in operators.

It will be well to point out several misapprehensions regarding the rules of the contest. No rule was set forth whereby it was necessary that a contacted station be actually participating in the contest but, nevertheless, many assumed that this must be so and consequently passed up many valid points. Some participants thought it was necessary that stations contacted send Headquarters copies of the two messages exchanged as an additional check on the QSO before any points would be counted, although nothing was said in the rules to this effect. A few over-cautious souls believed that logs and messages had to be submitted on standard A.R.R.L. forms and that a careful check would be made to eliminate any points made with a non-member of the League. We are certainly sorry that such misunderstandings came up, but we see little excuse for them. In any contest it is always safe to follow the rules *as they are written*. If you do this, you cannot go far wrong!

Now that we have bared the unfortunate sides of the contest, let us see what we can dig up on the "sunny side." That the contest was enjoyed by those who took part is clearly evident from the comments made by contestants in reporting their scores. W8AQ (ex-1AAC), an old-timer, says, "I enjoyed it more than any contest in years." W9GKI remarks, "Believe contest was very good dope and got a kick out of it. . . . I'm for more like it."

Many participants made similar comments, and the cry for another "National Contest" is now in the air. Many amateurs got some much-needed practise in message handling, and we dare say that there are now a number of individuals who have the Sweepstakes Contest to thank for their knowledge of proper operating procedure. A better conception of the A.R.R.L. sections was obtained by most contestants, and many were able to work sections they had never even heard before.

One of the outstanding good points of the Sweepstakes Contest was the fact that the fellow with low power was at no great disadvantage, and was able to strut his stuff with the best of them. W8APQ, the certificate winner in the Western Pennsylvania section, ran up his score using only 180 volts of "B" batteries on a Type '01-A! W6CTP, second high in the San Diego section, used a Type '12-A with 300 volts r.a.c. W9ACU boosted the Illinois total to the tune of 1680

points with a Type, '71-A fed by 175 volts of "B" bats. The high- and low-power stations ran neck and neck in this contest.

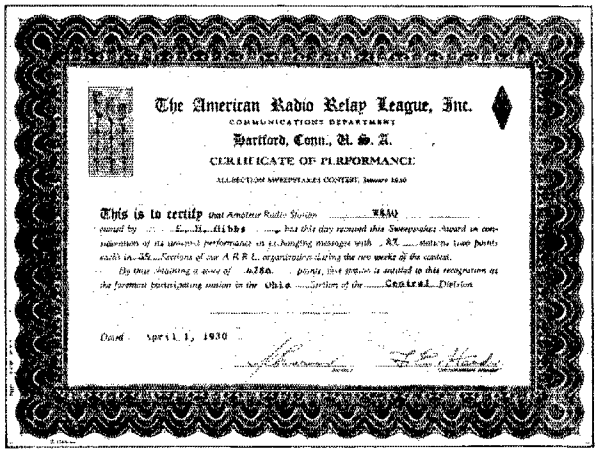
There was one station at least which used 'phone during the contest. This was W9GHI in Baldwin, Kansas. His score of 2592 was made to a large extent on 3500-kc. 'phone. Good work, W9GHI.

The choice of frequencies is an important factor in every contest, and it is interesting to note which frequency bands proved most popular in this contest. All participants either confined their efforts to the 3500-, 7000- or 14,000-kc. band, or divided their time on these three bands. Out of 90 stations reporting totals, 22 worked on both the 7000- and 14,000-kc. bands; 22 worked on 7000 kc. only; 17 pounded away on all three bands; 15 used the 3500- and 7000-kc. channels; 6 did all their work on 3500 kc.; 4 preferred the 3500-14,000-kc. combination; and 4 operated on 14,000 kc. only. It is surprising to note the number of stations successfully working the 7000-kc. band, especially when this band is so loudly proclaimed "QRM headquarters." Can this band be so bad after all?

The scores of the various contestants and sections are given at the close of this write-up. They are listed according to the standing of each section, and each participating station within the section. There are 48 sections represented. Certificates will go to but 46 of these sections, as no station in the other two sent in a report in accordance with the rules. Stations marked with an asterisk were not actually taking part in the contest and did not submit a score. They merely sent in the messages they exchanged to be checked and counted on participating stations' scores. The award committee has given them a score, however, and although they are not eligible for prizes, their scores are credited to their respective sections.

It is with much regret that we must record the disqualification of one participating station. It was stated most clearly in the rules that "the date and *time* acknowledged" must be noted on every message. W7AC would have had a pretty score of 1680 points had he not slipped up and failed to record the *time* the exchanges were made. We eliminate this station only out of fairness to the other participants who were more accurate and submitted satisfactory proof of their various two-way communications in line with the Contest rules. A very few contestants were reported by Official Observers as working off-frequency during the contest, but as two off-frequency reports were deemed necessary by the irregularities committee to constitute a disqualification, we are pleased to report that no participants in the Sweepstakes Contest were eliminated because of off-frequency operation. No more than one off-frequency report was received for any station.

It will be noted that the three leading sections also boast the three "high stations" for the country: W1ADW, W9DEX and W2BAI respectively. It is also well to observe that the certificate winner in almost every section is a well-known traffic man. Many are League officials. W1WV, winner in Eastern Massachusetts, is the SCM of that section; W9ERU, Illinois victor, is Route Manager for his section; K4KD, who takes the


The American Radio Relay League, Inc.
COMMUNICATIONS DEPARTMENT
Hartford, Conn., U. S. A.
CERTIFICATE OF PERFORMANCE
SWEEPSTAKES CONTEST, January 1930
This is to certify that Amateur Radio Station W1ADW
owned by E. H. Gibbs has this day secured this Sweepstakes Award in consideration of its unusual performance in exchanging messages with 32 stations, two points each, in 32 sections of the A. R. R. L. organization during the two weeks of the contest.
By this attaining a score of 13,158 points, this station is entitled to this recognition as the foremost participating station in the Ohio portion of the Central Division
Dated April 1, 1930

HERE IS ONE OF THE CERTIFICATES

honors for Porto Rico, is SCM of the Porto Rico-Virgin Islands section; W6WB, another winner, is SCM of the San Francisco section. Up in Canada VE2AC, SCM of Quebec, takes the certificate for the Quebec section. The New Mexico certificate goes to the SCM of that section, W5AHI. Likewise, the SCM of Montana, W7AAT, walks away with the certificate out there. A glance at the list of winners will reveal many more equally active brass pounders.

And now for the scores —

SWEEPSTAKES CONTEST SCORES

Section	*Station*	*Score*	*Section Score*
Connecticut	W1ADW	13,158	
	W1MK	5,976	
	W1UE	494	
	W1VZ *	2	
	W1APZ *	2	
			19,632
Iowa	W9DEX	12,212	
	W9EOP	60	
	W9ARW *	2	
			12,274
E. New York	W2BAI	12,090	
			12,090

E. Massachusetts	W1WV	5,270	
	W1DS	2,254	
	W1AAT	480	
	W1RV	128	
	W1TL	84	
	W1AU *	4	
			8,220
Kansas	W9CCS	4,620	
	W9GHI	2,592	
	W9GDH	684	
			7,896
Illinois	W9ERU	2,704	
	W9BSH	2,640	
	W9ACU	1,680	
	W9FCW	264	
	W9QI *	32	
	W9AFN *	2	
	W9ANQ *	2	
			7,324
Ohio	W8AQ	6,786	
	W8CFL	280	
	W8NP *	128	
	W8AFS *	18	
	W8BUS	12	
			7,224
New York C.-L. I.	W2CUQ	5,568	
	W2AYM	180	
	W2BST	27	
			5,775
Ontario	VE3BK	3,186	
	VE3BC	768	
	VE3ZZ	560	
	VE3ET	546	
	VE3DA	300	
			5,360
Porto Rico-V. I.	K4KD	5,180	5,180
Michigan	W8BGY	4,248	
	W8DYK	476	
	W8PP	384	
	W8LA	8	
			5,116
Oregon	W7AJW	4,032	
	W7ACH	506	
	W7AHX	126	
	W7WR	8	
			4,672
Utah-Wyoming	W6DPJ	3,392	
	W7AAH	972	
			4,364
North Dakota	W9BVF	2,704	
	W9DGS	1,560	
			4,264
Washington	W7GP	3,648	
	W7FA	260	
	W7ACS	176	
	W7AJH *	2	
			4,086
W. New York	W8DSP	1,880	
	W8QL	608	
	W8BJO	336	
	W8CMW *	32	
			2,856
West Virginia	W8IB	2,392	2,392
W. Pennsylvania	W8APQ	1,224	
	W8DLG	966	
	W8DPI *	50	
	W8DNO *	2	
			2,242
Santa Clara V.	W6YU	1,044	
	W6BYH	936	
	W6DQH	48	
			2,028
North Texas	W5AFM	1,760	
	W5AMK *	8	
			1,768
Los Angeles	W6AM	1,360	
	W6ETJ	342	
			1,702
San Francisco	W6WB	1,426	
	W6ERK	224	
	W6CIS *	2	
			1,652
E. Pennsylvania	W3BQV	1,581	
	W3MZ	18	
	W3CGS	2	
			1,604
W. Massachusetts	W1AZW	800	
	W1BKG	704	
	W1ZB	50	
	W1CNE *	16	
	W1SW *	2	
			1,572
Saskatchewan	VE4IH	1,540	1,540
Wisconsin	W9FAW	992	992
Quebec	VE2AC	950	950
Oklahoma	W5ZAV	950	950
Missouri	W9CJB	924	
	W9DQN	18	
	W9BMU *	2	
			944
New Mexico	W5AHI	330	
	W5AJL	112	
			442
So. New Jersey	W3UT	416	416
San Diego	W6EPZ	300	
	W6CTP	98	
	W6BYP *	2	
			400
Alabama	W4AG	312	312
Virginia	W3ARU	286	286
Indiana	W9GKI	240	240
So. Minnesota	W9GGA	176	
	W9BN *	32	
			208
North Carolina	W4FT *	200	200
Ga.-S. C.-Cuba-Isle of Pines	W4SS	176	176
New Hampshire	W1IP	144	144

(*Continued on page 76*)

Changes in A.R.R.L. Standard Frequency Service

W1AXV to Give Individual QRG Service—W9XL to Discontinue Schedules

IN keeping with the A.R.R.L. policy of a greater and more accurate frequency calibration service to amateurs, Standard Frequency Station W1AXV will supplement its regular standard frequency broadcasts with a direct frequency checking service to individual amateur stations. This new service should have a marked effect in clearing up off-frequency operation. Needless to say, it has the hearty approval of the O. F. S. Committee.

As described by Mr. Howard A. Chinn, who is in charge of W1AXV at the Round Hill Research Division of the Mass. Inst. of Technology, Round Hill, South Dartmouth, Mass., the frequency checking service will operate as follows:

"During the hour preceding each standard frequency broadcast from W1AXV we will work as many amateur stations as possible and measure their transmitted frequency for them. The precision of the measurement will be better than 0.1 per cent in all the amateur bands. Our transmitter will be adjusted to the frequency of the first standard frequency scheduled for transmission during the following hour, but we will listen for replies throughout that band.

"In order that amateurs may know that we are on the air to give this service, I suggest the new 'Q' signal, 'QGG:—Do you wish your frequency measured?'

"The procedure, then, will be as follows:

"One hour before our regular S.F. schedule we will call 'CQ de W1AXV QGG? AR.' Two operators—using separate receivers—will listen for replies. As soon as a station is heard calling W1AXV, his frequency will be measured and upon answering him we will give him his QRG.

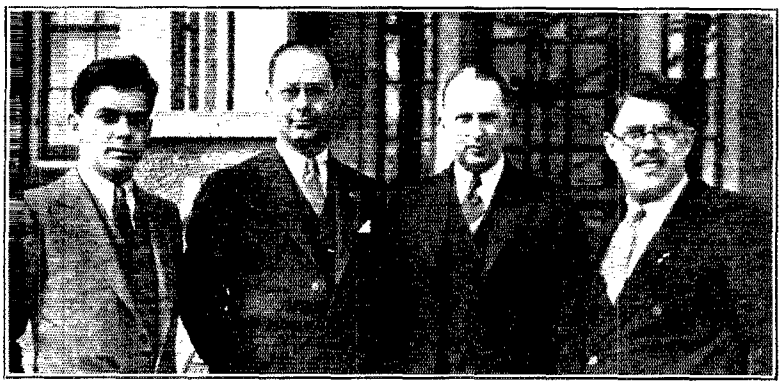
"Meanwhile, the other operator will be listening for other stations and immediately the transmitter is free he can work any station he has heard calling us. Therefore, stations can call us although we are in communication with someone else. It will be necessary for the successful functioning of the service, however, that stations desiring a frequency check have patience and stay with us until we can answer them.

"Our only request is that upon receiving his QRG, no matter how far away or close by he may be, the station drop us a line acknowledging the service in order that we shall have something in our files to show for our efforts."

W1AXV will also act as an Official Observing Station and notify stations heard operating off frequency. After a station has been warned once and is again heard operating off frequency, his call will be reported to A.R.R.L. Headquarters.

Now this direct service from W1AXV means more than may appear at a casual glance. The

(Continued on page 76)



W9XL'S STANDARD FREQUENCY CREW

In addition to their regular duties on the technical staff of WCCO, they have been handling the Standard Frequency Transmissions of W9XL since 1926. Starting at the left, meet Ivan H. Anderson, engineer in charge of WCCO's transmitter at Anoka; Hugh S. McCartney, the station's chief engineer; Lyall K. Smith; and George Collier.

Experimenters' Section

A SIMPLE METHOD OF CHECKING MODULATION PERCENTAGE

THE determination of the percentage of modulation on a 'phone transmitter is of as much interest and value to the amateur as to the broadcast engineer, because it is an index of the effectiveness of the set. As has been previously pointed out in *QST*, the higher the modulation factor (within the modulation capability of the transmitter), the greater will be the voice range as compared with the interference range of the carrier. A high percentage of modulation therefore helps the 'phone man in two ways: The possibilities of a given amount of apparatus are more fully realized, and the quantity of incidental interference is greatly reduced.

There are several methods available for measuring the modulation factor, a peak vacuum-tube voltmeter, such as the Modulometer described in August, 1929, *QST*, being about the most satisfactory. However, for the amateur who does not have the necessary equipment for such a device and who will be satisfied with an approximation of fair accuracy, less complicated and more easily applied methods may be used. One of these, requiring only the use of a thermo-galvanometer or low-scale thermo-ammeter, has been called to our attention by Mr. G. Willard Ray, of Hamden, Conn., who writes as follows:

"I believe the following will be of interest to our radiophone friends, in case they wish to compute percentage of modulation in their transmitters.

"The only piece of apparatus required is a current-squared thermo-galvanometer and a length of stiff copper wire. Make a few turns of the copper wire, and connect it across the meter, coupling loosely to the output of the transmitter, so that the instrument reads about half scale with the carrier on but unmodulated. Then talk into the microphone and the galvanometer will deflect if there is any modulation at all. Its maximum deflection point with regard to its original reading will tell the tale, thus:

$$\% \text{ modulation} = 100\sqrt{2\,(R-1)},$$

where R equals the ratio of maximum to minimum readings, i.e., scale reading of the galvanometer with modulation divided by the scale reading without modulation.

"As an example, suppose we arrange the meter and coupling loop so that the scale reading is 40 degrees when not modulating and suppose it climbs to 60 degrees at peak modulation. R then equals 1.5, and we have

$$\% \text{ modulation} = 100\sqrt{2\,(1.5-1)}$$
$$= 100 \times 1$$
$$\text{or } 100\% \text{ modulation}$$

"I use this method for actual computation at WICC and know that it is well worth trying. It can even be used with the usual old-fashioned wavemeter equipped with a thermo-galvanometer."

A simple calculation indicates that when R equals 1.5, the transmitter is being modulated 100%. Therefore the transmitter should always be adjusted so that R is never greater than 1.5, as distortion is sure to result.

The above formula is based on the use of a meter which reads current squared. The method may be used with an ordinary low scale meter calibrated to read current by slightly rearranging the equation. It then becomes:

$$\% \text{ modulation} = 100\sqrt{2\left(\frac{I_2^2 - I_1^2}{I_1^2}\right)}$$

where I_1 = current when carrier is unmodulated
I_2 = current when carrier is modulated.

In using this method it is well to keep in mind the fact that the needle of the meter takes an appreciable time to reach its maximum position. For this reason a sustained note should be sung into the "mike" until the pointer takes a steady value. If another person can be pressed into service to do a little listening in the monitor the point at which distortion becomes objectionable can be determined. The gain control should be increased until just below the point at which distortion becomes noticeable. Then sing into the microphone at the same voice intensity as used in the voice test, and the maximum modulation factor (with those particular transmitter

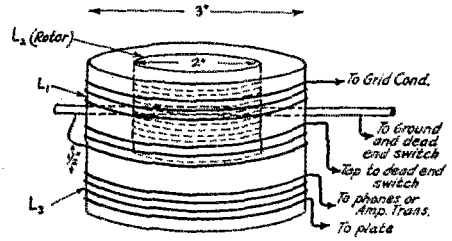


FIG. 1

L_1 — Stator, 6 turns of No. 20 e.c.c.
L_2 — Rotor, 9 turns of No. 20 d.c.c.
L_3 — Tickler, 4 turns of No. 24 d.c.c. placed ½" from L_1.
All coils are wound without spacing between turns, except where the shaft passes through the middle of L_1 and L_2. L_1 may be wound without spacing and placed entirely above the shaft if desired.

adjustments) can be easily calculated as outlined above.

Readers interested in the derivation of the above formulas, are referred to an article on "The Power in a Modulated Oscillator," by E. Howard Robinson, in the May, 1928, issue of *Experimental Wireless & the Wireless Engineer*, a British publication.

A USEFUL AMATEUR TUNING ARRANGEMENT

The tuning unit developed in the Burgess laboratories, described in February, 1930, *QST*, has stirred up quite a bit of interest in the amateur world, with the natural result that some of our construction enthusiasts have been building their own version of it.

Robert T. Foreman, W9ZZE, has worked out a successful tuner and is quite pleased with the ease of tuning and the elimination of the large number of plug-in coils necessary to cover the same tuning range in the commonly used type

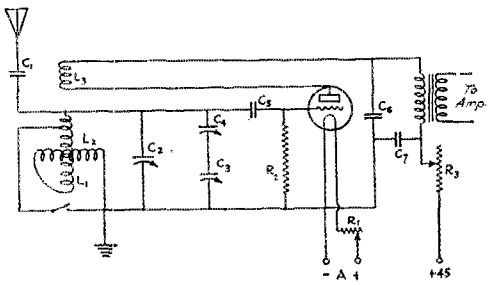


FIG. 2

L_1, L_2, L_3 — See Fig. 1.
C_1 — Antenna coupling condenser, may be variable 5-plate midget or made by placing two small brass angles facing each other.
C_2 — 100 μμfd.
C_3 — 100 μμfd.
C_4 — 100 μμfd., preferably s.l.f.
C_5 — 100-μμfd. grid condenser.
C_6 — 1000 μμfd. (not critical).
C_7 — 1 μfd.
R_1 — Filament rheostat suitable for tube used.
R_2 — 2-megohm grid leak.
R_3 — 50,000-ohm variable resistor.

of receiver. No special apparatus is required, and the bands may be spread to any desired degree.

The variometer is shown in Fig. 1. All three coils are wound in the same direction. The various connections are marked on the drawing. If metal rods are used to support the rotor, and also form the end connections of the coil, it is important that the shaft on which the dial is mounted be connected to ground, to eliminate body capacity effects. In the event that some hand capacity is present even with the connections as shown, a small copper or aluminum shield a few inches square mounted on the back of the panel, and connected to the shaft, will reduce it to a minimum.

This unit with the condensers specified in the diagram, Fig. 2, covers the band of frequencies between approximately 10,000 kc. and 3400 kc., with the switch open. When the switch is closed, the range is from 17,000 kc. to 8000 kc.

The tuning is done as follows: Set C_4 at minimum capacity and adjust the variometer and C_2 until the highest frequency desired at that particular portion of the spectrum is tuned in. The next step is to set C_4 at maximum, then vary C_3 until the receiver is tuned to the lowest frequency wanted. Obviously a large number of different settings of the condensers and variometer will give the same frequency as both inductance and capacity are variable. In general, it is best to use as much inductance and as little capacity as possible for maximum signal strength. These settings may be made by using "marker" stations of known frequency or with the help of a frequency meter or calibrated monitor. It is a good idea to keep a record of the best settings determined by experimenting as above for the more popular bands so the tuner can be readily reset without loss of time.

As an illustration, suppose we want to cover the 7000-kc. band with a little overlap on each side, or from 6900 to 7500 kc., for instance. Set C_4 at minimum capacity, no particular attention being paid to C_3, because its capacity is so large compared to C_4 that it will have comparatively little tuning effect on the circuit when C_4 is at minimum. Then adjust the variometer and C_2 until the 7500-kc. frequency is tuned in. If a station is heard at about this frequency, different settings of both may be tried until maximum signal strength is obtained. With these settings definitely determined, set C_4 at maximum and vary C_3 until 6900 kc. is reached. The band spread may be made as large or small as desired by varying C_2 and C_3 slightly.

It is best to mount C_3 behind the panel and use an insulating extension shaft for varying its capacity, because both sets of plates are at high r.f. potentials and hand capacity will be annoying if mounted in the usual manner.

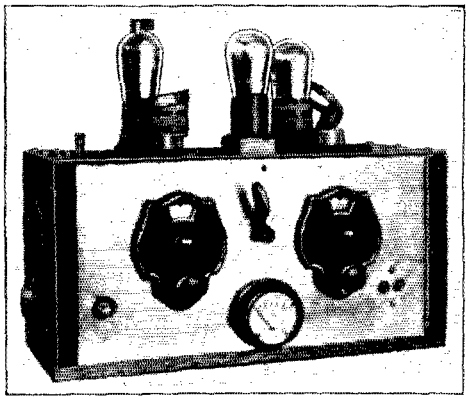
NOVEL RECEIVER AT W9AIR

It seems that the problem of rapidly changing from one band to another on a receiver has been receiving quite a bit of attention lately. Herman Radloff, W9AIR, suggests the method shown in Fig. 3, and has found it a convenient arrangement for shifting between two bands.

Two separate sets of coils and condensers are incorporated in the receiver, each covering a different amateur band. A four-pole double-throw switch serves to transfer the detector tube from one tuning range to the other. The photograph shows how the apparatus is laid out. Plug-in coils wound on tube bases are employed, so that by changing coils any two of the amateur

bands may be used at will. The antenna coils are not interchangeable, but the coupling can be varied by means of a pivoting arrangement, these coils being directly over the tube-base coils in the photograph.

Condenser C_1 is not used as a tuning condenser, but is used simply to allow the fixed capacity in the circuit to be adjusted. This is an advantage when the bands are spread over most of the dial, because changing the detector tube



RECEIVER AT W9AIR

often causes the tuning to change so markedly that only a portion of the band can be covered. This in turn requires alterations to the tuning coil unless there is some way of compensating for changes in tube capacity. Aside from the above feature, however, C_1 could be omitted entirely.

C_2 is adjusted by removing plates until the 3500-kc. band is spread over the dial scale. When this condition is attained, it will also cover the

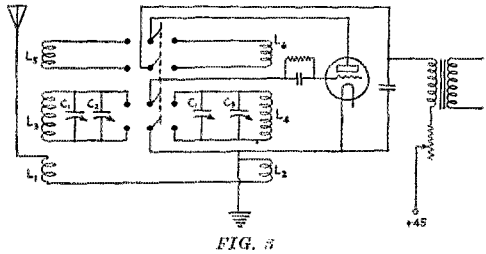


FIG. 3

L_1, L_2 — Fixed antenna coils.
L_3, L_5, L_4, L_6 — Plug in coils wound on tube bases for different bands.
C_1 — 50-μμfd. midget condenser.
C_2 — 50-μμfd. midget with plates removed to cover the 3500-kc. band.
C_3 — 50-μμfd. midget with plates removed to cover the 7000-kc. band.

1750-kc. band very satisfactorily with the proper plug-in coil. C_3 is adjusted in the same manner to spread the 7000-kc. band, and also works out nicely for 14,000 kc. No data is given on the coils, as these differ in no way from those used in the ordinary receiver.

Since the majority of amateur stations seem to work in only two bands regularly, a change-over idea of this type will no doubt be found useful.

TUNING THE OSCILLATOR TO THE SINGLE-WIRE FEED HERTZ ANTENNA

In using the single-wire feed Hertz there is always danger that the antenna and feeder will act simply as a grounded Marconi antenna unless the oscillator is tuned exactly to the fundamental or a true harmonic of the antenna. Getting the tuning exactly right is always a problem, even though the exact length of the antenna is known, because local conditions appear to have some influence on the fundamental.

An easy method of finding the correct oscillator frequency has been suggested by Mr. Paul E. Griffith, W9DBW. It requires the use of a monitor. The method is based on the fact that the reactance of an antenna is capacitive below its fundamental frequency and inductive at higher frequencies than the fundamental.

The oscillator is first tuned to approximately the supposed fundamental of the antenna, with the feeder disconnected. The monitor should be

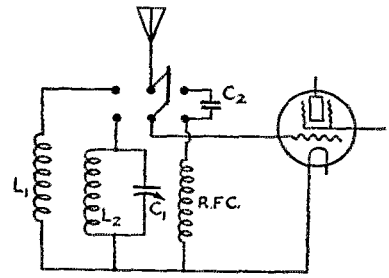


FIG. 4

L_1 — Antenna coil.
L_2 — Tuning coil for band used.
C_1 — Tuning condenser for band used.
C_2 — Antenna coupling condenser.
RFC — Radio Frequency choke suitable for operating frequency.

tuned to zero beat and the dial setting noted. The feeder is then clipped on the inductance, and the change in frequency, if any, noted. If the second frequency is higher than the first, the oscillator frequency is too high. If the second frequency is lower, the oscillator frequency is too low. The oscillator frequency should, therefore, be raised or lowered, as the case may be, until clipping the feeder on the tank coil makes no difference in the frequency, as indicated by the monitor, at which point the oscillator and antenna will be in resonance.

W9DBW also points out that once the correct frequency is determined, an ammeter may be

placed in the center of the antenna and the position of the feeder clip adjusted until maximum current flows, the oscillator frequency of course being unchanged during these adjustments. This is *not* the same thing as varying the frequency of the oscillator until the meter gives a maximum reading. Such a practice will result in a distorted wave form on the antenna, as explained in September, 1929, *QST*, and will reduce the actual radiation.

FURTHER SWITCHING DEVICES

The advantages of tuned r.f. amplification are well known, but most amateurs have preferred to use an untuned stage to avoid tuning com-

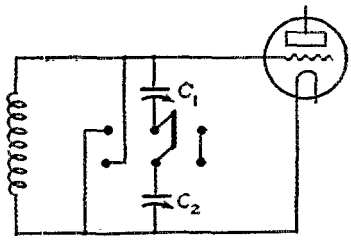


FIG. 5

Tuning condensers may be put either in series or parallel by installing a switch as shown.

plications. By means of a simple switching arrangement suggested by Gilbert J. Dutton, of Chicago, Ill., either tuned or untuned r.f. may be used at will.

Fig. 4 shows the system used by Mr. Dutton. In this case, the receiver uses an antenna coupling coil, necessitating the use of a double-pole double-throw switch. If the coupling is made capacitive for both tuned and untuned r.f. amplification, a single-pole double-throw switch will suffice. A resistor may be substituted for the radio frequency choke if desired.

Fig. 5 shows another switching arrangement suggested by Mr. Dutton which should interest those using series tuning condensers for band spreading. When the switch is thrown to the right, the condensers are in series, the setting of C_1 then being fixed at a point which allows the band to be spread properly on the dial of C_2, which serves as the tuning control. With the switch thrown to the left, the two condensers are in parallel, and either may be used for tuning. If the capacity of C_2 is several times as large as that of C_1, the latter can be employed as a vernier. With such a switch it is possible to cover both the broadcast and amateur bands with suitable plug-in coils, and the spread may be made as large or small as desired. Suggested values would be 50 $\mu\mu$fd. for C_1 and 350 $\mu\mu$fd. for C_2.

BIBLIOGRAPHY ON CRYSTAL CONTROL

More and more amateurs are using crystal-controlled oscillators. This is a good sign, although it should be realized that the mere use of a crystal in the oscillator is not a cure for all transmitter troubles. For instance, the frequency of a crystal-controlled oscillator depends upon the voltage and current at which the oscillator tube operates, the tube capacities, the temperature of the crystal, and the spacing of the electrodes in the crystal holder. The importance of temperature control, correct crystal holders, the proper oscillator tube operating at normal or reduced plate voltage and current, and the advisability of *calibrating the crystal under actual conditions encountered in practice*, have not been given sufficient serious attention. Simply inserting a quartz plate will not cure all transmitter troubles; it may not even guarantee to keep your signals in the amateur band.

The following bibliography on crystal control will, it is hoped, be useful to those amateurs who are using or are contemplating the use of crystal control.

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(*Continued on page 78*)

W4GV

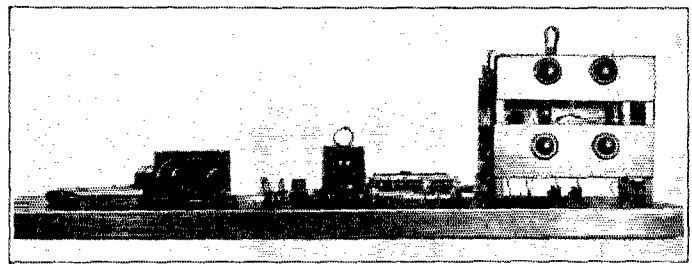
WHEN the 1929 regulations went into effect they did not concern Mr. Cornelius W. Zimmerman, of 604 East Parker Street, Lakeland, Fla., the present owner and operator of W4GV, for W4GV, with its Type '10 tube, has come into being since then. The station and the operator were both initiated into amateur radio in February, 1929. In building W4GV, effectiveness, convenience, and low cost were three requisites. Although the station uses a simple self-excited circuit, the contacts which W4GV has had with stations in other countries and continents has amply proved that it is possible to fulfill these three requisites without maintaining an elaborate or expensive station.

The station is built in a room in the basement, and is therefore quite comfortable in the summer when the weather gets hot. Moreover, by placing the station in the basement it was possible to obtain a suitable location for an antenna of almost any length suitable for amateur requirements. The cypress operating table is located directly in front of three windows. The two side windows are used for ventilation, while the center window was put to good use for providing insulation for the antenna feeders. On the table may be seen the receiver at the left, the monitor and station "chronometer" in the center under the call letters, and the transmitter at the right.

The first receiver to be used was a modest two-tube outfit using the circuit shown in Fig. 1. It was hoped that a screen-grid receiver could be built at a later date, but the original receiver using triodes was found to perform so well that it is still in use. The set is shown in one of the photographs. The wooden panel holds the tuning condenser (seen at the right), the regeneration condenser (at the left) and the band-spreading midget condenser between these condensers. The tuning condenser is a 100 $\mu\mu$fd. Cardwell remodeled so that only one rotor and one stator plate provide effective tuning capacity. The midget tuning condenser may be adjusted to permit the amateur bands to occupy a large portion of the tuning dial. This not only makes tuning in the crowded amateur bands easy, but makes it possible to tune a good distance on either side of the amateur bands.

The coils for the receiver are homemade and cover the 3.5-, 7- and 14-mc. amateur bands. They are wound with bell wire on a cardboard tube two inches in diameter, and, when given a coat of celluloid and acetone solution, are removed from the tubing. The coils are then mounted on a UX-type of tube base that has been sawed off so that only the four metal prongs and the flat disc holding them remain. Bakelite strips are bolted to the center of the tube base and the coil placed between the two bakelite strips and bolted in place.

The detector tube may be seen at the left of the coil and tuning condenser. The audio amplifying tube and transformer are seen to the left of the detector. Two small bakelite panels are screwed to the back end of the baseboard. The right-hand panel holds the two filament rheo-



GENERAL VIEW OF W4GV

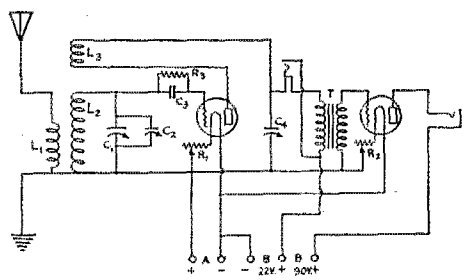
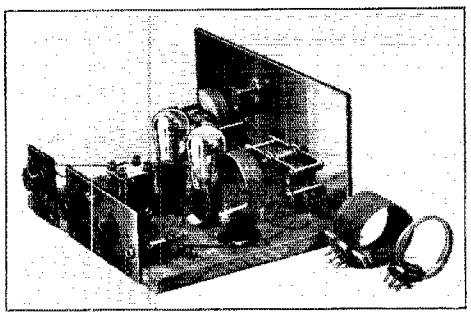


FIG. 1. — CIRCUIT OF W4GV'S RECEIVER

L_1 — 4 turns, 2 inches in diameter.
L_2 — 3 turns, 2 inches in diameter for 14 mc.
8 turns, 2 inches in diameter for 7 mc.
19 turns, 2 inches in diameter for 3.5 mc.
L_3 — 4 turns, 2 inches in diameter for 14 mc.
5 turns, 2 inches in diameter for 7 mc.
9 turns, 2 inches in diameter for 3.5 mc.
C_1 — Rebuilt 100-$\mu\mu$fd. tuning condenser, see text for details.
C_2 — 9-plate midget receiving condenser.
C_3 — 250 $\mu\mu$fd. regeneration control condenser.
C_4 — 250-$\mu\mu$fd. regeneration control condenser.
R_1 — 15-ohm rheostat.
R_2 — 10-ohm rheostat.
R_3 — 2-megohm grid leak.
T — Audio frequency amplifying transform.

stats, filament switch and two 'phone jacks. The panel at the left holds a UX socket which is used as a part of the home made plug and cable



W4GV'S RECEIVER IS SIMPLE ENOUGH, BUT IT WORKS WELL

arrangement to connect the batteries to the receiver; a UX tube base is used for the plug. The receiver is mounted on four soft rubber sponges which keep it quiet when the operating table is jarred.

W4GV'S TRANSMITTERS

During the first five months of operation one transmitter was used for operating in both the 14- and 7-mc. bands. Difficulty was found in returning to the same frequency, and considerable time was lost in retuning the transmitter each time it was operated in a different band. More thought resulted in the construction of a second transmitter. Both transmitters use the Hartley circuit, as shown in Fig. 2, and are of high-C design.

The construction of the transmitters may be seen from one of the photographs. Panel and sub-panel method of construction is used for both transmitters, and the transmitters are mounted one above the other. The first or bottom transmitter is four inches above the table; the second is ten inches higher. Filament voltmeter and plate milliammeter for both transmitters are mounted on the end of the framework in full view of the operator. Immediately above these meters are two porcelain switches for changing the filament and plate power supply from one transmitter to the other.

On a wooden panel in the rear of the frame are mounted two rows of Fahnestock clips and a double-pole double-throw porcelain base switch. The double-pole switch is the antenna change-over switch to connect either transmitter to the radiating system. The two sets of Fahnestock clips are connected to the jaws of the filament and plate supply switches at the end of the transmitter. The blades of these switches are connected to the four Fahnestock clips on the wooden crosspiece at the bottom and rear of the transmitter frame. Each transmitter can be removed from the framework by disconnecting the six antenna and power leads and sliding the transmitter forward toward the operator.

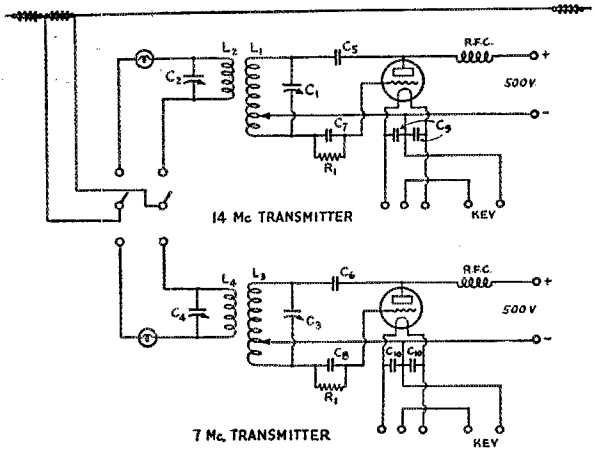


FIG. 2. — DIAGRAM OF THE TWO TRANSMITTERS AT W4GV

L_1 — 8 turns, ¼-inch copper tubing, 2½ inches inside diameter.
L_2 — 7 turns, ¼-inch copper tubing, 2½ inches inside diameter.
L_3 — 6 turns, ¼-inch copper tubing, 2½ inches inside diameter.
L_4 — 6 turns, ¼-inch copper tubing, 2½ inches inside diameter.
C_1 — 500-μμfd. tuning condenser.
C_2 — 250-μμfd. feeder tuning condenser.
C_3 — 250-μμfd. tuning condenser.
C_4 — 350-μμfd. feeder tuning condenser.
C_5 — 500-μμfd. plate blocking condensers.
C_6 — 2000-μμfd. plate blocking condenser.
C_7 — 250-μμfd. grid condenser.
C_8 — 2000-μμfd. grid condenser.
C_9 — 2000-μμfd. filament by-pass condensers.
C_{10} — 1000-μμfd. filament by-pass condenser.
R_1 — 11,000-ohm tapped grid leak.
RFC — 160 turns No. 30 D.C.C. wire on ¾-inch dowel rod.

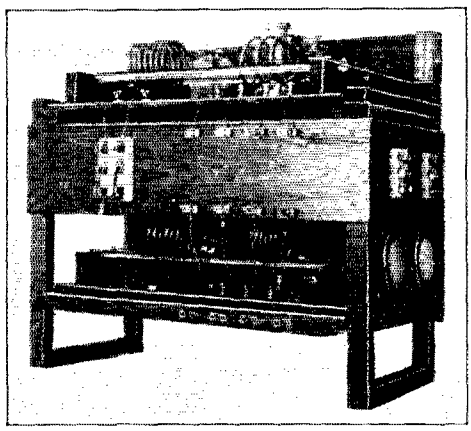
The lower transmitter operates in the 7-mc. band. The tuning condenser consists of a 250-μμfd. variable condenser shunted by two 500-μμfd. fixed condensers connected in series, so that the tuning capacity varies from 250 μμfd. to 500 μμfd. The feeders are tuned with a 350 μμfd. variable condenser. Since funds were not available for the purchase of a radio-frequency ammeter, a flashlight bulb is used to indicate resonance. A miniature socket is mounted in the antenna lead and a six-volt lamp, shunted with a length of No. 12 wire, serves very well as an antenna resonance indicator. The transmitter may be tuned easily by watching the indications of the antenna lamp and the plate current meter.

The second transmitter is constructed much the same as the first although, of course, some changes were necessary, as this transmitter operates in the 14-mc. band. The tank circuit

of this transmitter is tuned with a 500-$\mu\mu$fd. condenser; a 250-$\mu\mu$fd. condenser is used in the feeder system. Tapped resistors are used for grid leaks in both transmitters, and this is found to be a decided convenience in adjusting the transmitter. Both transmitters are built after the design of the Hartley transmitter described in the August, 1928 issue of *QST*.

POWER SUPPLY

A center-tapped 250-watt transformer, having voltages of 500, 750 and 1000, supplies power to the plate of the oscillator tubes. A 40-jar chemical rectifier is used with lead and aluminum electrodes one inch wide and three inches long. A thin layer of oil is used on top of the solution of borax and distilled water to prevent excess evaporation of the electrolyte. The rectifier has been found to be entirely satisfactory in operation and requires very little attention. The filter consists of a "dime store" 30-henry choke coil and a 1-μfd. condenser "fore and aft" of the



A BACK VIEW OF THE DOUBLE-DECKED TRANSMITTER

choke. Reports that the signals are r.a.c. are obtained with the filter out but these reports change to d.c. with the filter in the circuit.

An 8-volt center-tapped filament transformer is used for the filament supply. The filament voltage is adjusted by a wirewound rheostat in the primary of the filament transformer. The transmitters are keyed in the center tap of the filament circuit.

The monitor at W4GV is not only used to check the performance of the transmitters but is used also as a frequency meter. It is built in a completely shielded Radiola III cabinet; although the box is somewhat small, it is possible by using small filament and plate batteries to place all the necessary components in one box. All apparatus is mounted on the panel so that, if necessary, the monitor may be easily removed from the cabinet. Only a 7-mc. coil is provided; for 14-mc. operation, the second harmonic of the monitor is used.

A Zeppelin antenna having its fundamental in the 7-mc. band is used for 7- and 14-mc. operation. One end of the antenna is supported by a 45-foot cypress pole in an orange grove and the other end is fastened to a pole on top of the house. Feeders are spaced with glass rods purchased from the local five- and ten-cent store. Both the antenna and feeders are made of No. 12 enamelled copper wire.

The equipment at W4GV is completely home constructed. The station is neither an elaborate nor an expensive one, yet it is entirely complete. The results that have been obtained have been very gratifying. W4GV is a good example of what can be done with limited equipment.

A New Electrolytic Condenser

AN improved type of electrolytic condenser which has several advantages over the older form has been developed by the Sprague Specialties Co. of Quincy, Mass. The voltage rating of the new condenser is higher than

could previously be used, while at the same time the leakage current and series resistance faults have been considerably reduced.

An exploded view of the unit is shown in the photograph. The anode (at the right) is a corrugated aluminum cylinder, giving a large effective surface area. The edges of the corrugations are rounded off to reduce leakage. This feature makes this type of construction superior to that using a ribbon anode, as the leakage is greatest when the edges are sharp. There is no way of electrolyte escaping from the cell. The cathode is a cylindrical

(*Continued on page 80*)

I.A.R.U. NEWS

Devoted to the interests and activities of the

INTERNATIONAL AMATEUR RADIO UNION

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New Zealand Association of Radio Transmitters
Norwegian Radio Relay League
Radio Society of Great Britain
Reseau Belge
Reseau Emetteurs Francais
South African Radio Relay League
Wireless Institute of Australia

Conducted by A. L. Budlong

WE hoped to have several new societies added to our official roster at the head of this column this month, but return votes from the various member-societies are slow in coming in, and we are not yet able to announce any results from the December, 1929, calendar. It was this calendar in which the new societies were proposed for membership.

Member societies which have business to present to the Union, or non-members who wish to affiliate with the Union, are urged to communicate with Union Headquarters immediately, in order that any matters of sufficient importance may be included in the next semi-annual calendar, to be sent out in June. We already have one additional society for proposed membership. The *Rede dos Emissores Portuguses* has signified its intention of wishing to become affiliated with the Union, and will be presented for a vote in the June calendar. Amateurs who are familiar with the good work of this Society in Portugal, and of the activity of Portuguese amateurs in amateur matters, will be glad to learn of this move.

Interest in the WAC Club continues high, and certificates are being issued at a greater rate than ever before. We have now started receiving applications from hams who have worked WAC on 'phone, and one such certificate has been duly issued to the President of the Reseau Belge, Mr. Paul de Neck. FB OM!

Interest in the DX Tables seems to be falling off. No tables suitable for including in this month's department were received. We want to add, however, that Mr. Al Giddis, W1ABG, has sent a very excellent table for the months of June, July and August, and this will be printed next month, with, probably, the last of the tables of Mr. Ponting, G6ZR. Thereafter, unless renewed interest warrants it, the feature will be discontinued.

AMATEURS ATTENDING A GENERAL MEETING OF THE RESEAU BELGE RECENTLY

Many French amateurs made a special trip to attend this meeting. The two gentlemen on the bench in foreground are Mr. Robt. Larcher (left) and Mr. Paul de Neck. No, we do not have the names of the YLs!

Which reminds us to state that we are more than willing to include in this section of *QST* anything that pertains to international work and that the readers want. So if you have something you want to see here, let us know about it, and we'll try to oblige. That, you will remember, is how the DX Table business started, and while it now appears to have just about fulfilled its maximum usefulness, it met with considerable favorable reaction for many months. So fire away.

WAC awards for 1928 appear at the end of this month's column.

BELGIAN SECTION

By Paul de Neck, Pres., Reseau Belge

An International Congress of short-wave transmitters is going to be held in Antwerp and Liege next July, on the occasion of the International Exhibition celebrating the Centenary of Belgian independence. The executive committees for the two sections have been designated as follows:

For Antwerp: Messrs. Keerse, ON4GW (President); Verhelst (Vice-President); Respen, ON4HV (General Secretary); Quaeyhaegens (Secretary); Leebuyckx (Treasurer); Dierickx, ON4EA and Nissen, ON4GK (Technical Advisers); and Perleaux, ON4IA and Dierckxens, ON4CZ (Traffic Managers).

For Liege: Messrs. Pissart, ON4PJ (President); Dabempre, ON4FH (Secretary); and Jonlet, ON4JJ (Treasurer).

The Congress shall be opened in Antwerp the 12th of July, 1930, and the program will be as follows:

Antwerp Section: Saturday, July 12th: Opening reception by the President of the Reseau Belge and officers. Visit to the Antwerp Exposition. Sunday, July 13th: International meeting with special program; visit to the Antwerp zoölogical gardens; special transmitter and receiver tests at our booth; special folklore attractions and entertainment. Monday, July 14th: International meeting; conclusions; special trip on the River Escaut and visit to the new maritime installations; banquet and hamfest at the exposition.

Liege Section: Tuesday, July 15th: Reception by the Liege section; visit to the international exhibition; technical meeting with special program; banquet and hamfest with special entertainment. Wednesday, July 16th: Technical meeting; conclusions.

Brussels Section: Thursday, July 17th: Reception by the Brussels section; visit through the city and principal wireless stations in the vicinity; banquet and hamfest; close of the Congress.

On the following day, at Brussels, will take place a special historical pageant, depicting all the costumes, emblems and banners from the time of the Romans up to the present.

Brother hams from all parts of the world are cordially invited to take this opportunity to visit Belgium, and special arrangements are being made to give men a cordial and friendly welcome. Those desiring further particulars may secure them by writing to the Secretary, Reseau Belge, 53 Boulevard Anspach, Brussels, or to the Antwerp Section, 15 Plaine de Malines, Antwerp.

General conditions on both the 7000- and 14,000-kc. bands have been rather poor for DX work, and nothing of particular interest is known at the moment. ON4HC has been in good contact with CE7AA, at Punta Arenas; ON4XAN worked XTF9O, on 48 meters, this being a ship near Spitzbergen; ON4GW and ON4KIR were received R8 on 'phone by I1MM in Italy.

BRITISH NOTES

By J. Clarricoats, G6CL, Hon. Sec'y, R.S.G.B. and B.E.R.U.

Additional interest in 28-mc. work has recently been noted, as a direct result of the special R.S.G.B. tests arranged by our Contact Bureau Section. During February conditions were somewhat variable over the week-ends. An increase in first contacts was reported. G5VB worked FM8RIT, and G6HP worked SU8RS, both being notable contributions. YI1LM was heard at good strength in London on February 23d, while ZS4M seems the most reliable South African. Very few new W stations have been logged.

Successful two-way working was established on 56 mc. between G2OL and G2OW. This is probably the first authentic QSO made in England by amateurs working in this band.

On the 7- and 14-mc. bands conditions showed a definite improvement. During the A.R.R.L. tests considerable activity was noted, although during the early days of the tests contacts from London appeared to be difficult except in the case of high-power stations.

Attention has been drawn to the fact that the conditions reports which appear in these notes are not always a true representation of the state existing at the time, but I would mention that in general an attempt is made to present average conditions for the month based on evening work, mainly, as the majority of the world's amateurs are busy during the day.

A series of 1750-kc. tests are to be run during April by the Contact Bureau Section. European amateurs are cordially invited to take part in this attempt to prove the present-day utility of this band. To clear up any misconception which may have arisen regarding the B.E.R.U., we would state definitely that the British Empire Radio Union is the name given to our Colonial membership, and is not intended in any way to

(*Continued on page 64*)

Calls Heard

A. H. Tüse, Railway Parade, Yeronga, Brisbane, Queensland

w7ag w6xw w6ev w6ad w6ps w6chk w6eph w6gm w6btz w6ent w8emd w9um w9dr w9ax w9apm w9ghv w8bkp w8eft w8bau w8ban w8mb s8sg w8enl w8adm w8eau w6bat w5zk w5ahx w5af w5jv w4ko w4ly w4aef w4bk w3am w3wo w3awl w3amt w2ee w2dp w2as w1dp w1ps w1pw w1hr w1bi w1bux w1epr w1ags w1apj ka1xn ka1el ka1jk ka1jr ka1ac ka1hc ka1pw ka1dj ka1hr ka1zc ka1nj ka1ac ka1cm k1dp k1hr k1ce k4ko lu6aj oa4z oa4r oa4m oa4t oaeq oa4b oa4h vs8ab vs6ae vs6ah vs7ag vs7ap vu2bq vu2zq eu2dn f8bu v8et f8wb f8ho on4tb on4bz on4pj on4my pa0gw pa0dw pa0hb g2dz hc2jm hc2ah hc1fg su8rs zpal sp3lb xu2uu ac8hm ac6bd ac2ag py1aw py1ca py2al pk2ag pk5bm pk4bo la2g x1a x9a j2eb ju2de xo7ax ct1bg cm2ac

SM6WL, Gothenburg, Sweden

14,000-kc. band

w1agi w1asf w1bil w1bwa w1caw w1cow w1cre w1ma w1rv w1sz w2aev w2ahi w2alk w2arb w2cxl w3hq w3ajd w3dh w4aef w4adm w8ea k4kd vk2ns vk5gr vs7ap vuxx zs2n zu6w

7000-kc. band

w1bwi w2alu w2cxl w4aef w4ft w8gz hc1fg ka1rc kfzt

28,000-kc. band

fm8bg fm8rit fm8bg

G5GP, Gus Parslow, 27 Eastbourne Road, Tooting Junction, S. W. 17, England

14,000-kc. band

ac1eb ce5aa ce7aa cx1oa fo3sl fo9sr py1ah py1ca py1cm py2ad py2ak py2ba ve2aa ve2be ve5ao ve5aw vk2kj vek3go vk5hg vk6mu vo8ae vo8mc su8rwy vq2bs vq2nc vq4msb vq5bh vs7ap vu2dr yl2gq zl2gh zl3aj zs4m zs5rz zs5w zt5r zu6w w1aqt w1asf w1cv w1da w2abi w2ba w2bka w2nm w3ajd w3bhp w4ahl w8ak w8dm w9ect wfa

W6DZM, George De La Matyr, 119 East Raymond St., Compton, Calif.

7000 and 14,000-kc. bands

ac1bd ac1bx ac8cw ac8go ac8hm ac8rv ac8tj ac8wp au1zy ce3ag ce3dg ce5aa cm2xa cm8yb ct3aj deaav earl52 f8dm f8er fm8rit g5by g6wy hc1fg hc2jm i1ll j1dm j3ct j1dp k1aan k4dk k6aim k6bhl k6ceu k6exo k6eqm k6evw k7anq k7ew kalaf kalag kalau kalce kalcy kalel kalhc ka1hr ka1jr ka1mc ka1pw ka1rc ka1zc kdv5 la1w lu3fa lu3pa nj2pa nn1nic nn7nic oa4q ok2si ozlk oz7y py2ih py2ii py2cb sm4xx sm8tn sm7rv ve2be ve2ax ve2ay ve3bm ve3bq ve3cj ve3cz ve3dd ve3fc ve3gt ve3kp ve1bc ve1bu ve1cu vedu ve1fd ve1gk ve1gq ve1hd ve5ev vc2dy vek2es vk2hm vk2lf vk2lv vk2nb vk2ns vk2rb vk3ag vk3bw vk3es vk3go vk3hk vk3hl vk3ho vk3nj vk3pr vk3rg vk3tm ve3wv vk3wx vk4bh vk4cg vk4kh vk4mm vk5hg vk5it vk5mb vk5wr vk6sa vk6wi vk7ch vk7dx vs3ab vs5sa vs6ag vs7ap v6ecq wfa wfat x2a x2at x2x s5z x9a xcn8mjb zl1aa zl1ao zl1bb zl1bc zl1bi zl1fc zl1fs zl1fw zl1fx zl2ab zl2ac zl2aw zl2bz zl2df zl2go zl3as zl3bb zl3bc zl3cm zl3ct zl4aa zl4am zl4ao zw2fm

VK2JT, C. Luckman, 72 Wangee Road, Lakemba, N. S. W., Australia

w1tk w1bkf w1ayj w1co w2ma w2cxl w2wy w2asg w2aaw w2eb w2rz w3anh w3en w3ant w3cvj w4rm w4au w1to w4js w4ao w5amn w5aan w5aqy w4axb w5wg w5aa w6awp w6aut w6am w6amw w6amn w6aih w6abg w6amm w6btd w6bh w6bch w6chw w6bpo w6dvz w6dlo w6dnm w6dpj w6de w6ebg w6elz w6ehi w6ece w6eiz w6emt w6ek w6eqf w6eoz w6ebn w6ihj w6of w6rpf w6wak w7aag wabg w7acg w7aco w8amg wart w7aiz w7ajw w7acg w7acd w7amg w7art w7aiz w7ajw w7aj w7be w7dow w7mb w7ts w7wg w8bud w8cyp w8fz w8rl w9an w9buh w9bqe w9dfy w9ecz w9eke w9eve w9um ka1mc ka1pw ka1ze ka1ce ka1jr ka1cm ka1rc ka1hc ka1hr ka1el ka1cy ka1xa ka1pr k6ch k6est k6ewb k6wec k6or ka1pr k6eh k6est k6ewb k6or k6eum k6euw k6esb k6evw ac2ff ac3fr ac8rv ac8cw ac1bx ac1ts ac8zw ac8go ac1bd ac2ay vc5js sp3kv lu3oh py1ab py2ik omitb ssiaz rl1lf cxo9 wfa bam xwh x1cm

K4KD, E. W. Mayer, Box 103, Ensenada, P. R.

7000-kc. band

w1adw w1ae w1ajd w1bil w1id w1mk w1pk w1vf w1wr w1za w2afo w2afp w2alo w2aof w2aoj w2ass w2box w2bpc w2ebp w2emu w2cqd w2de w2fn w2rd w2uk w3aer w3arp w3att w3avm w3bel w3dg w3ia w3ke w3na w3ux w4agr w1akw w4ar w4em w4fx w1gz w4ik w4si w4we w5afi w5afn w5cf w5mi w5qj w6bfe w6btx w6bxi w6czk w6dpj w6eib w6eif w6equ w6lx w6sf w7ac w7amx w7be w8aat w8aks w8ayw w8bax w8bcz w8bdk w8brh w8eml w8cyg w8dgb w8dld w8hx w8im w8la w8np w8pp w8sg w8yb w9aay w9apd w8aqz w9bvh

14,000-kc. band

w1axv w1bjn w1bl w1wv w2arb w2atk w2bbv w2bcx w2bih w2biv w2bka w2bon w2bwe w2evj w2fn w3apu w3cj w3gf w3mz w3rg w1pk w8abe w8bct w8bto w8cfr w8dxv w9ams w9clh w9ffq g2ma g5rq ve2be ve3da vk2gs xoq

7000-kc. band

w1anx w1bil w1cd w1cft w1mk w1np w1sz w2are w2ate w2auj w2avo w2ayj w2bai w2bvl w2bzb w2cg w2fn w2kj w2nt w2rd w2rt w2uk w3aer w3ahz w3amp w3apf w3apf w3ato w3fj w3hs w3lu w3uh w3vb w4aef w4agr w4ajk w4al w4ft w4lx w4oc w4qn w4we w5blv w5cf w6aaz w6abg w6beb w6byh w6bzd w6cum w6cxw w6czk w6dpf w6dwi w6ehi w6epz w6ew w6kg w6yx w7ac w7be w7kr w7mo w8aat w8acb w8adg w8aed w8aks w8aqm w9ac w8bce w8bgx w8bid w8bkp w8bnt w8bpf w8byn w8eau w8ebi w8cfw w8cyg w8cyj w8dap w8dlg w8dme w8dub w8dvk w8gz w8hx w8js w8np w8wk w8yb w9aay w9azy w9bba w9bko w9bqe w9bwj w9cbk w9cos wcps w9cuh w9dck w9ebo w9egq w9elx w9eru w9fdl w9fmr w9fsx w9gdh w9gdm w9ggq w9um w9yc kfr6 ve2ca ve3da ve3fn ve3gf ve3go w1abg w1abl w1acg w1ajd w1ap2 w1asf w1aze w1bad w1bft w1bkr w1bob w1bsk w1cmx w1cqr w1df w1hd w1hv w1la w1lm w1vs w1vz w1zb w2aey w2ajj w2amm w2aog w2arb w2bbv w2bok w2bys w2cjx w2cuq w2cxl w2fp w2kx w2ma w2ns w3acx w3adp w3aiu w3aiz w3ajh w3ake w3arx w3atj w3ekl w3dh w3fb w4abr w4ahj w4ly w4pj w5ww w8axa w8bm w8box w8bup w8cew w8era w8ded w8djv w8dpq w8dxv w8nw w8of w8pr w8ul w8sy w9aja w9bdw w9ef w9dgz w9dxl w9ef w9exw nj2pa ve2ac ve3bk vk2ns vk2rx x9a

(*Continued on page 84*)

Correspondence

The Army-Amateur Radio System

Independence, Calif.

Editor, *QST:*

A question often asked me these days is, "Why should I join the Army-Amateur Net? Is there anything in it for the ordinary amateur?" Having applied and been accepted by the A.A.R.S., I can quote some real advantages I have received.

The first point is that I now have an established, reliable traffic outlet, giving me an opportunity to report to the SCM with something more than "Traffic very light this month." The second is that I have a better excuse for operating a station than the usual "Ur sigs RAC FB," etc. The third, and from my personal standpoint, the most important, reason is that it gives excellent practice in copying transmissions not in plain English, my job being to handle a wire for the Western Union Telegraph Company.

The A.A.R.S. nets often shoot out unpronounceable cryptograms — "hash" as it is sometimes called — and it is necessary to hold an A.A.R.S. ticket to decode these transmissions or know when they are actually in code. Furthermore, the facilities are at hand to check your errors. After copying a few such "QYXTJLSVEZ" I land in my WU office next morning, and when some messages come in in Spanish or industrial codes I assure you they become easy in comparison. The technicalities have vanished, unfamiliar words have lost all terror, and if that does not make a better operator, whether land line or radio, I am shy considerable code work in my 22 years of telegraphing.

I hope new hams and others will learn the real value of Army-Amateur work.

—*Merle Smith, W6EAF, Alt. NCS, 9th Corps Area*

From the I.A.R.A. of China

Shanghai, China

Editor, *QST:*

Herewith enclosing list of calls heard by Station AC8HM operated by Mr. H. MacGowan, of Shanghai.

We trust that this information will be of interest and worthy of attention in that wonderful organ, *QST*. We want you folks on the other side to know that through the means of amateur radio, we are enabled to keep in touch with one another regardless of the miles that may separate us, and also that your interests are our interests and that we look to the American Radio Relay League as a son does to his father.

Wishing the American Radio Relay League every success.

— *T. J. Engstrom, Secretary, The International Amateur Radio Association of China*

XDA

Buffalo, N. Y.

Editor, *QST:*

I would like to register a protest against commercial station XDA.

He is not only within the 14,000-kc. amateur band, but his signals spread over five degrees on my tuning dial and his key clicks much farther. Can nothing be done about this encroachment in our band?

— *Burton T. Simpson, M.D., W8CPC*

EDITOR'S NOTE: Mexico has not ratified the Washington Convention of 1927, and is therefore not bound to observe the frequency assignments for different services outlined in that treaty. It is our practice in cases of this kind, where the country in which the interfering station is located is a party to the Convention, to refer the question to the I.A.R.U. section in that country for action. There is no national society in Mexico affiliated with the I.A.R.U.

Good News Two Ways

Ancon, C. Z.

Editor, *QST:*

I wish you would publish my gratitude toward Sgts. Henry C. Grant, 10th Signal Co., Corozal, C. Z., and George C. McVicker, 15th Signal Co., Ft. Monmouth, N. J., stations KDV5 and W2CXL respectively, for their prompt aid in obtaining the good news for me, in about 40 working minutes, that my father had recovered from pnuemonia, and was again up and about at his home in Long Island, N. Y. I was very much worried down here in the Canal Zone, for I naturally feared that the worst was to come.

I promise in future not to censure my husband when he stays late at KDV5 with his ham friend, Sergeant Grant.

Continued prosperity to the A.R.R.L. and the Army and Navy Ops.

— *Mrs. A. A. Kopf*

Broadcasts from W1MK

Editor, *QST:*

Ever since the Spokane flight started, I have been trying to get a solid copy of broadcasts from W1MK, but have failed on account of the dozen or so stations that continue to operate on W1MK's frequency. Have been following your endeavors to collect the different news items from the several amateurs who are in touch with the patrol, so that you might give us to all available reports up to 10:00 p.m. every night. Have noticed the poor coöperation of amateurs in something that I deem very interesting, and which ought to be the same to every amateur, as it brings us closer to the Signal Corps.

It seems to me that out of common courtesy to W1MK and the other 17,000 amateurs that all stations should keep clear of a channel sufficiently wide to allow W1MK to reach everyone without interference. We all ought to be interested in every signal that W1MK puts on the air, and tune him in whenever he has something to say. Personally, I have never heard W1MK on the air when there was not something being broadcast that concerned us all. I had rather copy W1MK than work my own little set.

I am certain that there are many more amateurs who would be pleased to see a channel kept clear for the use of our Headquarters station.

Let's hope this comes to pass in the near future.

— *Ross W. Brown*

A Good Method of Calling

Pettit Barracks, Zamboanga, P. I.

Editor, *QST:*

Would it be possible to insert a note in *QST* to the effect that amateurs in the States who wish to work DX should be more careful in giving their call letters? Quite often the signals are faint, and, while making CQ very slowly and distinctly, the call will be sent about 30 per minute. The result is that it is a jumble, and you pass up that station for one who makes his call letters slowly and distinctly. Only this morning I heard one signing W2C??, who, I am sure, would be pleased to know that his signals were being heard half way around the world. However, he made his call letters so fast and ran them together to such an extent that it was impossible to read him.

In this regard, I believe the system used by VK5HG the best I have heard. He usually calls as follows: CQ CQ CQ de VK5HG VK5HG VK5HG, repeating this over and over. The result is that you know exactly when he is going to give his call letters, and can be on the alert in case you missed him previously.

The point of the entire matter is that we are more interested in getting the call letters than we are in hearing CQ over and over. Less CQ and more call letters distinctly sent.

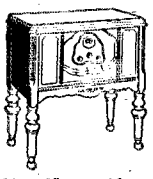
— *W. N. Haltiwanger, 1st Lieut., 45th Inf.*

New Screen Grid Neutrodyne Power Speaker Radio

In the Popular Newly Designed Low Utility Consoles!

Look at the pictures of the new Crosley "Companionship" Series shown in this advertisement — read the descriptions of chassis and cabinets, note the low prices — then determine for yourself whether or not they represent the most amazing radio values ever offered. These "Companionship" Series models, with their unusual features and unexcelled performance, will readily become true companions in millions of homes!

With the presentation of the new Crosley "Companionship" Series there is ushered in a new era in the development of radio receiving sets for the home. It is now possible to obtain radio sets — complete in beautiful low console utility models — with improved power speakers built in — using Screen Grid tubes, with Neutrodyne circuits, operating from electric light sockets — at prices so low that everyone can afford to own one Get in touch with your Crosley distributor today — get your share of the profitable business being created by this amazing new Crosley "Companionship" Series.

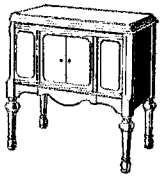


The CHUM

This model is a useful inconspicuous, low 3 and 5-ply walnut veneer cabinet for use anywhere. An improved Dynacone moving armature electro-magnetic power speaker is concealed in the cabinet. Uses six tubes — two Screen Grid No. –24, one No. –27 as a bias-type power detector feeding into two No. –71-As connected push-pull, and a No. –80 rectifier tube. Has built-in power supply incorporating genuine trouble-free Mershon condenser. Dimensions: 28¾" high x 27" long x 14¾" deep. Amazingly low priced at only..

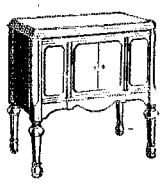
$75 Less Tubes

The PLAYMATE



This beautiful wood model is built of two-tone walnut veneer. The set incorporates the seven-tube refined Crosley Monotrad chassis. It uses two Screen Grid tubes No. –24, one No. –27 tube as a bias-type detector, one No. –27 as a resistance coupled first audio, two No. –45 tubes in push-pull, and one rectifier No. –80. The latest refined Crosley Type "M" Dynacoil power speaker is concealed in the cabinet. Dimensions: 29¼" high x 28¾" long x 16¾" deep. No radio value ever approached this model at only.....

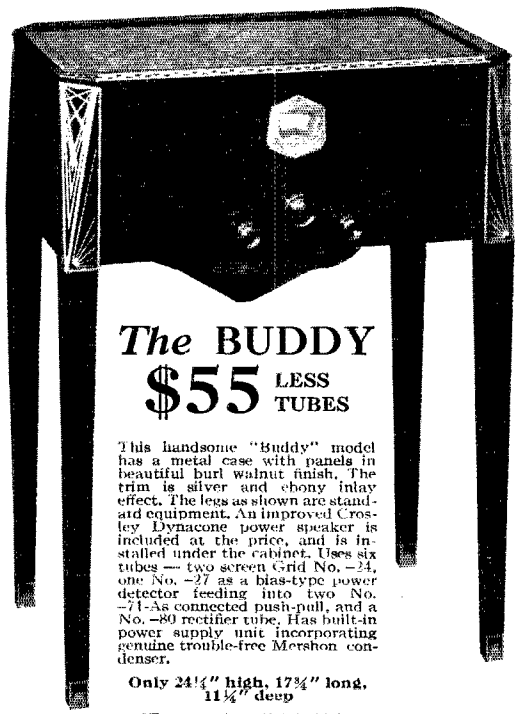
$90 Less Tubes



The COMRADE

This set is enclosed in the same cabinet as the "Playmate" but incorporates the refined Crosley Unitrad eight-tube chassis, giving somewhat greater sensitivity and performance due to the use of three Screen Grid tubes instead of two. You've never seen so much value in radio for only.....

$105 Less Tubes



The BUDDY

$55 LESS TUBES

This handsome "Buddy" model has a metal case with panels in beautiful burl walnut finish. The trim is silver and ebony inlay effect. The legs as shown are standard equipment. An improved Crosley Dynacone power speaker is included at the price, and is installed under the cabinet. Uses six tubes — two screen Grid No. –24, one No. –27 as a bias-type power detector feeding into two No. –71-As connected push-pull, and a No. –80 rectifier tube. Has built-in power supply unit incorporating genuine trouble-free Mershon condenser.

Only 24¼" high, 17¾" long, 11¼" deep

Western prices slightly higher

THE CROSLEY RADIO CORPORATION

Powel Crosley, Jr., President

CINCINNATI, OHIO

HOME OF WLW—"*the Nation's Station*"

You're *THERE* with a Crosley

CROSLEY RADIO

Auroral Display

Fairmont, Minn.

Editor, *QST:*

Having read the article in December *QST* on auroral interference, I would like to report an auroral display I observed, which seems to be at odds with all I have ever seen published. It took place in southern Minnesota during warm weather in 1917 in the early evening — before 10 p.m.

It first appeared as a glow (pink tinge) in the northwest with rapidly growing intensity, and appeared as a characteristic curtain aurora; like a drape sharply defined at the top, with a rather indistinct lower edge that wavered about. This rapidly approached us, from the northwest, and at the same time descended and also fluttered more violently as though blown by a wind. Then it began to break up into sections, and these, still coming closer, broke up into patches of light. These patches of light were quite distinctly outlined and looked like small clouds of phosphorescent fog. They were absolutely parts of the auroral display, yet they came down, still giving light, until they rubbed out against the ground.

Several of them passed between us and groves of trees so that I could swear that they were less than one fourth of a mile away. There was a very light breeze from the northwest, but these pieces of aurora do not seem to have depended on the wind for they traveled much faster. We tried to run into one of them with a car, but they traveled much faster than we could go — we could do 60 miles per hour easily, but they seemed to travel about three times as fast as we did.

This would seem to discount the belief that the aurora is a phenomena of rarified air, or that it only takes place in the upper regions of the atmosphere.

I have never seen another one break up and come drifting down in pieces and they are not common in this locality, and I have often wondered if any other people have seen such a display.

If several observers could be found to report such low auroral displays and have seen them actually rub out on the ground, would it not upset all present theories of aurora?

Perhaps some of our Canadian or Alaskan hams, or those with extreme northern United States locations, could report similar experiences if they would. I realize that one report won't change the accepted ideas of where the aurora takes place, but several would at least start an investigation.

— *J. A. Nightingale*

We *Do* Progress

Abiline, Texas.

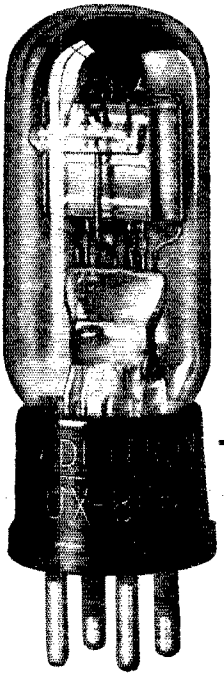
Editor, *QST:*

It has been some time since I have had the pleasure of exploring the pages of *QST*. Today while going through the March issue I noted the article on 14-mc. 'phone transmission. I would like to take this moment to compliment *QST* on

Radiotron

UX-864

A General Purpose, Non-microphonic Tube



Filament volts . . .	1.1
Filament amperes . . .	0.25
Plate volts	90
Grid bias volts . . .	-4.5
Plate current (m.a.) . .	2.5
Plate resistance (ohms) . .	15,500
Amplification factor . .	6.6
Maximum length . . .	4″
Maximum diameter .	1 3/16″

Possessing superior rigidity of construction, UX-864 may be used to advantage by amateurs in the design of their receivers and their microphone amplifiers.

Its freedom from microphonic noises, even when subjected to continuous vibration; its economy of operation, its small over-all dimensions—all these are features which will establish UX-864 as an important contribution to the improvement of amateur reception and transmission.

Sensitive in performance, yet free from microphonic disturbances, Radiotron UX-864 will be appreciated by those amateurs who desire improved tube performance.

RCA VICTOR COMPANY, INC.

New York—261 Fifth Avenue

Atlanta—101 Marietta Street — Chicago—100 West Monroe Street

Dallas—Santa Fe Building — San Francisco—235 Montgomery Street

this article, as I consider it one of the most comprehensive articles that I have ever read.

My work deals entirely with 'phone transmission, and it was indeed a pleasure to see amateur 'phones taken in the same light as broadcast transmitters.

The days of absorption loop modulation are over, and it seems good to me to see the interest that is being shown in honest-to-gosh amateur 'phones.

It has been two years since I have listened in on frequencies above 1500-kc., and received the surprise of my life when I unlimbered the old regenerative set last night and noted the difference on the higher frequencies. Almost all the old familiar signals that I knew were gone, but they were replaced with fine clean-cut signals that would be a credit to many a commercial station.

I hope the amateur fraternity keeps up the good work; it is wonderful as is. I'm for you and hope that I can be back in your ranks again soon. More power to you.

— *Wm. N. Greer, Chief Engineer, KFYO*

I.A.R.U. News

(Continued from page 56)

take the place of or compete with the I.A.R.U. The latter is an international body representing the national amateur societies of the world, while B.E.R.U. is but a suitable name for describing R.S.G.B. members located elsewhere in the British Empire.

We are pleased to record that our B.E.R.U. membership has almost reached the 200 mark. Egypt has recently provided us with a number of new members, while Canada, South Africa and Australasia continue to swell the Union. Our ultimate aim is to extend the B.E.R.U. into every corner of the British Empire. All inquiries should be directed to the Headquarters, 52 Victoria Street, London, S.W. 1.

GERMAN SECTION

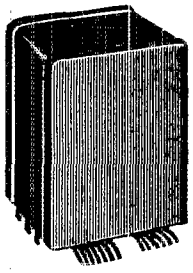
By W. Rach, D4ADF, Sec'y, D.A.S.D.

Considerably more activity has been shown by German hams on 3.5 mc., particularly by D4KZA, D4ADF and D4AFA. D4ABV and D4ABF, of Breslau and Karlsruhe/Baden, respectively, are working in that band, too. The principal reason for this 3.5-mc. activity seems to be the terrific QRM experienced on 7 mc. Over here, it must be remembered, we have many 'phone stations "busy" on 40 meters. It is everyone's sincere hope that they will leave the already crowded 7-mc. territory, however, and go either to 3.5 mc. or up to 1.75 mc.

When the QRM permitted, DX on 7 mc. was fair, and quite a few W stations were heard. Only a few of the D's got hold of them, though.

On 14 mc. some D's carried out tests with South Africa; D4LD being one of the leaders in this work. The most favourable time for South

RCA Power Transformers



Size: 5⅛x4½x3¼"
Weight 6½ lbs.

For UY-224 Screen Grid and UX-245 Power Tubes

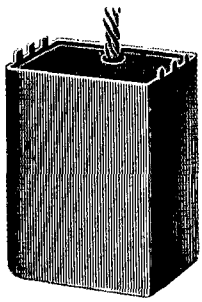
TYPE GW-380

This shielded Power Transformer was made by General Electric Company. It is an excellent Power Transformer for making up A. C. Receivers, Power Packs, or converting Battery Sets for A.C. operation. Primary voltage 110-120 volts, 50-60 cycles A.C. current, filament rating 60 watts. Rated to supply filament voltage for two 224, three 226, one or two 245 and one 280, also high plate voltage of 600 volts center-tapped for UX-280 tube. This Power Transformer is very conservatively rated and is exceptionally well built.

SPECIAL $5.75

RCA Double Filter Chokes

Contains Two 30 Henry 80 Mill Chokes



Weight 6 lbs.
Size: 5¼x3¾x2⅛"
List Price: $10.05

This heavy duty, rugged, double Filter Choke is excellent for all types of filter circuits and experimental work in receiving sets, power amplifiers, eliminators, transmitters and various other purposes.

Made by General Electric Company for Radio Corporation of America, and is RCA Replacement Part No. 8336 for the Radiola 33, 18 and 17.

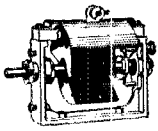
Each Choke has a 1000 Volt insulation test and the D.C. resistance is 500 Ohms.

When connected in parallel these double Filter Chokes have a capacity of 30 Henries at 160 Mills, and when connected in series have 60 Henries at 80 Mills.

Fully shielded in metal case with special insulating compound. Made of the best parts, including the highest grade of silicon steel.

SPECIAL $3.75

SAMSON SHORT WAVE CONDENSERS



10 mmf. to 125 mmf.	**List $7.00**	**Special $1.50**
10 mmf. to 75 mmf.	**List $7.00**	**Special $1.50**

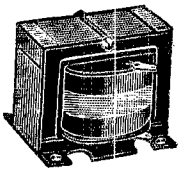
These Short Wave Variable Condensers are precision made and compact. Copper Shielded. This Samson Uniform Frequency Condenser is the finest made for High Frequency Short Wave work. For panel or base mounting.

We also can supply these Variable Condensers in capacities of 250, 350 and 500 mmf. for Broadcast wavelengths at a special price of $1.25 each.

DUBILIER FILTER CONDENSERS. Type P. L. 571-4 MFD 600 Volt. D. C. Working Voltage. List $12.00 . . . **SPECIAL $2.25**

THORDARSON DOUBLE FILTER CHOKES. Type T 2458 Each choke 18 Henries – 250 Mills. List $19.50 **SPECIAL $6.25**

FILTER CHOKES



30 Henries **120 Mills**

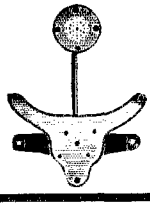
Manufactured by the Chicago Transformer Corp.

These Filter Chokes have a D.C. resistance of 400 Ohms. Made of Armco extra special transformer steel. Extra size core. Tested at 1600 Volts. With Mounting brackets.

Fine for any type filter circuits.

Special $2.25

Western Electric MICROPHONES



An efficient Microphone for use in amateur phone transmission and various other purposes.

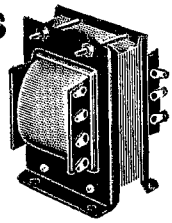
Breast Type (without straps).

Special $1.25

THORDARSON POWER TRANSFORMERS

150 WATT

Delivers 800 Volts (350 m. a.) center-tapped, also 5 Volts (4 amps.) center-tapped.
Excellent for use in furnishing power supply to a Transmitter or Power Amplifier.
Using this Thordarson Power Transformer in conjunction with a Filament Transformer is all that is necessary to build up the finest and most powerful A. C. set.
Operates on 90-125 Volts, 50-60 cycles A. C. current.
This rugged, heavy duty Power Transformer weighs 10½ lbs.



Model T-2430-A
Size: 6¼x4½x5"
List Price: $24.00

SPECIAL $3.95

AMERICAN SALES CO., 19-21 Warren Street, New York City

African work from this country seems to be 1600 G.C.T.

D4AFJ of Wuedlinburg/Harz is now licensed on 5 meters, and carries out regular experiments in that band. A detailed report on these tests is to follow.

Amateurs of the Saar District are using the prefix TS instead of D in accordance with present regulations. All cards for them are to be sent via the D.A.S.D., as usual.

NETHERLANDS SECTION

By H. Pomes, Asst. Traffic Mgr., N.V.I.R.

During January and February conditions remained about the same, which was bad, and only in the eastern part of our country was any improvement noticed. It is a curious thing that in our comparatively small territory the eastern amateurs have quite good results with DX stations, both as regards transmission and reception, while the western amateurs are practically "insulated" and are still waiting for better times.

Although our traffic department is making every effort to bring all 'phone amateurs to the 3500-kc. band, the number on 7000 kc. continues to increase, to everybody's disgust. The 'phone men seem to be devoting most of their effort to increasing their output, on the theory, apparently, that the man with the loudest voice will be able to work over everybody else. Conditions for c.w. in this band are about as good as ever, although usually impossible due to phone QRM. Many Dutch amateurs consider the 7000-kc. band as being virtually lost to them as an active band for this reason, and have gravitated to the 14,000-kc. band. It is this latter band which particularly shows the differences mentioned between the eastern and western parts of the country.

At the present time normal "winter" conditions are reported from the western part of the country, with generally bad DX possibilities and little or no long-haul reception. On the other hand, amateurs in the eastern part report working all over the world with comparative ease. PA0DW again worked all continents (several times) during this period, including 29 VK and 19 ZL QSO's. Much thought has been given as to possible reasons for the great difference between the conditions in the two parts of the country; at present it is assumed that the higher and drier ground, made up chiefly of sand and gravel, is the major influence.

We again want to point out that all Dutch hams use calls made up of the prefix PA followed by the zero (- - - - -) and not the figure ten, as we frequently see in other magazines. There are no divisions here, and the calls do not in any way indicate locations. Since our prefix is now PA, no Dutch amateurs answer calls using the old intermediate EN; please note this.

Our annual meeting was delayed beyond its set date, but was finally held on March 16th; it is hoped that a report of this meeting can be included in next month's report.

NORWEGIAN NOTES

By G. H. Petersen, LA1D, Sec'y, N.R.R.L.

The last month saw a general improvement in both transmitting and receiving conditions, and also a very marked increase in the activity of Norwegian transmitters. Although we have no pioneer work to report in the comparatively unexplored 28 or 3.5 mc. — the latter being "unexplored" for Norwegians — our members are showing much interest in low-power work on the 14- and 7-mc. bands.

LA1G says that conditions on 14 mc. are fine, again. He now works entirely from DX Tables and is able to make contacts regularly with South Africa, Australia and New Zealand. The rest of the Oslo gang is active with European, AU and FM contacts. LA2K complains that his new Philips TB1/50 tube will not "go west" (luckily for him — hi!) but seems to like the Bolshevist hams better, making a lot of EU and AU QSO's.

The Bergen gang has done some fine low-power work. LA2X has again worked W3, and LA2V, on the air for the first time in four months, got a reply from VO8MC on his very first CQ. LA1J made a contact with a running train, XSM5UX, near Stockholm, the Swede using an "indoor" aerial and only 7 watts. He is an expert in low-power work, having worked G with 50 volts and a few assorted milliamperes, and SM with .04 watts!

SWISS REPORT

By H. Degler, President, U.S.K.A.

The licensed Swiss amateurs want it distinctly understood that they are doing everything possible to discourage and locate the few unlicensed Swiss amateurs now operating on the air. All members of the U.S.K.A. are licensed; we do not give any encouragement to the operation of unlicensed stations, and will not forward any QSL cards for such amateurs.

The Swiss QSL service as announced in this department a short time ago is in error. Amateurs wishing to forward cards for Swiss hams should address them to *Swiss QSL Service, Postfach, Berne 2, Switzerland.*

JAPAN

Through the courtesy of Mr. Y. Katsuki, K6DPG, at Honolulu, we learn that a number of Japanese amateurs have been licensed to operate on short waves, most of them being J4's or J1's (followed by two letters, of course, to complete the call) and operating with a maximum licensed power of 10 watts on the 10-, 20- and 40-meter bands.

CHINA

Through Mr. Elliott Sigourney, W6DPF, we have the following report from the VS gang at Hong Kong: "Conditions on 14 mc. are becoming very erratic, and the VS gang has gone with one accord to 7-mc. territory in order to help our western station friends pile up points in the

A.R.R.L. contest. Much QRM is being experienced from the KA stations, but the top score so far is way ahead of that in the last contest. VS6AH (who sent the report — A.L.B.) is old AC1AX, and will be glad to forward cards for the VS6 gang. The address is Box 414, Hong Kong, China."

BRITISH COLONIES

We learn that the prefix VS is assigned to all British colonies in the Far East, with the numeral following this prefix used to designate the particular colony concerned. So far these seem to be:

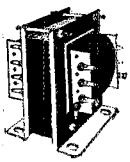
VS1 — Singapore
VS3 — Malaya
VS6 — Hong Kong
VS7 — Ceylon

WAC

The following were issued W.A.C. certificates during the year 1928:

F. N. de A. Costa, sb1AO; L. E. Green, foA4V; Walter S. Keith, nu1CMF; William C. K. Irwin, nu2CUQ; H. D. Huston, nu6BZF; E. G. Smith, eg5YX; Ralph E. Pierce, nu1AXA; John R. Witty, eg5WQ; Don C. Good, nu6AJM; Buck McKinney, nu5ATF; Robert H. Powell, nu1AQT; C. A. Richardson, eg2RX; Donald A. Troy, nu2BIR; J. A. Partridge, eg2KF; Robert J. Browne, oa4RB; Julius Geritz, nu6CTX; Fernand Fontaine, ef8GI; F. L. Stollery, eg5QV; A. F. Sise, nu1ASF; B. W. Thompson, nu1BW; Harold Thomas, nu1ID; Fred Link and J. B. Knight, nu2ALU; W. McDonald, nu2TY; W. E. Jackson, nu3HF; Guy L. Carter, nu4OB; William Penn, nu5AAK; Edwin Lofquist, nu7ABH; Herb Hollister, nu9DRD; Robert Dubs, ef8FR; W. E. D. Bennett, foA3V; F. E. Frost, foA9A; Max Spitzkowsky, oa2MS; W. H. Barber, oa5WH; Hubert F. Lovett, oa7HL; Earl C. Dunn, nu5MX; Paul D. Houghtaling, nu8CJM; Clement Coleman, nu9CRD; C. E. Krohn, nu6DEV; G. A. Sears, nu6BQ; P. B. Curtis, nu1BKE; P. E. Bostaph, nu5AVS; H. G. Musterman, nu2TP; W. Y. McAuley, oa3WM; Vernon L. Harvey, nu6BCH; Yves Naintre, ef8YNB; J. Halenback, nu6CUC; W. H. McAulay, nu6CLO; Curt Relph, nu9BPL; J. E. Mersch, nu5AGQ; G. W. Fisk, ac2FF; Carl Miller, oh6AVL; H. Rieder, oaA4X; C. W. Jones, nu6BYZ; Robert J. Wood, nu8CDB; A. I. Innes, foA4E; Carlos Reiher, sc2AR; G. C. Stevens, sb1BO; G. T. Gulde, oz1FB; D. R. Whitburn, oa5BY; James E. Turner, nu3WM; Roy Gould, nu6DHQ; R. G. Chatfield, oz2AV; K. Keeley, nu6DHS; Lt. Eugenio de Avillez, ep1AE; W. R. Shuler, nu6CSJ; Glenn Morgan, nu5AMO; Glenn Mrans, nu6ADP; R. R. Sawell, ep1BK; B. W. Warren, eg6CI; N. J. Winch, oz1AP, Stephen Lieberman, ej7DD; J. Freitas, sb2AZ; A. T. Hutchings, oa3HL; Charles H. Colman, nu3QT; Robert V. Byron, nu1AVJ; Ingram Patterson, oa3CP; L. H. Thomas, eg6QB; Dr. Joao R. Baccarat, sb2AJ; George Miles, eg5ML; G. Dexheimer, ef8GYD;

THORDARSON TRANSFORMER



150 watts, 400 volts each side of centre tap at 375 M. A. 5 volt filament, centre tap. Fine for power supply for 7½ watter or for crystal control power supply. Specially priced for a short time only. Each **$3.95**

Size 6¼ x 4½ x 5

Net weight 10½ lbs.

Make your own transmitting and receiving coils. Copper tubing transmitting inductance.

Size of tubing

Inside Dia.	3/16"	1/4"	5/16"
2 1/8"	9c	10c	12c*
2 3/8"	9c	10c	15c*
3 1/8"	10c	12c	17c*

Prices per turn

Ham Green, double silk covered, No. 16 receiving inductance.

2" diameter.....30c per inch
3" diameter.....35c per inch

LEEDS

The Home of RADIO

45 VESEY STREET
NEW YORK

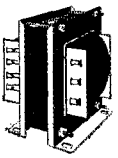
New York's Headquarters for Transmitting Apparatus

When in Town Visit Our Store

EVERYTHING IN
ACME JEWELL PYREX
BRADLEY FLERON
THORDARSON
ELECTRAD NATIONAL
LYNCH SIGNAL
FLECHTHEIM
NATIONAL RECTOBULB
GENERAL RADIO
CARDWELL
IN STOCK

THORDARSON B-Eliminator TRANSFORMER

using the Raytheon B-H tube. Will carry the maximum current consumption without overheating. 285 volts on each side of centre. Lower voltage may be obtained if desired. Listed at $5. Special NOW only . . **$1.65**



Size 3 x 4 x 3" — Net Weight 2¾ lbs.

NEON GLOW LAMPS

Super Sensitive
For wave meter and other uses; candelabra base. ½ watt, ⅝ inch diameter. 1¾ inch long over all. Special.....**$1.75**

Porcelain base socket for above lamp.....10c

Aluminum Shield cans and panels of every description to order.

SPECIAL NOTICE

The 6th edition (second printing) of the Handbook contains 4 pages of items you need from time to time. Look for Them.

Write for special folder and prices

DUBILIER HIGH VOLTAGE FILTER CONDENSER

4 MFD. D.C. Working Voltage 600 V

These Filter Condensers are designed for use in filter circuits in Transmitters, and all high Voltage Socket power devices and Power Packs.

SPECIAL $2.25

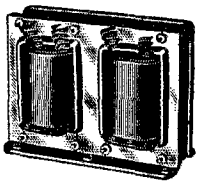
TYPE PL 571
List Price $7.25

THORDARSON DOUBLE FILTER CHOKES

CONTAINS TWO 18 HENRY 250 MILL CHOKES

Heavy duty, rugged double Filter Reactor for Filter Circuits in Transmitters, Power Amplifiers, "B" Eliminators and various other purposes. ¶ Each Choke has a 2000 Volt insulation and the D.C. resistance of each Choke is 108.5 ohms. ¶ When connected in series this Filter Reactor has a capacity of 36 henries at 250 mills, and when connected in parallel 18 henries with 500 mills carrying capacity.

SPECIAL $6.25



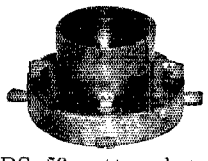
MODEL T-2458
List Price $19.50

1930 SHORT WAVE RECEIVER

A short wave receiver that's got them all beat. Best circuit design and finest mechanical construction. 3-Tube Receiver — detector — 2 audio, using three 201-A tubes. Universal type, continuous range 15 to 100 meters; amateur type covers Ham bands 20–40–80 meters with generous spread on the dial. List price $60. *Special Offer*, net..... **$37.50***

SHORT WAVE X-MITTER

7½ Watt Hartley type Transmitter. Will operate with a 201-A tube, with 90 volts on the plate, up to a UX-210, with 30 watts input; has plug in transmitting coils. List price—kit $55. Completely constructed $70. *Special Offer*, completely constructed **$57.50***



By Insistent Demand

LEEDS 50-watt socket, positive contact; heavy phosphor bronze springs, heavy brass shell; highest grade porcelain insulated base; will hold your tube in one position. Specially priced.

LEEDS RADIO LABORATORIES

Precision Custom Built Short Wave Receivers and Transmitters

This department under the supervision of the Short-Wave Specialist Jerome Gross. We design, construct and advise on any material for the "Ham" Broadcasting station or laboratory. Write Jerry Gross for advice on any of your problems.

PLEASE PRINT YOUR NAME AND ADDRESS PLAINLY to AVOID DELAY | **WRITE FOR SPECIAL PRICE LIST** | **MAIL ORDERS FILLED SAME DAY** *10% Cash Must Accompany All C. O. D. Orders*

R. H. Sainsbury, oa2YJ; C. W. Baker, oa3VP; E. W. Simms, oa3XS; H. D. Price, eg6HP; E. Menzies, eg5MQ; G. L. R. Lower, foA6W; H. F. Abella, su1FC; A. Depuyott, eb4CB; Allan Caldwell, ac2CK; W. K. Adamson, oa5UA; H. M. Cooper, Glenleg, S. Australia; Charles Heiland, nu6DCV; Charles M. Green, nu6DOR; Charles L. Lundblad, nu6CYX; M. E. Endersby, nu9AVJ; Henry J. Welsh, nu1CPB; I. D. Chisholm, eg2CX; H. B. Elsberry, nu6BSN; Charles Harrison, oa7CH; D. O'Dwyer, eo18B; Harold G. Fownes, oz2GO; George Merriman, ac1AX; Robert H. Reid, nu4TK; H. T. Petersen, ed7ZG; J. R. Wells, nu6QL; Bill Martin, nu3QE; C. F. Bane, W6WB; Tom Jentges, W6BXI; E. P. Jobe, W6AKD; E. S. Clift, W6BJH; S. Embling, oa3DC; E. L. Mallette, W6ARV; T. R. Vianna, sb3QA; H. Brabrook, eg6BB; H. F. Petersen, ed7HP; San Mateo Junior College Radio Club station W6JU; Conde de Thomar, CT1BX; Cid Santos, sb1AK; H. J. Powditch, G5VL; Willy Blaschek, EAKL.

Staff Changes

(*Continued from page 15*)

I.R.E. to become communications manager of the Globe Communications Co. (H. & K.-Dollar) at San Francisco, Westman was made full secretary and promptly came to Hartford and demanded that we do our duty again. We hope the third time is "the charm."

Our Regulations Are Revised

(*Continued from page 20*)

be judged only by its external effects. Power changes were what the authorities most wanted to have on record. It was finally solved by the requirement that the amateur note his plate watts input (to the last stage) on his log at every transmission.

Section IX is a simple authorization of the Department of Commerce to carry on the routine licensing of amateur stations. The Department of Commerce would have no authority over *stations* without this declaration. The Commission is not permitted to delegate any of its discretionary functions, however, and the legal situation is necessarily such that all special cases must come to the Commission itself and be handled in all due formality as provided in the Radio Act.

These new regulations are now in effect. The Radio Division is already at work making the license changes dictated by the changes in text. So far as the regulations require change from the present practice in the individual amateur's station, they apply at once and each of us should proceed to make the necessary changes. Although no one will insist or admit that they are perfect, they are a big improvement over the old text, they better fortify the amateur position,

A SAFE GUIDE

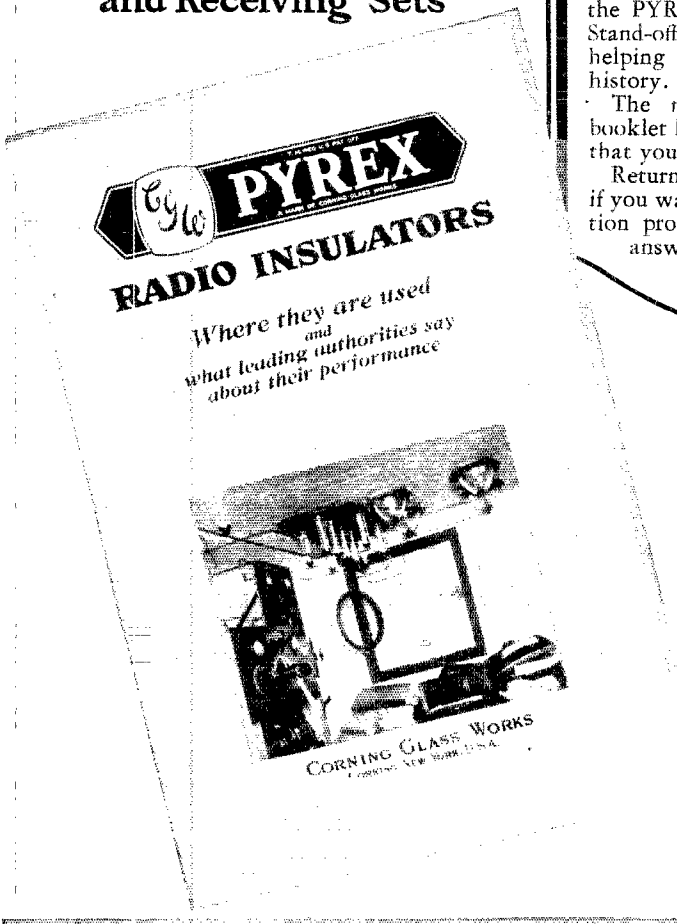
in the selection of insulation for Radio Transmitting and Receiving Sets

OVER 300 broadcasting stations, leading radio telegraph systems, the United States Army, Navy, Air Mail, Coast Guard and Ice Patrol Services, explorers like Commander Byrd, and exacting amateurs everywhere have utilized PYREX Insulators in many spectacular achievements.

Regardless of whether you are sending or receiving — on land, sea or airplane — you should be thoroughly familiar with the PYREX Antenna, Strain, Entering, Stand-off and Bus-bar Insulators that are helping these leaders to make radio history.

The new PYREX Radio Insulator booklet lists all types and sizes with data that you will want for ready reference.

Return the coupon for your copy, and if you want further advice on any insulation problem, our Technical Staff will answer your questions promptly.



Send the coupon for your copy

CORNING GLASS WORKS
Corning, N. Y.

Gentlemen:

Please send me copy of your new bulletin on Radio Insulators.

Name

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Address

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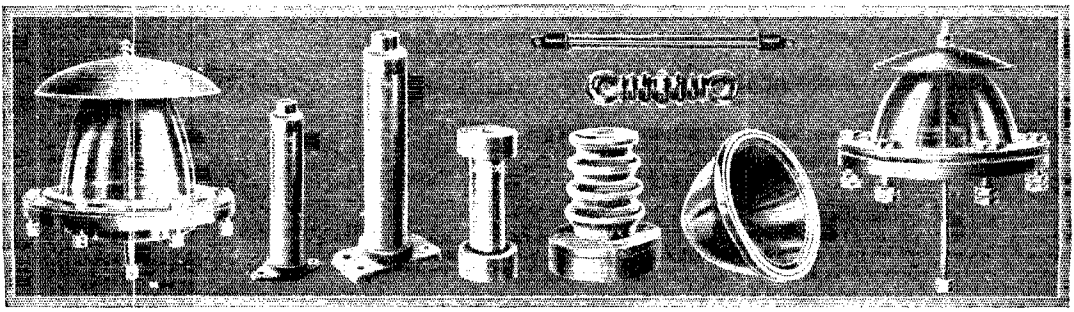
QST 4-30



and by and large they are the most liberal and the most sensible amateur regulations anywhere in the world today.

Official Frequency System

(*Continued from page 42*)

While no responsibility, financial or otherwise, is assumed for the accuracy of these transmissions, every effort will be made to have it exceed the figure given.

Reports on Standard Frequency Transmissions are solicited from all who take advantage of this service. No matter how far from or how near to the transmitting station you may be, your report will be of value to us. Standard blanks which will facilitate your filling out and our handling of the reports are available on request. All such requests and reports should be addressed to: Experimenters' Section, American Radio Relay League, 1711 Park St., Hartford, Conn.

After your report has been checked, and acknowledged, it will be forwarded to the Standard Frequency Station upon whose signals it comments.

OFFICIAL FREQUENCY STATIONS

(Required accuracy 3–10 of 1%)

W1AVW-W1ZL, W1AWW, W1AXA, W1BD, W1BZQ, W1CCW, W1CK, W2BO, W2CDC, W2CLA, W2DS, W2EF, W2MU, W2UV, W4BY, W4LK, W5EW, W5OX, W5SP, W4ZAV, W6AKW, W6AM, W6AYC, W6ACE, W6AVJ, W6BB, W6BGM-W6CVO, W6BMW, W6BRO, W5BZU, W6CAE, W6CDY-W6CPX, W6CMP, W6EC-W6XE, W6QL, W6QX, W6WN, W6ZV, W7AAT, W7GQ, W8AQ, W8EQ, W8GZ-W8ZG, W9AHQ, W9ACG, W9BGH, W8BGK, W9BVC, W9CBK, W9BZO, W9CPM, W9EGU, W9IG, G2PD, G2NM, G5BY, G5YK, GI5NJ, VE2BE, VE3CO, VE3FC, VE4BT, VK5BG, VK5LF, VK7CW and ZL2AC.

STANDARD FREQUENCY TRANSMISSIONS OF WWV

Schedules of standard frequency transmissions from WWV, The Bureau of Standards, Washington, D. C. will be found on page 8 of the January issue of *QST*.

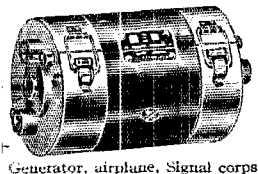
—*J. J .L.*

Strays

The editorial in the January 10 issue of *Wireless Weekly* (Sydney), entitled, "Amateurs Going Down," contained the news that the privilege of amateur operation in the frequency band of from 1500 kc. to 1200 kc. has been withdrawn. The band is now given over to broadcast activities, since "his (the amateur's) small use of the 200- to 250-meter band may be taken as an indication of his fading interest." Have you ever listened in on 7 or 14 mc.?

BARGAINS

ARMY AND NAVY RADIO SURPLUS



DYNAMOTOR WESTINGHOUSE B. BEARING 12/350 volts, 80 mils. **$18.00**

32/350 volts, 80 mils. **$15.00**

Generator, airplane, Signal corps, with shaft, can be used as motor, 12 volt 33.6 amps. 5000 R.P.M. $10.00

Generators, 12 volt, 60 amp. has automatic controls. 20.00

West. Elec. Dynamotor, C.W. 927, two D.C. 32/350 volt dynamotors in noiseless hangar. Used in parallel gives 160 mils at 350 volts, series gives 80 mils. 700 volts, suitable for xmitters and receivers 25.00

West. Elec. switchbd. control panel for above dynamotors, has switches, 0–50–500 voltmeter, complete filter system, etc. Special 8.00

Ammeter, Weston No. 425 thermo-couple 0–2 amp., mtd. on large bakelite base with D.P. hi voltage switch. ... 7.50

Ampere hour meter, Sangamo, battery charge and discharge, type MS 0–500 scale, capacity 15 amp. 10.00

Milliammeter, Westinghouse, 0–150 surface mtg., b. con. 5.00

Milliammeter, Westinghouse, type C.A. 0–500, zero adjustment, flush mounting 5.00

Voltmeter, Westinghouse, type C.A. 0–25, zero adjustment, flush mounting 5.00

Voltmeter, Westinghouse, A.C. 8" diameter with external resistance 0–175 volts, 60 cycle power house type. ... 12.50

Voltmeter, Westinghouse model PT, 3 scale, 0–5, 0–7.5, 0–150 for measuring A, B and C voltages, portable bakelite case. Special 3.00

Motor generator, Crocker Wheeler & Holtzer Cabot, 110 D.C. 220 A.C., 500 watt, 500 cycle. Ball bearing. .. 50.00

Complete line 500 cycle motor generators ¼ to 5 K.W.

Transformers, General Electric, 125 to 2500, with center tap, 60 cycle, 200 watt 7.50

Transformers, Simon, 220 to 11,500 closed core, ½ K.W., 500 cycle, "pancake" secondary 5.00

Transformer, Amertran, oil immersed, 1 K.W., 500 cycle, 220/8000 volt 10.00

Transformer West. Elec., output, No. 102 A, 4 to 1 ratio.. 3.50

Transformer West. Elec., output, No. 202 A, 5 to 1 ratio.. 3.50

Transformer West. Elec., imput No. 201 A, 7 to 1 ratio... 3.50

Condensers, transmitting, Murdock .0017 mfd. 12,000 volt, ideal for plate blocking 2.50

Condensers, Wireless Specialty, copper glass leyden jar, 10,000 working voltage .002 mfd. 2.00

Condenser, Dubilier, mica, op. volts 12,000 cap .0004 .... 10.00

Condenser, Dubilier, mica, volts 40,000 cap .0012–.001–.0008 or .003 ..... 30.00

Condenser, Dubilier, mica, op. volts 8500 cap .004 ..... 10.00

Condenser, Dubilier and Wireless Specialty, op. volts 12,500 cap .004 ..... 12.50 to 20.00

Condensers, West. Elec. 21 A.A., 1 mfd. 1000 volt A.C. test 1.00

Condensers, Grid, with leak, mica Dubilier (Aircraft) .003 mfd. 1500 volt, 15,000 ohm 2.50

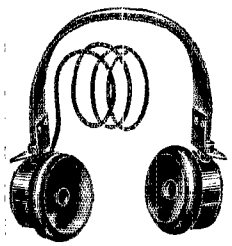
Headphones, West. Electric No. 194W same as C.W. 834, 2200 ohms, D.C. slightly used 5.00

Holtzer Cabot, "Mike" Utah type, carbon granular transmitter. Special ..... $ .95

Western Electric Radiophone Transmitter unit, 326W. Special $1.50

Dynamotor, GE Navy Airplanes 24/750 volts. Aluminum frame, unusually good for airplane test work. Specially priced, 200 mils 25.00

Dynamotor, aircraft 32–275 volt, with shaft 10.00



HEAD PHONES U. S. NAVY

Pair **75c**

80 Ohms. Excellent for practice and instruction purposes. High grade make.

NAVY Dynamotors General Electric 24/1500 volt. 233 mils $37.50

Edison storage battery cells, nickel alkali, 225 amp. hour, 1.2 volt type A-6, weight per cell 20 lbs. 4.00

Coils, Retardation, West. Elec. Co. 57C, .83 ohm, 2 windings 1.00

Ret. coil West. Elec., No. 65 A, 1800 ohm 12 henry 2.00

Ret. coil West. Elec., No. 66 A, 85 ohm 1.3 henry 1.50

Ret. coil West. Elec., No. 64 B, 11 ohm 1 henry 1.50

Induction coil, platinum contacts, can be used as Hi. pitch buzzer 1.50

Telegraph and buzzer portable sets, mahogany case, 2 tone 4 contact platinum contact high frequency buzzer, 3 telephone toggle switches, potentiometer, sending key, 3 mfd. condensers, transformer and 2 choke coils, receiver, $30. value 5.00

Magnetos, Army mine and ringer type, 4 large magnets.. 1.00

Battery, U. S. Army, lead-acid type, 10 volt, 20 ampere hour. Consisting of 5 individual 2 volt cells in carrying case 5.00

Sounders, Signal Corps, 120 ohms, adjustable 2.50

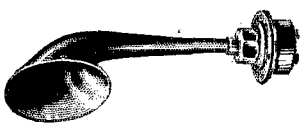
Spark transmitter, complete, airplane type, rotary gap, transformer, mica condenser, 200 watt 500 cycle with Gen. self x-cited ball-bearing 35.00

Generators, Westinghouse 110 volt, A.C. 900 cycles, 200 watts, self excited 15.00

Generator ¼ kw. 500 cycle, 300 volt, self x-cited, can be hand driven 25.00

Voltmeters, D.C. portable new Weston model 45, 3 scale 0–3–15–150 guaranteed ½ of 1% accurate 40.00

Ammeters, D.C. portable, new Weston model 45, 3 scale 0–1.5–15–150 with 3 scale external shunt and leads ¼ of 1% accurate 40.00



LOUD SPEAKER

$5.00

UNIT 193 West. Elec. Ideal for monitoring. Transmitter with Horn

Headphone, Army, with strap, 120 ohm ..... .75

Headphone, Radio School, leather headband, 75 ohm.... 1.50

Keys, transmitting, Navy, back connected on bakelite base, 2 kw., ⅝-inch silver contacts 5.00

Keys, xmitter, 2 kw., comb. relay and hand ⅝" silver contacts 10.00

Keys Navy, ¼" silver contacts 1.50

Charging panel, Navy type, S.E. 899, 32 volt, Ward Leonard, var. and fixed res., Weston voltmeter and ammeter, Sangamo ampere hour meter. Complete with all switches 30.00

Buzzers, Western Electric, Extra quality, high frequency 1.50

Receivers, Navy, C.N. 240, 1000–10,000 meters 50.00

Receivers, S.E. 143 and I.P. 500 100–150

Resistors, vitrohm, screw base, 600, 900 or 2000 ohm. ... .50

Resistance, variable 200 ohm 1.5 amp 1.00

Rheostats vitrohm, variable Ward Leonard, 500 ohm .2 to 1.5 amp 35 tap field reg. type 5.00

Rheostat, vitrohm, variable, Ward Leonard, 6 ohm 15–5 amp. bat. charge type 3.50

Resistors, vitrohm Ward Leonard, with leads, ass. sizes per doz. 1.50

Relays 2 and 5 kw. (110 or 220 volt) ⅛ silver contacts.... 7.50

Relay West. Elec. low voltage, 2 upper and 3 lower platinum point screws, 3 contact arms 5.00

Extra platinum contact screws or arms ..... .35

Amplifier, W.E. Radiophone, C.W. 926 ..... 15.00

Heterodyne, Signal Corps, type B.C. 104. 1000 to 3000 meters, with detector 15.00

Receiver, Type 122, 175–775 meters. Especially recommended for "standby" for coastal Broadcast stations as required by Dept. of Commerce 50.00

Air compressors, Kellogg, Model T, 1½ cu. ft. per min. weight 6 lbs., 600 R.P.M., 125-lb. Requires ¼ h.p... 3.00

Motors back geared 110 A.C. variable speed, auto reversible (Socony oil burner type) has over one thousand uses, a very good buy 7.50

Motor generator, R & M, 110 D.C. 3½ h.p., 2 kw. 20 volt D.C. 80 amp. Great for large station filament supply. 125.00

SPECIAL — U. S. Army instruction book on telephony or telegraphy. Hundreds of pictures and diagrams... 1.00

Largest Radio and Electric Supply House in U. S. specializing on Army and Navy Surplus. Write us your particular requirements. *Sufficient postage* and deposit of 20% required on C.O.D. orders. NO C.O.D. ON CANADIAN ORDERS. DUE TO LIMITED GOV'T SURPLUS WE DO NOT ISSUE CATALOGS.

MANHATTAN ELECTRIC BARGAIN HOUSE, Dept. Q, 105-7 Fulton St., New York City

The All-Section Sweepstakes Contest

(Continued from page 46)

Manitoba	VE4IC	144	144
Montana	W7AAT	144	144
Mississippi	W5AOM	112	112
No. New Jersey	W2ALO	32	
	W2WR *	2	
	W2UK *	8	
	W2JF *	8	50
Alberta	VE4GD	32	
	VE4EI *	8	40
British Col.	VE5BU	24	
	VE5BL *	2	26
Md.-Del.-D. C.	W3CJ	8	8
No. Minnesota	W9BBL	8	8
Maine	W1TB *	2	2

* These stations not actually taking part.

Changes in A.R.R.L. Standard Frequency Service

(Continued from page 47)

frequency measuring equipment used at Round Hill is of the highest order and there is no questioning a frequency check made by the operators there. If they tell a fellow he is off frequency — he is off frequency. This is service on a silver platter; if the gang doesn't take advantage of it we are an ungrateful lot indeed; if we do use the service but do not drop W1AXV a card acknowledging our appreciation, we are even more ungrateful.

The operators at W1AXV may not be able to hear every station calling them for a frequency check, but those who cannot raise W1AXV but who can hear them should stand by for the regular Standard Frequency Transmissions which follow. These schedules are published in alternate issues of *QST* and are in this one.

Our enthusiasm over the good news from W1AXV is tempered by an announcement from our other Standard Frequency Station, W9XL. Because of an expansion in the activities of WCCO, whose operators also operate W9XL, the standard frequency transmissions from this station must be suspended after June 1st.

The boys at W9XL have served amateur radio yeomanly since away back in 1926 when they first began transmitting standard frequencies on regular schedules under the amateur call, W9WI. Transmitting standard frequencies by its very nature is pretty much a service for service's sake — and those who give it receive appreciation greatly disproportionate to the time, effort and exactitude involved. Whether it be the truth or not, we amateurs seem to take too many things for granted,

particularly those services requiring the least effort on our part.

The gang at W9XL has gone right along making a fine job of the work voluntarily undertaken, their only recompense a few QSL cards and heartfelt thanks from those sufficiently appreciative of a valuable service — and thoughtful enough to acknowledge it.

Three and a half years is a long time to keep a schedule consistently and dependably going just for the fun of it, as any brass pounder will admit, but that's what Hugh McCartney, Lyall Smith, Ivan Anderson, and George Collier have been doing at W9XL. We are grateful to them and wish them all the best of luck and 73.

— *J.J.L.*

Experimenters' Section

(Continued from page 51)

Modern Practice in High Frequency Radiotelephony, Hull, p. 9, April, 1929.

An Effective Low-Cost 'Phone and C. W. Transmitter of Modern Design, Lamb and Dudley, p. 9, September, 1929.

WTIC — A Modern 50-kw. Broadcast Station, Lamb, p. 9, October, 1929.

New Crystal Fragments, Experimenters' Section, p. 41, November, 1929.

Quartz Crystal Facts, Hollister, p. 29, January, 1930.

14-Mc. 'Phone Transmission, Dudley, p. 17, March, 1930.

PROCEEDINGS I.R.E.:

The Piezo-Electric Resonator, Cady, April, 1922.

Uses and Possibilities of Piezo-Electric Oscillators, Hund, August, 1926.

Piezo-Electric Crystals at Radio Frequencies, Meissner, April, 1927.

Note on Piezo-Electric Generators with Small Back Action, Hund, August, 1927.

Modes of Vibration on Piezo-Electric Oscillators, Crossley, April, 1928.

Bibliography on Piezo-Electricity, Cady, April, 1928.

Piezo-Electric Resonator and Its Equivalent Network, Van Dyke, June, 1928.

Thermostat Design for Frequency Standards, Marrison, July, 1928.

A New Type of Standard Frequency Piezo-Electric Oscillator, Wheeler and Bower, August, 1928.

Notes on Quartz Plates, and Gap Effect at Audio Frequency Generation, Hund, August, 1928.

The Dependence of Frequency of Quartz Piezo-Electric Oscillators Upon Circuit Constants, Terry, November, 1928.

GENERAL RADIO EXPERIMENTER:

Piezo-Electric Quartz Plates, February, 1930.

BOOKS:

Radio Amateur's Handbook.

Principles of Radio Communication, Morecroft (2nd edition).

Principles of Radio, Henney.

Strays

Here is the way to do it!

Recently when looking for a new home, W2VG (who, of course, had to consult his XYL) found that one of the apartments had a bedroom so laid out that the clothes closet was directly opposite the windows. W2VG is now located in the clothes closet and is such an improvement over the former station that Mrs. W2VG takes an active interest in the station, even putting up QSL cards for the OM.

A New Electrolytic Condenser

(Continued from page 54)

copper can which also acts as the container for the unit, and has a Mogul type screw base. A copper socket for mounting the unit is supplied with each condenser. The capacity of the unit is 8 μfd. at 400 volts, the series leakage current after five minutes of steady operation at the rated voltage is 0. 3 m.a. or less. The over-all size of the unit is 5 inches long by 1¾ inches in diameter.

Such a unit should find wide application in amateur transmitters. It is quite compact, and two may be connected in series to form a 4-μfd. condenser to be used in the filter for the usual transformer and rectifier system supplying 500 or 600 volts to a Type '10 transmitter. Further ways of using electrolytic condensers were described in *QST* for March, 1930.

Roanoke Division Convention

(Continued from page 25)

man Gluck, W4CQ, had his newest S/W super on display. Valuable prizes were awarded for all the contests held during the convention sessions. After the drawing which followed for the apparatus which remained, in which nearly everyone got some useful piece of equipment, the convention was declared officially closed.

The Charlotte Amateur Radio Association was sponsor of this Convention. The members of the Convention Committee, E. J. Gluck, W4CQ-WBT (Chairman), G. S. Smith, W4BX (Secretary), Paul Rosekrans, W4AGE, and S. L. Hall (Publicity), "Bob" Morriss, W4JR (Registration) and G. D. Bruns, W4AEN (Finance) and all who assisted them deserve thanks and congratulations. Excellent planning and coördination by those in charge can be held accountable for the success of the convention and the good time had by all. After a rising vote of thanks and without a dissenting vote, the gang acclaimed Charlotte the place for next year's gathering. Take a tip and don't miss it! — *F. E. H.*

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, of *QST*, published monthly at Hartford, Conn., for April 1, 1930.

State of Connecticut } ss:
County of Hartford }

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

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, The American Radio Relay League, Inc., Hartford, Conn.; Editor, Kenneth B. Warner, Hartford, Conn.; Managing Editor, none; Business Manager, Kenneth B. Warner, Hartford, Conn.

2. That the owners are: (Give names and addresses of the individual owners, or if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent. or more of the total amount of stock). The American Radio Relay League, Inc., an association

TALKS TO LONDON FROM PLANE IN AIR

Reporter in Craft Speeding Over City Has Conversation Across the Ocean.

THREE CALLS ARE MADE

Words Understood Clearly In Spite of Static—Electric Experts Pleased With Results.

Special to The New York Times.

HADLEY FIELD, N. J., June 25.—Flying at ninety miles an hour today with a thick fog blanket blotting out the earth below him, W. W. Chaplin, Associated Press reporter, casually turned to a microphone and asked for the London office of the news association. The request, relayed through the laboratories of the Bell Telephone Company, passed on to the radio ocean radio telephone station at Belfast, Me., and then carried again on the air across 3,000 miles of ocean to London.

The connection was made quickly and Chaplin asked that Miss Martha Dairymple of the London office be called to the phone. The conversation, once greetings were over, Chaplain said later, had to do mostly with the weather. It was broken somewhat by static, but the two persons talking, one in a fog-bound plane a half-mile in the air and the other in a fog-bound London office, understood each other and exchanged greetings.

without capital stock, incorporated under the laws of the State of Connecticut. President, Hiram Percy Maxim, Hartford, Conn.; Vice-President Chas. H. Stewart, St. David's, Pa.; Treasurer, A. A. Hebert, Hartford, Conn.; Communications Manager, F. E. Handy, Hartford, Conn.; Secretary, K. B. Warner, Hartford, Conn.

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

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

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

K. B. WARNER.

Sworn to and subscribed before me this 22d day of March, 1930.

Alice V. Scanlan
(My commission expires February, 1934.)

Calls Heard

(*Continued from page 57*)

W8DDK, Hosea Decker, 44 Campbell St., Delaware, Ohio

7000-kc. band

cm2jm cm5fl cm8lc cm8yb cmz7 d4aez ear149 k4acf k4kd k6alm k6boe k6dv k6ewb k6oj nn1csb nn1fx nn1sc nn7c ti2fg li2wd vk2ns vk2ou vk3bq vk3bw vk3cs vk3hl vk3ls vk3ml vk3pp vk3vp vk3wx vk4do vk4bh vk5gr vk5hg vk5it vk5jo vk5wr vk6sa vk3wi vk7wi vk7eh vk7dx zl1ft zl2ac zb2bg zl3az x1nq

14,000-kc. band

ct1bx ear96 f8hr g5by g6lv g6wl lu8dy on4ft py1el py1er py29h zl2uo

AC8AG, Andre Guillabert, P. O. Box 1197, Shanghai, China

14,000-kc. band

ac1ts ac8jk ac8ls ac8mg cxcmk ka1jr lu3de lu3dh pk2aj pk3bm py2ik vk2dy vk2jp vk2hb vk2hu vk2lv vk3go vk3lp vk3xo vk5gr vk5hg vk6sa vs1ab vs3ab vs6ae vs6ag vs6ah zl1aa zl1ac zl1an zl1fb zl1fw zl1fx zl2ac zl3as zl3cm

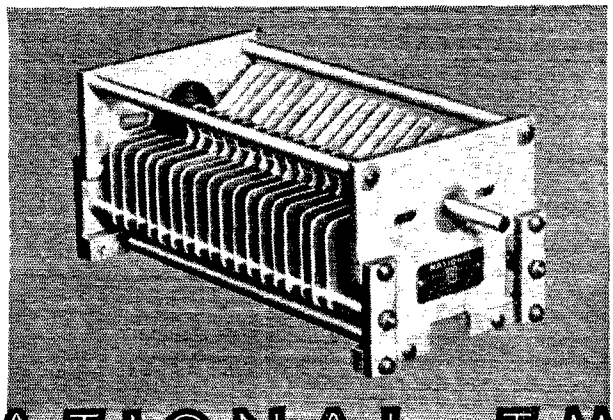
W9UM-W9BOH, M. W. Macy, Lake Wawasee, Syracuse, Ind.

7000-kc. band

dhe fzo jes ovid pza sgcn xw1m rpx 8aa x2x ckn xoq ja xvei xbb nurl obg rb45 55x cab1 wfa wfat wfbt vjp hh1a xfnih xbal kfzt obe cla nejn fgz lct fx7fx tip ngx d4az lcte pxr wsq c2hr k5dd jap x7xdt ss1ap gob hi2hi sb1a tg2clo fm8rt lu2ca vk2ar vk2aw vk2eb vk2dy vk2gj vk2hc vk2hk vk2hm vk2ho vk2hu vk2hw vk2jc vk2jh vk2jj vk2jt vk2js vk2jk vk2ku vk2lv vk2no vk2ns vk2ow vk2ra vk2rb vk2rf vk2rg vk2sk vk2wk vk2wu vk3ag vk3ak vk3ax vk3bq vk3bw vk3cp vk3cz vk3es vk3ha vk3hk vk3hl vk3hw vk3oh vk3kj vk3jk vk3ls vk3ml vk3pa vk3pk vk3pp vk3pr vk3rg vk3rj vk3tm vk3sh vk3or vk3ru vk3vp vk3wo vk3wx vk3xf vk3yn vk4aw vk4bb vk4bd vk4bh vk4cg vk4cm vk4do vk4hk vk4jr vk4ju vk4mf vk4mm vk5ax vk5bg vk5bj vk5da vk5do vk5gr vk5hg vk5it vk5ja vk5jh vj5jo vk5kj vk5mb vk5mm vk5nt vk5wr vk6fl vk6lg vk6mu vk6sa vk6wi vk7ch vk7ew vk7dx vk7lj vk7wi vk2rw on4pr on4ka on4jo ve1da ve4ar ve4bb ve4bq ve4cp ve4dj ve4en ve4gk ve4gm ve4hp ve5by ve5cm ve5co ve5cp ve5cv rx1aa kdv5 ac8rv ac8go ti2ea ti2hv ti2wd ti2rs cm2ar cm2iq cm2jm cm2xa cm2yb cm5by cm5fc cm5fl cm5im cm5ry cm8by cm8yb cm8lc cm2mp cm6cf cmz7 cm8ur cmz4

MICALEX INSULATION

NATIONAL TMU Transmitting Condensers for amateur and experimental uses can be *furnished* with Micalex insulation, under special license agreement with R. C. A.



HIGH VOLTAGE

Made in two series: 5000 v. and 7500 v. Stock sizes up to .0005 mfd., 5000 volt series; and up to .00025 mfd., 7500 volt series. Special made sizes to order.

NATIONAL TMU

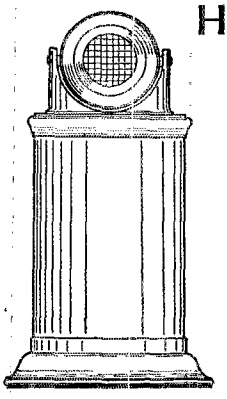
NEW MODEL TRANSMITTING CONDENSERS

The NATIONAL TMU Transmitting Condenser is a new and improved design, embodying all the latest features for efficiency and steadiness of signal. All plates have rounded edges. End plates are heavy aluminum with a beautiful crystalline finish.

As Micalex insulation can be furnished only for amateur and experimental uses, we are equipped to supply standard and accepted insulating materials, when condensers are intended for commercial or other uses than those covered by our license agreement.

Write for full information and prices, mentioning QST.

NATIONAL COMPANY INC.
ENGINEERS AND MANUFACTURERS
61 SHERMAN ST., MALDEN, MASS.



HERE IT IS!

Our New

Condenser Microphone

The condenser type of microphone has proved itself unrivalled in practical use. General advantages of this type are: improved tone quality, absolute freedom from carbon noise, very low upkeep expense, greater ruggedness.

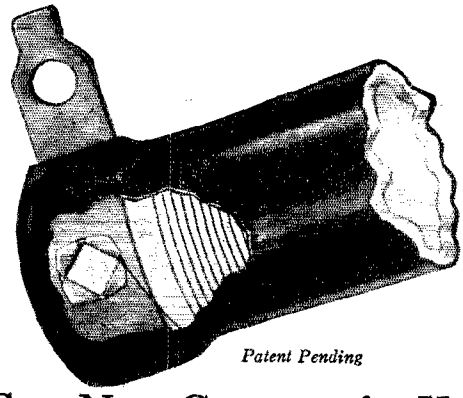
Our latest model, in addition, possesses features of superiority over other condenser microphones. Among these are: greater output obtained through the use of two stages of amplification, balanced frequency characteristics, unusual flexibility, reasonable price.

This one model may be used as a desk type, or mounted on a floor stand, or suspended in an inverted position. The condenser is swiveled to point in any direction.

Price $190 net

E. F. JOHNSON CO. + Waseca, Minn.

(ORDER DEFOREST TRANSMITTING TUBES FROM US)



Patent Pending

Two New Contacts for You

Our Catalog brings simplified Resistance Computing Tables. Write us for it — and ask too for a description of the New HH Contact.

ONE of them is shown above — the new Eyelet Contact that is now a standard part of every HH RESISTOR. It has been universally approved by Electrical and Radio Engineers for its effective reduction of *contact resistance* through increased, *fixed contact areas* between wire and terminal.

The other new contact is the one that we welcome between your organization and ours. We are making RESISTORS for an impressive list of leaders in the industry. There are definite reasons why you should be among them. May we tell you what they are?

RESISTORS

Hardwick, Hindle, Inc.
215 Emmet St. Newark, N. J.

cmz12 cmz9 cmz6 cm8ur cm8uf f8rkl f8rcm f8syy f8gyn f8tpax g6by g6gy g5ml g6dc k6bhl k6ceu k6cib k6eb k6ewe k6oa k6evr k6ewb k9zzg nj2pa x1nq x1g x5a x9a x29a x25a cn8rux vo8mc zl1aa zl1as zl1az zl1bb zl1bi zl1fb zl1fc zl1fr zl1ft zl1fu zl2ab zl2ac zl2ad zl2aj zl2al zl2aw zl2bb zl2bc zl2be zl2bh zl2bz zl2da zl2bgd zl2gl zl2gn zl2gp zl2gq zl2dg zl2dz zl3ah zl3aj zl3as zl3az zl3bb zl3bc zl3bf zl3cm zl3cn zl3cr zl3cz zl4ab zl4am zl4ao zl4ap zl1bi zl4bo zl4xc nn1fx nn1nic nn7nic nn2nc nncab nnfx nn7c nn7xj ka1ce ka1hc ka1hr ka1pw ka1rc ka1ze ka1dj k4kd k4dk k4aan k4sa k1acf ear94 oz7eh he1fg he1dr he1lc he2jc

W1ABG, 53 Lamb St., Lowell, Mass.

14,000-kc. band

ce5aa cm2jt cm8uf ct1aa ct1by ct2aa d4xn f8axq f8cs f8da f8ex f8gdb f8fem f8fr f8hr f8lx fm8gkc fo3sr g2bm g2gm g2ma g5by g5bz g5is g5ml g6dh g6gb g6gs gCmc g6qb g6rb g6vp g6wt g6xb haf8b he1fg he1lc he2jc j4rk k4dk k4kd lu3dh lu4eo lu9cp nj2pa oa4j oa4l oa4q on4fm on4fp on4gn on4jj on4oj on4ro pa0dw pa0tw py1ah py1aw py1er py2bf py2ik su8rs ve5al ve5ao ve5aw vk2wu vk3rk vk3wm vo8ae vo8an vo8aw vo8mc x9a zl1ao zl2ac zl2bg zl2gh zp7ab zs1i zs2n zs4m zs5u zu6a zu6n

7000-kc. band

k4dk vk5gr zl2go

W9EBO, M. F. Whitton, U. A. Weiler, Burlington, Wis.

7000-kc. band

zl3cm zl3aj vk3ml vk5am vk7dx zl2aw vk3jk vk2ns zl2wa k4kd x5a x5z wfat k6xak zl2ab em8uf x29a cm8yb nncab ti2rs zl2gp vk7ch vk3rb vk4do k6evw vk2aw k6ae k1acf oyid nn1uic zl1bb zl2wj vk3ml zl1aa zl1bi vk2wj zl1fr vk3rg vk3rb vk2hw he1lc vk2hk

14,000-kc. band

cm5ex py1ca py1ah py2qb f8swa lu1ba py1aw lu5ae he1lc ct1aa lu2ab lu3dh

W8OT, W. J. Wiseman, 1296 12th St., Milwaukee, Wis.

7000-kc. band

cm5fc cm5fg cm5fl cm8lc cm8uf cm8yb cmz57 cmz7 kflf kfr5 kdv5 k1aan k6dtg he1dr he1fg nncab nn1nic nn7nic nj2pa obg vk3av vk3vp vk5hg vk5jo x9a x9b x29a x1nq xm2j xw1m ys1x 55x ti2hv

W4AL, Senior High School, Asheville, N. C.

14,000-kc. band

py1aw py2ay py2bf lu3de lu4da lu5aj lu8dy lu9ot ce2aa ce2ab ce5aa oa4j he2jm ti2hv k6alo k4kd k4dk ct1aa g5by on4jj on4jb f8fr f8da cm1by cm8uf cm8yb ve1br ve2ea ve3cj ve4bd ve4bu ve4bq ve3cj ve4bd ve4bu ve4bq ve4bx ve5al ve9al x5a x9a nj2pa nu4my ve5ac

14,000-kc. 'phone band

w5ql w9drd w8dld w4agr ve3cm cxcwk w6egh w6bax w6ecl w6vz w6afd w7mo x9d ur4mf

W9COB, Fred Novak, Chicago, Ill.

w6det w6adw w6ded w6li w6io w6ecj w6bgf w6bsn w6edy w6bpc w6bfb w6hv w6ecs w6bxv w6egd w6azy w6bck w6cbw w6vz w6zq w6dyl w6qy w6dio w6dwi w6auo w6dwi w6auo w6bkx w6dsp w6acg w6dzp w6car w6bzy w6bzi w6doz w6vt w6eze w6dip w6dgn k6av k6avl k6dv w7aax w7ks w7wb w7dp w7amb w7aed w7lz w7bd w7asz w7alm w7ajh w7anj w7amp ve2ea ve4bx cm8yb ve2aa ve1fp he1lc ve2am ve3ca ve4fk x9a nj2pa

W1AIX, Ed Waitt, 37 Wilfred Street, Lynn, Mass.

14,000-kc. band

zl3cm w6aaz w6ama w6cwf w6blx w6eeb w6bfb w6wb w6vz w6aqj w6eim w6te w6ts w6axm w6dev w6cum w6mx w6cyi w6cyb w6eak w6ehi w6bvs w6cur w6cae w6acp w6blk w6eif w6bpm w6oe w6dzx w6ac w6csj w6dgq w6dpj w6bb w6bax w6bip w6adq w6bux w6bsn w6avp w6amp w6kg w6eav w6fe w6aaz w6bdb w6bvx w6al ww6aoa w6bqk w6clq w6dgx w6dcg w6etp w6egh w6dmk w6bak w6cyb w6cot w6ayj w6euk w6axk w6dyz w6bux w6eug w6cis w6ac w6ayz w6cyi w6fe w6afi w6brv w6egh w6box w6da wr6dln w6cks w6bjt w6bsn w6cxw w6vzw w6bin w6etr

w6akf w6acl w6ec w6afa w6ajm w6bng w6ctp w6bto w6bvx w6bto w6eje w6aqq w7aaz w7na w7ait w7aro w7ar w7iv w7abd w7qr w7si w7acd w7aff w7mo w7qy w7af w7bd w7wl w7amx x9a py1cm py1aw lu3dh ck1fc cx1af eur65 qq1a g2gm lu8de lu2fi py1ch cm8uf lu9ce ce5aa oa4l py1ah lu3fa ppx2 lu9dt ct1bx hc1lc zl2ac zl4ax lu3hc oa4l oa4q fqpm hc2jm cm2j k4dk nj2pa py1cw py1aa wfa lu3de p8box fm8gk py2az lu3fe py1cl ct1by cx1af x235 lu2re lu2aa py2ay py2ih py2ik py1fb cmb3 py2sb oa4r lu2acj hc1fg x8a

Ross J. Konchar, 4500 North Artesian Ave., Chicago, Ill.

3500-kc. 'phone band

w1aby w1aox w1cu w2abf w3aex w3ain w5kx w8ahz w8ajh w8bfx w8bke w8bvc w8dec w8drt w8ih w8lt w8pw w8rd w8wf w9ahk w9baq w9bfe w9bmm w9bqb w9cgd w9cku w9ckw w9daq w9deq w9fua w9fuu w9gw w9mm w1alq w1amf w1asp w1akz w1bh w1bop w1bet w1bqf w1bil w1cmt w1cnj w1chs w1fn w1pi w1zs w1vi w2amr w2aur w2apk w2arq w2bai w2boz w2bsc w2bec w2bub w2btz w2bia w2bmm w2bey w2bjj w2bdh w2bvc w2bds w2bjo w2cg w2pw w2qf w2wz w3aeo w2aaz w3anr w3att w3als w3blp w3bsc w3ic w3lx w3pm w3sb w3im w3sj w3nk w3ur w3oz w4aaq w4ahl w4abr w4akr w4acl w4akt w4ahq w4aef w4aiq w4fx w4ft w4gk w4gw w4ge w4hu w4ik w4qv w4ty w4we w4wq w4hj w4abl w4oc w5au w5aqy w5ana w5aao w5jp w5aaj w5bbu w5bam w5bdd w5bdl w5bfp w5qe w5aea w5ms w5bfq w6ewf w6by w6ax w6ctk w6lo w6dpj w6byb w6epz w7ahw w7mo w7mb w7bg w7bd w8ax w8aao w8awc w8aeh w8aaz w8adj w8aqh w8atz w8acf w8aid w8adu w8axf w8aat w8aab w8agd w8bck w8bd w8bkl w8bez w8boo w8bom w8bed w8bjk w8baz w8btm w8bti w8bey w8bgx w8bma w8bku w8bze w8bdk w8byz w8bne w8ceo w8cuj w8chq w8cbl w8dtl w8duw w8dpo w8dan w8ded w8dlg w8dui w8dei w8dgg w8dev w8djb w8ddk w8dub w8eo w8ld w8mt w8nz w8on w8od w8pe w8vy w8yb w9agk w9au w9ayd w9azy w9ajd w9arf w9akz w9avy w9an w9ada w9aeq w9amw w9apd w9bgn w9dyj w9cmg w9fis w9bqw w9bkw w9egn w9ese w9dns w9dwl w9bae w0dks w9add w9es w9bsd w9bns w9dv w9ffd w9dlh w9exz w9fd w9ciy w9fsw w9ens w9fb w9enf w9bnr w9dmg w9ebz w9fnk w9dsz ve2ca ve3bk k4dk

Ernest E. Peyssard, 26 Seguine Ave., Princess Bay, Staten Island, N. Y.

3500-kc. 'phone band

w1aar w1abb w1abo w1adt w1afq w1agg w1agh w1agp w1ajb w1amq w1aox w1apk w1auy w1bjd w1cjr w1ckq w1clh w1cre w1ei w1io w1lc w1qk w2abi w2adi w2ahg w2aih w2aja w2ajw w2ama w2ani w2aow w2biz w2bks w2blm w2boz w2brm w2brq w2bso w2bxh w2byu w2bza w2cas w2cbe w2ff w2fr w2gj w2hy w2mg w2qn w2st w3abn w2abq w3ac w2aem w3acv w3aex w3ain w3alq w3hp w3apz w3asu w3bgd w3bo w3bq w3by w3ca w3cv w3gs w3jz w3km w3mt w3oo w3ra w3ux w3vj w3wi w4ib w4lq w4pk w5abq w5awg w6alz w6bbj w6cne w7acj w7ce w8abt w8aci w8agu w8ahz w8ajh w8arw w8asd w8avq w8ayg w8azk w8azo w8bap w8beg w8biz w8bmb w8bot w8bra w8bsl w8btk w8bxy w8bye w8cfa w8el w8dbq w8dtk w8rd w8rw w9aai w9afn w9agx w9ahq w9avu w9bag w9bgd w9bjw w9eyz w9ezn w9fke w9fql w9gim w9mm ve3bb ve3hb

VK5GR, G. B. Rogless, South Road, St. Marys, S. Australia

14,000-kc. band

w1adm w1ang w1aqt w1awe w1bhm w1bjd w1bux w1cek w1cmx w1cow w1da w1dp w1dq w1hy w1kn w1om w1vc w1vz w1wv w2abu w2afr w2afj w2ai w2atx w2afv w2ary w2aox w2ate w2avq w2bka w2bcx w2bai w2bjg w2bmm w2buy w2bda w2chd w2cmu w2cuq w2el w2fp w2ff w2gx w2hq w2ku w2mb w2rd w2rs w2sn w2vd w2wl w2zg w2acx w3aqz w3aiy w2ajd w3arx w3ake w3bg w3gcz w3jm w3pf w3lz w3nk w3ut w3ra w4aef w4alg w4alb w4kh w4ql w4sk w4sy w4we w5df w6de w8adz w8dth w8buk w8brh w8bto w8bud w8bji w8bti w8box w8cvo w8cqr w8cnx w8cjz w8caq w8efr w8dxv w8dqk w8drp w8dhc w8djv w8fz w8giy w8ib w8rd w9amr w9bqe w9ddy

w9drc w9eaj w9ebo w9enr w9fax w9flb w9fyi w9fci w9gdz w9giy w9mt vs6ab vs6af ve2ea ve2am vq2bh vu2ac vu2ek vs3ab vs6ae vs6ag vs7ap ac1bd ac8go ac9gh ct1aa f8gdb f8fr f8ex f8swa f8fk f8azq f8xw f8arv fa8bak vm8bg f8ex f8swa f8fk w8azq f8xw f8arv fm8bg fi8lrp fo9sr g5by g5bz g5rq g5ls g6rr g6xc haf3b hb9d hc2fm ear21 ear59 uowg d4jl xu2uu su8rs su8wy zu5b zt5r zu6n x9a pa0qf pa0wj pa0dw j1dm j1dn j3tz pk3bm pk4az oa4l oa4j oa4z on4hc on4hp on4uu ok2si ka1jr ka1pw ka1hc k6boe ctbj lg jni

7000-kc. band

w1kn w2ma w2rq w3aho w3bm w3ec w3ckl w4aku w5ahq w5sg w6acq w6aih w6am w6auk w6bch w6by w6ef w6cgq w6cul w6cxw w6czk w6dcq w6di w6dyh w6dyj w6dzm w6ely w6epz w6hm w7aar w7ajw w7bb w7if w7lz w8axs w8baz w8evq w8cyp w9azy w9bsh w9dgz w9dpv w9ebo w9ecz w9erm w9ezt w9um ve2ac ve3cz va1ab vs6ae vs6ag ac1bd ac1ts ac8ew ac9gh f8cw f8rko f8orx fm8tv g5tz d4ual ear8 ct1aa ct1co pk3bm ka1ce ka1dj ka1el ka1hc ka1hr ka1pw ka1rc ka1zc ka4hw ka9pb k6boe k6ewb zt5x ctbj kanc vada

W8CX, Homer Sussman, 405 Alameda Ave., Youngstown, Ohio

ve1ac ve1ck ve4hr ve4fx ve6st ve1ah ve1co ve4ha ve4ic ve4gi ve4fk ve4ek ve1br ve1ar ve4ic ve5ao ve5al hc2jm hc1fg hc1fl hc2aa cm8uf cm8yb cm5cx cm1by v9a(4) ct1aa ct1bx ct1by ct2ac vo8mc vo8aw f8gq f8iem f8dmf f8pam f8da f8ig f8fr n52pa k4dk k4kd k4akv vk2ak vearn py1aw py1aa py2lk py2bf py1cm w6ae w6aqi w6bax w6ay w6awg w6de w6abp w6auj s6bsw w6dep w6ac w5qr w7aeq w7be w7sg w7si w7na w7afe w7ek w7ty oa4z oa4j oa4q ce3ag ce5aa ce3ba g5yg g5by c2cx g6wt g6hp g2lz ear96 ear110 ear10 zu1n lu3dh lu5fa lu9dt lu4fa lu1bz lu3ha ow4dl ow4tj on4fp on4gw oz7y

H. W. Yohnel, Helmetta, N. J.

ve1co ve1hr ve4ec ve4cu ve4bu ve2bd ve1as ct1aa ct1by k4aan k4dk k4kd x9a cm8uf gtis g6wt py1aw py2ik f8uu f8axq f8kz f8ig f8axq on4fp on4de on4eu i1to haf8b oa4r oa4j hc1fg fqpn jna cx7 x5 vk2ns vk2wu vk2aw vk2jc vk2es vk2ku vk2ra vk3pg vk3hl vk3 p vk3jk vk3wo vk5gr vk5it vk5wr vk5hg vk5bj vk5cs vk7eh k4kd k kfkf k4rh k4acf k6cb kfr6 kfr5 cm7sh cm8uf cm8le cm8yb cm2jm cm2wa cm1ax nn7nic vo8mc nj2pa zl1bb zl4ji zl4ao zl2ac zl2ao zl2hz zl2aw zl3bb ve2ca ve2bq ve4bb ve3cz ear116 fm8eor pxr wsq ss1ap wfbt wfat jes vjp fzo

F8IIA, Jacques de Maussion, Coulommiers (Seine and Marne), France

oz1j oz1i oz3c oz5a oz5m oz7ko oz7fk oz7kh zl1fr zl2bg zl3aj w1aze w1vz w1ve w1bft w1eow w1dp w1ok w1ie w1bs w1asf w1bjd w2adp w2avm w2adj w2arb w2mb w2bwc w2ku w2aey w2afr w2arb w2cuq w2biv w2afv w2bia w2bey w2amm w3ajd w3dp w3aqz w3nk w3aex w3ln w3eq w4aef w4sk w4ql w4akh w4aep w6abq w7wp w8bbl au7aa eu2gf haf3zo haf3b haf3ca haf3fv haf7a haf7b haf8c d4ic d4xn d4gj d4ce d4zp d4an uowg uooz uoor uozb uocz fm8gkc fm8cr fm8bg fm8rit fm8tui sm4xx sm5rp sm5yf sm5ze sm5uk sm5uv sm6wl sm7rv g2ma g5is g5pl g5by g6dr g6ia g6yc g6nx g6wt oh1ux oh1ob oh1je oh1nf oh2og oh2nm oh2od oh2ux oh2os oh5no oh5uf oh5nl oh5ng oh7nb ok1au ok2yd ok2si ok2ny ear59 ear98 ear113 ear116 ear136 ear155 pa0dw pa0tw la1j la2b la2c la2k on4fp on4bt on4uu on4lt on4ro f8hr f8gdb f8fk f8ex f8axq f8xw f8da f8cs f8dmf f8swa f8whg sp3wr sp3ks sp3yl sp3pb su8rs su8wy ct1aa ct1by ct1cp ct2aa un7ww ve1da vo8ae vo8mc zs4m cn8rux gi5hv

W9BDW, Jack Woodruff, 7025 Yale Ave., Chicago, Ill.

14,000-kc. band

k7anq lu3fa lu4a ct2ac on4zz on4gn py1aa py1aw py1ia py1ik py2aj py2ay py2bj py2bf ve1al ve1am ve1as ve1br ve1co ve1da ve5ao ve5aw ce2ab ce3bf ce5aa ti2hv cm1by cm2jt cm5cx cm8uf cm8yb hc1fg hc1ic hc1jm g5by b5hp g5mo nj2pa x9a x29a vo8an vo8aw zl2ac oa4j oz4o oz4t k4akv k4dk k4kd ct1aa ct1bx zs1p ear96 ear149

HAM-ADS

(1) Advertising shall pertain to radio and shall be of nature of interest to radio amateurs or experimenters in their pursuit of the art.
(2) No display of any character will be accepted, nor can any special typographical arrangement, such as all or part capital letters be used which would tend to make one advertisement stand out from the others.
(3) The Ham-Ad rate is 15c per word, except as noted in paragraph (6) below.
(4) Remittance in full must accompany copy. No cash or contract discount or agency commission will be allowed.
(5) Closing date for Ham-Ads is the 25th of the second month preceding publication date.
(6) A special rate of 7c per word will apply to advertising which, in our judgment, is obviously non-commercial in nature and is placed and signed by a member of the American Radio Relay League. Thus, advertising of bona fide surplus equipment owned, used and for sale by an individual or apparatus offered for exchange or advertising inquiring for special equipment, if by a member of the American Radio Relay League takes the 7c rate. An attempt to deal in apparatus in quantity for profit, even if by an individual, is commercial and takes the 15c rate. Provisions of paragraphs (1), (2), (4) and (5) apply to all advertising in this column regardless of which rate may apply.

PLATE power for your set, the very heart of its performance. For quietness, DX ability, life-long permanence, absolute dependability, lowest ultimate cost, no other plate source even approaches the achievement of an Edison steel alkaline storage B battery. Built painstakingly; every joint pure nickel, upset electrically welded. Genuine Edison Electrolyte. Our list describes complete batteries, construction parts, enameled aerial wire, silicon steel. Available immediately, filament and plate transformers for the new 872 rectifier, complete plate power units. Rectifier Engineering Service, radio W8ML, 4837 Rockwood Road, Cleveland, Ohio.

THE finest in radio for amateur, broadcast and marine. The most modern short-wave receivers. Four to ten tube designs. Radiophone CW transmitters of any power or type. We make a complete line of apparatus, including speech amplifiers, filter coils, inductances, power units, etc. Any special apparatus, designs, built to order, using your parts if desired. Prices on request. New bulletin lists complete line of apparatus. Write for copy. Ensall Radio Laboratory, 1527 Grandview St., S. E., Warren, Ohio.

AMATEURS — experimenters, builders. We serve over 4000 I.R.E., A.R.R.L., etc., experimenters and "nuts." Full discounts. $50,000 stock approved parts — no sets. Over four pounds catalog, circuits, data, prepaid, 50c. Weekly bulletins (new items, results of experiments, etc.), 20 weeks, $1.00. Sample experimenters "Over the Soldering Iron" magazine, 25c. Transmitting data, price list, etc., 25c. Kladag Radio Laboratories, established 1920, Kent, Ohio.

SPECIAL rectifier aluminum, $1.25. Lead, $1.00 square foot. Elements 1 x 4 15 cents, 1 x 6 17 cents pair. All prepaid. Best silicon transformer steel cut to order, 25–35 cents pound. Postage extra. George Schulz, Calumet, Mich.

A.R.R.L. sweater emblems should be worn by all League members. They are yellow and black 5" x 8" diamond, felt letters and embroidered symbol. Only $1.00. Money order or currency only accepted. Eric Robinson, 135 Jefferson Road, Webster Groves, Mo.

TELEGRAPHY — Learn Morse and wireless telegraphy. Big salaries. Tremendous demand. Expenses low, can earn part. Catalog free. Dodge's Institute, Wood St., Valparaiso, Ind.

WANTED — Navy Standard Receivers SE143 SE1220 SE1420 IP500 IP501, also spark gap units. Paul Trautwein, 38 Park Place, New York.

PIEZO quartz plates — guaranteed perfect oscillators, 7000 kc., $40; 3500 kc., $15; 1750 kc., $10. Dr. Gerald W. Fox, physicist, W8BNT, 419 W. State, Ann Arbor, Mich.

TELEVISION — Listen in on announcements from W3XK, 2000 kc., 8 o'clock, E.S.T., or send for descriptive literature. Jenkins Laboratories, 1519 Connecticut Ave., Washington, D. C.

HIGH "C" 210, 1930 type, Hartley transmitter as per November, 1928, *QST* and new Handbook, for sale. Built exactly to specifications, with 500 mmf. Cardwell, 3500 kc., ¼" tubing coils, G. R. ammeter and milliammeter. Price, complete, $21 cash. T. D. Robinson, 60 Pleasant St., South Natick, Mass.

250-watt transmitter complete, consisting of W. E., R. E. L., National, Jewell and Navy 500 cycle supply 110–60 ½ h.p. drive, $100. Grebe CR18 with two-stage amplifier, nearly new, $22.50. Silver Marshall No. 730, brand new, never used, with 4 tubes, $27.50. 7½-watt fone good job with 400-volt Esco and 5 extra new 210 tubes complete, $50. Sockets for W. E. 212D tubes, $4. Never-used 212D tube, $45. Bargain high grade wood turning lathe with new ¼ h.p. motor, never used, brand new. Sacrifice, $30. Write for details on all above listed. Radio, Box 726, Newton, Iowa.

WANTED — tubes, meters, motor generator. What have you? Quote cash price. Lowell Ecker, Sedan, Kansas.

QSL cards, $1.00 per 100. Two colors. W8AAM, 533 Manhattan, Hazleton, Pa.

SEE our advertisement page 76. Hatry & Young, Inc.

EDISON "A" outfit consists of 5 cells. Tungar charger for "A" or "B" batteries. All arranged in mahogany case, $22; cost $95. Meters — Jewell 0–2000V No. 54, D.C., $14. Write for complete list. Hilet transformers and chokes. (See Hilet advertisement.) Transmitter panel name plates, 75c engraved, $2.00. M. Leitch, Park Drive, West Orange, N. J.

WANTED — Weston, Jewell meters, Sterling, Sentinel, Beverly eliminator. State condition, model, range, price. N. A. Peebles, 717 Chestnut St., Wilmington, N. C.

WANTED — blown-out transmitting tubes from 50 to water-cooled. W2AWZ, Irvington, N. Y.

SALE — one R.E.L. ten-watt transmitter, 20–40–80 meter coils, factory built, including R.E.L. power supply unit. One S-M 735 a.c. short-wave receiver. $75 takes the whole outfit. All nearly new and in first-class condition. G. Ferenbach, 108 Butler St., Kingston, Pa.

QSLs, 85c and up. Radio Press, 3306 Eastside Ave., Cincinnati, Ohio.

$37 takes new National SW-4 with cabinet. Need cash. Gerhard Ebenhahn, Omemee, N. D.

SELL — one Thordarson T2387 brand-new plate transformer, 1000V–1500V each side (300 V. A.). $17. W2BCJ.

WAVEMETERS, $3.75 postpaid. Solid. Calibrated. Accurate. Wilfred Beach, W9ALU, Hull, Iowa.

210s meter tested, $3.45 postpaid. Remittance must accompany order. Radio Novelty Co., Menasha, Wis.

W2API — Call changed to W2ZC. 1000-watt xtal beam transmitter. Transatlantic radiogramme schedules. Will my old friends of W2API please look for me under W2ZC? Harold Baring Churchill, Little Silver, N. J.

WHO will sell his National Thrill-Box four for $25 to C. H. Page, 19 Overhill Road, Providence, R. I.?

WE build anything from a crystal holder to a broadcast station. Smith, 65 Glenwood Road, Montclair, N. J.

QSLs, two colors, 90c per hundred. W9DGH, 1816 Fifth Ave., N., Minneapolis, Minn.

100 ham xmiter parts for sale. Get list. W8CSV, 1235 Twenty-first Ave., Altoona, Pa.

UV204A, almost new, $45. H. G. Wiest, 13 State St., Schenectady, N. Y.

SELL — factory wired Pilot d.c. super-wasps, $28.50. Also Pilot a.c. super-wasp, $34.50, delivered to your door. Can't use all these six new sets. Hot buys. OMs. Write Bill Ryder, Hibbing, Minn., W9CIY-CSU.

SELL — synchronous rectifier, $15. W6EA, 343 South Fremont Ave., Los Angeles, Calif.

TRADE — Zenith 4-R receiver. Magnavox three-stage power amplifier, R2 dynamic horn. All like new for good two-button microphone, microphone transformer and General Radio wavemeter. Ronald Patrie, Loretto, Mich.

FILTER blocks containing 6 Mfd. or more, $3.00. Non-inductive. 2 1 Mfd. 4-paper 1800-volts test. 4 Mfd.; 2 Mfd.; 1/10 Mfd. 3-paper 1200-volts test. New and perfect except one section. John Winter, 151 Madeline Ave., Clifton, N. J.

AND are they using them? Those genuine General Electric CG1162 Navy five-watters. Up to 750 on plate and 7.5 on filament. Many fellow Hams are using them in their fone sets; reports show remarkable results. Can be used as either oscillator, modulator or amplifier. All new and in original boxes. Only $1.25 each. A wonderful buy. Western Electric single-button mikes, $3.00. Try our suprise package, values up to several dollars. Your money refunded if not completely satisfied with contents. Price, $1.00 per package. Send for our new and better list of parts for Ham needs. All merchandise always guaranteed. Sent C.O.D. or P.P.E. Hufnagel 879 South 18th St., Newark, N. J.

TELEVISION Kit — 12-inch scanning disc; shaft and bearing frame; motor hub and driving disc; synchronizing screw; neon lamp and lamp holder $7.50, parcel post prepaid. Jenkins Laboratories, 1519 Connecticut Ave., Washington, D. C.

PAIR Marathon UX210s, never used. Guaranteed OK, $5.40 each, postpaid. Set used Aero plug-in coils, $5. Two Silver-Marshall power transformers. Want xtal holder. W1AVE.

6000-v., 12,000-w., 3-phase drive motorgenerator, $1500. 3000-v., 6000-w., 3-phase drive motorgenerator, $500. 2000-v., 500-w., 1-phase drive, $195. 1500-v., 400-w., 3-phase drive, $125. 1000-v., 300-w., $95. 1000-v., 250-w., $85. ½-h.p. 3450 speed motors, $10.50; converters, 110-v., D.C. to 75-v. 60-cycle, 1-phase, 250-watt, $27; 300-watt, $35. Queen City Electric Co., 1734 Grand Ave., Chicago.

UV204A R.C.A. tubes, new, $60. Weston 425 thermo-galvanometers, $8.25. Other bargains. Frank Coates, 3605 Fifth Ave., Sioux City, Iowa.

W8TN selling out. Sacrifice 50-watt transmitter, whole or parts. T. J. Donohoe, 841 Franklin Ave., Columbus, Ohio.

500-volt, 100-watt motorgenerator set. Sell for $25, or exchange for small Graflex camera. Harry Blewitt, 2806 Rogers Road Youngstown, Ohio.

SPRING clean-up. Crystals, 85-meter band, $8; 160-meter band, $6. 300-watt Esco motor generator, 8–500 volt, $25. 50-watt xtal xmitter with tubes and 866 power supply, $58. Many small parts. Box 157, Mound Valley, Kansas.

SELL — 204A, in A1 condition, used approximately 35 hours, $55. W6UI, 1761 E. First St., Long Beach, Calif.

RECEIVER — Super-Gain a.c. W2ZC QSO'd all continents in 12 hours. 224 TRF; 224 Det.; direct coupled 227 AF. No hum. Low cost. Circuit construction blue-print, 50c. John Winter, 151 Madeline Ave., Clifton, N. J.

GUARANTEED 281s, $2.50. Filter chokes, 75c and up. Nassau Radio, Seaford, N. Y.

TRADE — 1 kw. G. E. transformer, 1150 and 2300 volts, for 852 or what have you? W9CTI, Wetmore, Kansas.

CRYSTALS — for sale or trade. 80-meter band, $10; 160-meter band, $6. Ground to any frequency. W9DLL, 222 W. 73rd Terrace, Kansas City, Mo.

5-WATT tubes. Brand-new at $1.00 each. These are rugged, thoroughly tested tubes. Renmo Tube Co., 115 Newbury Ave., Atlantic, Mass.

QSL cards, message blanks, wall cards, etc. Selden's, Cranesville, Pa.

SELL — a.c. super-wasp with tubes, $30. Bargains in xtals, tubes, parts. W8BXY, Old Forge, N. Y.

SELL — Esco motor generator set, 2000-v., 500-w., single-phase, ring-oiled, perfect shape, $175. Dillon, 2013 Orange St., Dallas, Texas.

SELL — Hartley 210 xmitter with 20, 40 es 80 meter coils. W7TK, Everett, Wash.

WANTED — Used Teleplex. Braga, 421 Woodside Ave., Newark, N. J.

SELL or trade: R.C.A. 203-A, 211, 852, 860, 845, 204-A, WE211D, 212D; H tube; power xtals; 210 xmitter; dynamotors 500-v. MG; 1500-v. MG; mercury arc outfit; Omnigraph Teleplex; Jewell set tester; other apparatus. W9ARA, Butler, Mo.

FOR sale — new super-wasp kit, $23. C.O.D. only. Hand cylinder printing press, compact, like new. Job press and equipment. Surplus radio parts. Haines, Box 2107, Cumberland, Md.

SINGLE control UX210 transmitter, similar to one in December *QST*. Wavemeter, adjusted Hertz antenna, husky power supply included. Ready to operate except tube. Nearly new, good results. $38. Hal Justice, W4TS, Canton, N. C.

OMNIGRAPHS, Teleplexes, Codegraphs, transmitters, receivers, wasps, mikes, transmitting tubes, Vibroplexes, portables, motor generators, speakers — bought, sold, traded. Ryan Radio Co., Hannibal, Mo.

SELL or trade — Brach model 40 power amplifier and B eliminator, uses one 281 and one 210. Supplies 500 volts filtered d.c. at 110 mills. Perfect speech amplifier, $10. ½-kw. 1000-volt, 110/220 a.c. motorgenerator, perfect shape, $65. Marathon tubes in original cartons, 210, $2.00; 281, $2.00; 250, $2.00; 245, $1.00 0/150 a.c. voltmeter, $2.25; 0/300 d.c., $2.25; 0/300 milliammeter, $1.00; 0/100 mills, $1.00. Robert M. Smith, W9LD, Box 25, Argentine Station, Kansas City, Kans.

QSL cards, two colors, $1.00 per hundred. Free samples. W8DTY, 257 Parker Ave., Buffalo, N. Y.

QSLs, 100 two-color, $1.00. Stationery, samples. W9CKA, Corwith, Iowa.

WANTED — large transmitting tubes, large broadcasting stations and large amateur stations. Uncle Dave, 117 N. Pearl St., Albany, N. Y.

SELLING out — one model 55 Aero phone and CW transmitter complete. One Pilot superwasp receiver, complete. Write for details. Guy Williams, Madison, Ill.

RECTOBULBS, power xtals, W.E. and R.C.A. transmitting tubes, or any item of new apparatus; W9ARA has it at maximum discount with immediate service. Write: R. E. Henry, W9ARA, Butler, Mo.

WANTED — parts and tubes. Must be a buy. State price and condition. Trimble, 4649 Elston Ave., Chicago.

SELLING out. Write for bargain list. Also want honeycomb receiver and Vibroplex. W3FP.

FREE radio course. An absolutely free correspondence course in radio is given with every $19.85 code-teaching machine. This course formerly sold for $85. Diplomas awarded. It prepares you for commercial first-class operator's examination. Truly a wonderful offer. Five days' free trial. C.O.D. Pay postman on delivery. Radio Instruction Bureau, Box 167, Winchendon, Mass.

WE supply parts for receivers, transmitters, and power supplies. Push-pull specialists. Special apparatus. Bulletin on request. Pontiac Engineering Co., 1100 Avenue I, Brooklyn, N. Y.

SELL — Aero Monitor, new, $7. Two UV 204A's, slightly used, guaranteed, $42 each. Weston Type 425 galvanometers, new, $8 each. Thordarson 450-watt, thousand, fifteen hundred each side centre tap, $8; Kellogg two-button mike, new $50; case for mike, $8; transformers for above, $5. Acme, large surplus meters and most every kind of equipment. Send for list. W9UM, Syracuse, Ind.

TO avoid moving, am offering for limited time only brand-new Ex-Navy ½-kw. 500-cycle ball-bearing generators with exciters at a very special price, $7.50. Deposits required on C.O.D.'s. General Electric dynamotors, 24/1500-volt, $37.50. 24/750 volts, $27.50. Westinghouse twins for 27.5/350 or 700 volts, $20. Single, $12.50. These dynamotors are ideal for plate supply. Complete list. Henry Kienzle, 501 East 84th St., New York.

TYPE 866 seconds (new tubes). All characteristics normal. Mercury vapor — 2.5-v. filament. Guaranteed perfect operation and safe delivery, $5 cash. E. Ewing, Jr., 29 S. LaSalle St., Chicago, Ill.

MOTOR generators, all types. 275-volt d.c., new generators, $8. Used, $5. 200-watt, 500-cycle, $10. ½-kw., 1-kw., ¼-kw. motorgenerators. R. Wood, 46–20 102nd St., Corona, N. Y.

UNCONDITIONALLY guaranteed quality merchandise at quality prices. Columbia transmitting condensers. Ratings — all working voltage. 1750 v., 1 mfd., $3.55; 2 mfd., $5.20; 1000 v., 2 mfd., $2.30; 4 mfd., $3.80; 6 mfd., $5.00; 10 mfd., $9.50. 2000v., 1 mfd., $3.95, 2 mfd., $6.05, 4 mfd., $9.40. Special unmounted condensers, 850 v., 2 mfd., each 80c; 4 for $2.60; 8 for $4.80; 12 for $6.60. 1 mfd. each, 35c; 4 for $1.35; 8 for $2.45; 16 for $4.25. Good tubes: UX201A, 65c; UX171A, $1.50; UX227, $1.05; UX224, $2.30; UX210, $2.50; UX250, $2.75; UX281, $2.25. Power chokes, 30 h. 200 M.A., $2.50. R.C.A. power rheostats, 65c. Cash or c.o.d. Send for list. Columbia Specialty Co., 1038 Longwood Ave., New York City.

NEW Morton Electric Company motorgenerator sets sold at wholesale. Hanson, 4832 Rice St., Chicago, Ill.

SLIGHTLY used UV204As, $60. Payments accepted. UP1016 transformers, 1500 each side center, $10. W2AVF.

TRADE — short-wave xmtr wid Jewell meters es receiver for folding Kodak wid fast lens es shutter. J. Doczy, 311 S. Fifth St., Elkhart, Ind.

2 mfd. condensers, tested 500 volts d.c., 50c each. Rush your orders before supply is gone. W6DCQ, 1436 E. Fillmore St., Phoenix, Ariz.

ESCO — 500-watt, 1000-volt motorgenerator, in brand-new condition. Field rheostat included in low price. Communicate with Engineering Department, or Office of WICC for quotation.

1000-volt Esco motorgenerator set, almost new, 500-watt type L. One Esco dynamotor, 500 volts, 6 volts input. A lot of useful parts, meters, R.E.L. L inductance. Also S Cardwell and National variable transmitting type condensers. 1000-volt 500-watt complete chemical rectifier. James V. Dorraugh, 111 Ruskin Drive, Altoona, Pa.

TROUBLE shooter and repair man wants work in N. C. or south. 21 N. 21st St., Camden, N. J.

RADIO parts, kits, tubes for transmitting or receiving, at the lowest wholesale prices. Wedel Company, Seattle, Wash.

QSL cards, two colors, $1.00 per hundred. W9DGH, 1816 Fifth Ave., N., Minneapolis, Minn.

TUNGARS — Westinghouse full-wave, 2 amperes; for Keep-alive, Crosley A-power etc., $2.00. 210s, large plate, $3.53. 281s, 750-volt rectifiers, $2.84. All tested in transmitter. Guaranteed W9DWA, R. V. Howard, 5508 Fulton St., Chicago.

QSLs, $1.00 per hundred. W9BEU, 9032 Windon, St. Louis, Mo.

FLECHTHEIM 1500-volt condensers, porcelain insulators, 2 mfd., $4.50; 4 mfd., $7, used. Mershon condensers, $1.75. New National 3000-volt .00045 with vernier dial, $9.50; .00023-6000 volt, $12.85. Jefferson 300-volt center-tapped transformers, $1.65. Pilot D. C. Super Wasp kit, $28.90, with a pair of Timmons 'phones free. Pilot A. C. Super Wasp kit with cone speaker and power pack, $50. Newest type Rectobulbs R3 mercury vapor, $10 prepaid. 281 type mercury vapor, $7 prepaid. Allen Bradley radiostat, new type 500 watt, $5.50. Aero Monitors, $10.85. R.E.L. Wavemeters, $16. Pilot and Silver Marshall coil forms, $.39. Wire-wound 5000-ohm grid leaks, $.39. Freshman 375-volt, not center-tapped, and two 7½ center-tapped filament windings, $2.25. Signal High Frequency buzzer, $.95. New Cardwell .00035 SLF condensers, $.79. No. 14 cotton covered enameled aerial wire, $.90 hundred feet. No. 12 solid enameled aerial wire, $.95 hundred feet; $1.80 two hundred feet coils, R.E.L. 50-watt sockets, $1.50. Used Kellogg double-button microphones, $35. Sangamo 5000-volt .00025, .0005, .001, .002 mica condensers, $1.50. Thordarson key click filter chokes, 1½ Henry, 200 mill, $2.95. Thordarson modulation transformers, $2.95. Latest Amateur Call books, $.85. Used Western Electric 212D 250-watters, $35. R.E.L. sockets for same, $9. New UX 852, $28. Slightly used R.C.A. 211, $17. Slightly used 204As, $50. R.C.A. UV 217As, $7.50 each. UX 866s, $11.85; New UX 851 1000-watter, $250. Western Electric 211A, D, or E 50-watters, $15, slightly used. New 211Ds, $20. Jefferson, 30 Henry chokes, 100 mills, $3.25. Thordarson twin chokes, 20 Henry, 250 mills, each $6.25. 2500-volt lamp 133 segment Spaulding generator, directly coupled to G. E. five-horse-power motor, cost $650, special $225. Here's a real buy. Limited quantity new original cartons Gold Seal UY 227 tubes, $.89 each; UX 245, $1.15; UX 280, $1.05; R.C.A. High Mu UX 240, $1.00; R.C.A. Voltage Regulator UX 874, $3.25. Broadcast microphone cases, $2.25. Thordarson 400-volt each side center, 150 watt, $3.90. Uncle Dave, 117 N. Pearl St., Albany, N. Y.

SURPLUS radio parts to trade for Thordarson or Acme power supply for 50-watter. What have you? Address, F. G. Bullington, 3219 Carolina Ave., Richmond, Va.

SEE our advertisement page 76. Hatry & Young, Inc.

TELL me your radio requirements. I carry the best nationally known lines of parts and transmitting equipment, and ship to hams and set builders all over the world. Regular trade discounts. Since 1921. Roy C. Stage, Wholesale Radio, Syracuse, N. Y.

CONDENSERS? Transformers? Chokes? Everything in radio. See our advertisement page —— Harrison Radio Co.

Q R A SECTION

50 c. straight with copy in following address form only:

W2BJI — Hackensack Radio Association, Y. M. C. A. Building, Hackensack, N. J.

W4VT — Cipriano Ruiz, Box 53, Oteen, N. C.

W6FC — George B. Criteser, 5452 Bond St., Oakland, Calif.

W9DQE — Ensign A. L. Bergtold, C-V (S), U.S.N.R., Unit commander-Volunteer Communication Reserve, Naval Reserve Armory, Duluth, Minn.

W9EIJ — Paul H. Leake, 260 W. Jackson St., Martinsville, Ind.

VE3GT — S. B. Trainer, Jr., 4 Shorncliffe Ave., Toronto 5, Canada.

W1MK

A.R.R.L. Headquarters

R. B. Parmenter, Chief Op. "rp"

The following calls and personal sines belong to members of the A.R.R.L. Headquarters gang:
W1AKW–W1KP Clyde J. Houldson "ch"
W1BAW R. B. Beaudin
W1BDI–W1XL F. E. Handy "fh."
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W1FL–W2JR G. Donald Meserve "dm."
W1SZ–W1BIZ C. C. Rodimon "rod."
W1UE E. L. Battey "ev."

To Our Readers who are not A.R.R.L. members

WOULDN'T you like to become a member of the American Radio Relay League? We need you in this big organization of radio amateurs, the only amateur association that does things. From your reading of *QST* you have gained a knowledge of the nature of the League and what it does, and you have read its purposes as set forth on page 6 of this issue. We should like to have you become a full-fledged member and add your strength to ours in the things we are undertaking for Amateur Radio. You will have the membership edition of *QST* delivered at your door each month. A convenient application form is printed below — clip it out and mail it today.

A bona fide interest in amateur radio is the only essential qualification for membership

AMERICAN RADIO RELAY LEAGUE
Hartford, Conn., U. S. A.

I hereby apply for membership in the American Radio Relay League, and enclose $2.50 ($3 in foreign countries) in payment of one year's dues, $1.25 of which is for a subscription to *QST* for the same period. Please begin my subscription with the ..... issue. Mail my Certificate of Membership and send *QST* to the following name and address.

.....

.....

.....

Do you know a friend who is also interested in Amateur Radio, whose name you might give us so we may send him a sample copy of *QST*?

.....

Thanks

For Your Convenience

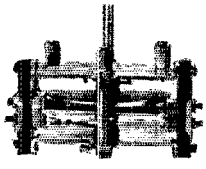
QST'S INDEX OF ADVERTISERS IN THIS ISSUE

WE'VE "GOT SOMETHING" ON THE BALL!

Year after year Cardwells are "striking out" condenser problems. There is a Cardwell for every tube and purpose, and every Cardwell is an accurate, rugged piece of mechanical perfection. For over ten years Cardwell has satisfied the critical and set the pace in Specialized Condenser manufacturing. An ever growing list of the mightiest in Industry testifies to Cardwell Performance and Durability.

Cardwell transmitting condensers for Amateur, Commercial and Broadcast use. Receiving condensers in many types and a broad range of capacities. Special capacities to specifications.

If your dealer does not stock Cardwells, order direct. We will gladly send literature on request.



The 201E
A 2 plate variable condenser having the stator plate readily adjustable to permit changes in maximum capacity ranging from 50 to 10 mmfds, with a constant minimum of 7 mmfds.

CARDWELL CONDENSERS

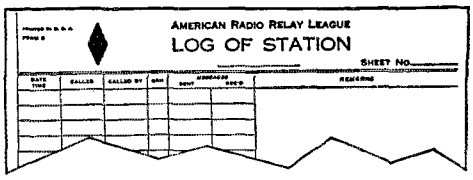
THE ALLEN D. CARDWELL MFG. CORP.
81 Prospect Street, Brooklyn, N. Y.

Since broadcasting began

"THE STANDARD OF COMPARISON"

RUMFORD PRESS
CONCORD, N.H.

NEW Regulations Require Station LOG



HERE Is the Form You Need at New Low Prices

The new amateur station regulations of the Federal Radio Commission, announced in May QST, oblige every amateur station to maintain a log of operating activity. Every station ought to keep a log. A.R.R.L. has been preaching it for years. Now it becomes compulsory under the regulations.

A well-kept log gives proof of station transmissions. It is invaluable in checking up the records of your work. Its presence identifies your station as a systematic one. The Government now requires it as a record of transmitting activity. The regulations say:

> "The licensee of an amateur station shall keep an accurate log of station operation, in which shall be recorded the time of each transmission, the station called, the input power to the last stage of the transmitter, and the frequency band used."

The A.R.R.L. Log Sheet lends itself nicely to these requirements. There are columns for the date and hour, the station called, the calling station (your own or any others that you wish to record), the frequency, messages sent and received; and a remarks column in which may be recorded the power used and any other pertinent data. Lithographed on heavy 8½ x 11 bond paper, punched for standard three-ring loose-leaf binder. Being printed on but one side of the sheet, the blank sheet opposite the recording page provides ample space for notes and sketches on experiments, etc.

Being purchased now in large quantities, the price of the Log Sheet has been substantial y reduced. The new low prices:

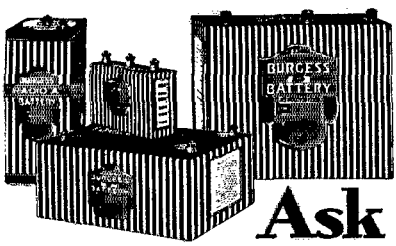
100 sheets	50c	*Postpaid*
250 sheets	$1.00	*Anywhere*
500 sheets	$1.75	

Send in your order today!

AMERICAN RADIO RELAY LEAGUE

1711 PARK STREET , HARTFORD, CONN.

Outstanding . . .



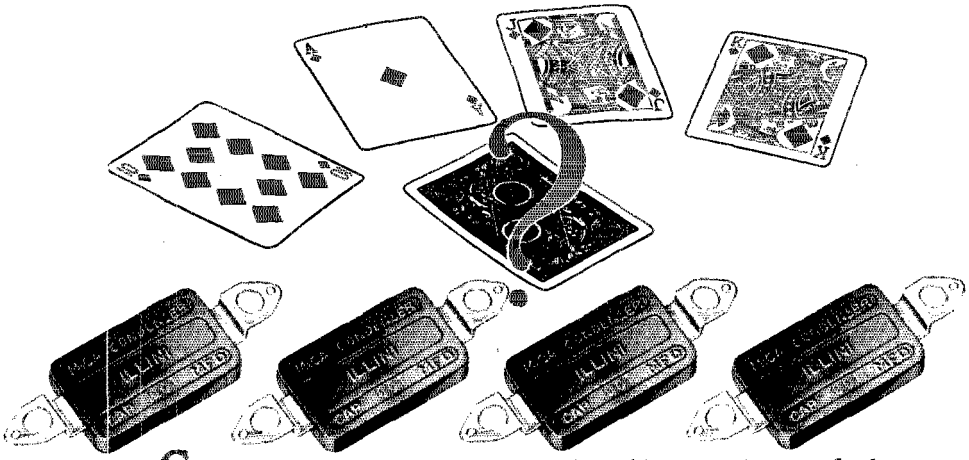
To the amateur and to every other user of dry cell batteries. Outstanding because of unequalled performance under most severe as well as all ordinary circumstances.

Ask *any* Radio Engineer"

BURGESS BATTERY COMPANY

MADISON, WISCONSIN

Don't gamble on "long chance" condensers



Sangamo Fixed Condensers are accurate and they *stay* accurate

If you want to play the ponies, or sit in on a friendly game, or even take a flier in Consolidated Tombstone, that's your business.

If you want to risk production losses by gambling with "long chance" condensers, that's your business, too. But whether or not it's *good* business is questionable.

No item can cost so little and cause so much trouble in a receiver as a fixed condenser. Why risk reassembly and service losses that far outweigh any possible savings that might result from the purchase of condensers of uncertain dependability?

Sangamo standards of precision carried into the manufacture of Fixed Condensers, have made it possible for manufacturers and custom set builders to eliminate condenser troubles.

The standard line of Sangamo Fixed Condensers leaves the factory tested to maximum variation of 10%. The reliability of these ratings is attested to by a number of nationally known radio manufacturers. Sangamo is equally reliable as a source of supply.

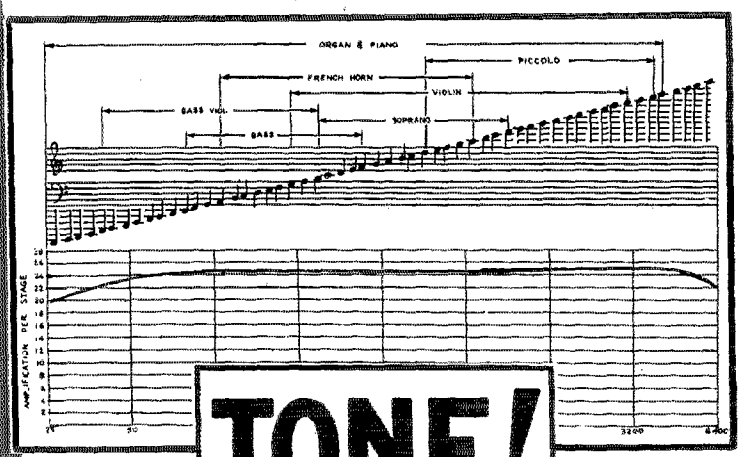
SANGAMO ELECTRIC CO.

SPRINGFIELD, ILLINOIS, U. S. A.

Manufacturers of Precision Electrical Apparatus for 30 years

SANGAMO

See Reverse Side



TONE!

Curve of Type "A" Sangamo Straight Audio Transformer showing uniformity of amplification at all audible frequencies.

Sangamo Transformers in the "audio end" give your set a "tone" advantage over competition

"X" Line Transformers

Type AX straight audio amplification ..... list price $6.00

Type BX Push-pull Input unit ..... list price $6.50

Type CX-171 Push-pull Output Transformer, for 171 or 250 power output tubes for cone speaker; list price $6.50

Type DX, same as CX except for 210 and 112 power tubes; list price $6.50

Type HX Push-pull Output for 171 or 250 Power Output tubes to match the impedance of moving coil of Dynamic loud speakers..list price $6.50

Type GX, same as HX except for 210 and 112 power tubes; list price $6.50

Type E output choke to match impedance of the various type power tubes ..... list price $5.00

"A" Line Transformers

Similar to X Line but with special core metal to give greater amplification at low frequencies.

Type A straight audio amplification ..... list price $10.00

Type B Push-pull Input Transformer for all tubes..... list price $12.00

Type C-171 Push-pull Output, for 171 or 250 type power tubes with cone speaker..... list price $12.00

Type D-210, same as C except for 210 and 112 power tubes; list price $12.00

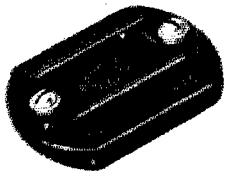
Type H-171, Push-pull Output for 171 or 250 power tubes for Dynamic Speaker..... list price $12.00

Type G-210, same as type H except for 210 and 112 tubes; list price $12.00

Type F Plate Impedance for use as a choke to prevent oscillation and for impedance coupled amplifiers ..... list price $5.00

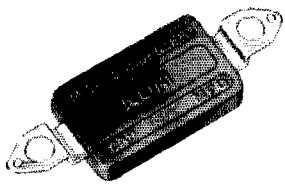
Unusual facilities for furnishing transformers with or without cases ready for mounting and quick assembly with the receiver. Prices on application.

The Sangamo Type "A" Condenser



Every sound characteristic is affected by the quality of the fixed condensers in a set. Sangamo builds accurate mica condensers, molded within an overall enclosure of genuine bakelite with only the terminals brought outside. Moisture, heat, shocks or jars will not alter their characteristics nor affect operation after the set leaves the factory.

Sangamo "Illini" Condensers



"Illini" Condensers are standard with those manufacturers who insist on ratings being actually what the specifications call for. Manufactured by exclusively designed equipment, held to the tolerances your engineering department demands, Sangamo Condensers will reduce to a negligible quantity inspection department rejects and "reassembly" losses in profit.

Sangamo High Voltage Condensers

Tested at 5000 volts D.C. and 3500 A.C. and built to Sangamo standards, known throughout the radio world, amateurs, commercial men and manufacturers have learned to depend on Sangamo High Voltage Condensers. Accurately rated and adequately tested—these condensers offer the maximum protection in high voltage, high frequency circuits.

Prices on request

PIN THIS TO YOUR LETTERHEAD AND MAIL

SANGAMO ELECTRIC CO.
Springfield, Illinois, U. S. A., Dept. T-9

☐ (*For manufacturers*) I am interested in engineering data regarding your transformers and condensers.

☐ (*For set builders*) Please send circulars describing your apparatus and latest audio hook-ups. I enclose 10c to cover cost of mailing.

Name.....

Address.....