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"Of, by and for the amateur," it numbers within its ranks practically every worth-while amateur in the nation 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 prerequisites. Correspondence should be addressed to the Secretary.

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Address all general correspondence to the executive headquarters at West Hartford, Connecticut.
IT WOULD be a sad mistake for amateur radio

to get the idea that the problem of securing
more frequencies at Cairo is going to be a push­
over, that all we have to do is demand loudly
enough and the frequency fences will tumble.
Realizing that any rational examination of our
problem will be misconstrued in some quarters,
still we think it will be helpful for us to look at
some of the hurdles that must be hurdled before
we find ourselves in the Elysian fields on the other
side of the fence.

If only the eighty nations of the world wanted
to give us more frequencies, they could do it all
right. They could apply some modern engineering
to their allocation structure, make more room,
mov a few hundred fixed stations, and we would
be all set. Trouble is they’re not going to want to
do this, and something more than simple requests
or demands will be necessary. Reason for their
reluctance is that, in the absence of an engineering
plan that makes more channels, they won’t
know where to put their moved stations. In a
note in our last issue we described the conditions
obtaining in the high-frequency fixed-service
bands. Each one of these stations grimly holds
on to its frequency for dear life, because every
similar frequency has a station notified on it,
priority claimed and all that sort of complication.
When any amateur listens to these bands at his
own location at any given time, what he mostly
encounters is silence, but as a matter of fact there
is a surprising number of registrations on the
books. A few figures may be interesting. In the
fixed-service region between 6000 and 8000 kc.,
not counting our band, there are approximately
1900 fixed stations registered, with an average
density of one every 1.11 kc. From 7300 kc. to
and including 7500 kc. there are about 260, an
even greater density; and this region also includes
some channels used in various countries for
the aeronautical and meteorological services,
experimental stations and government stations,
with a relatively large number of stations on each
such frequency. This whole question of interna­
tional allocation is bughouse. It is more respon­
sive to international politics and jealousies than it
is to engineering, and it would take a super World
Court to adjudicate its complex irrationalities.
Some of the stations notified have never been put
in commission and ought not to have the right to
obstruct a going station, but such is the interna­
tional complexity of the problem, such its delicacy

and touchiness, that a better plan has never been
worked out. Perhaps a better one will by the
time of the Cairo meeting. So long as the world
observes the principle that the first notifier has a
prior right, regardless of his importance or the
date that he actually gets into operation, progress
will be very difficult.

Now let no one misunderstand us: The
A.R.R.L. is going after more frequencies at
Cairo and a committee of our Board has the
question under detailed study right now. We cite
the above things because it seems to us that there
is no proper appreciation of the difficulties and
magnitude of the problem, too much of the feeling
that it is as simple as “ask and ye shall receive.”

There is an amateur movement being started
to get more frequencies at Cairo by an action
addressed to the Congress of the United States.
This country is in an unsettled political condition
and strange things happen in Washington poli­
tics, perhaps stranger than this. Perhaps it can
be done that way; just because this magazine
doesn’t at this time see how, we’re not going to
say it can’t. Congress of course controls the situa­
tion in the United States, because it makes our
laws, but we don’t need their help with respect to
United States laws because our regulations al­
ready give us every kilocycle that international
treaties permit. Under normal conditions the
basic concept of going to Congress for an interna­
tional action certainly would be fallacious.
While the past is no reliable guide to the future,
we don’t suppose the Congress ever “instructed”
a delegation to an international conference—any
more than it instructs armies when it sends
them to war; it declares war but the executive
branch of the government carries on the war.
The executive branch of the government also
negotiates treaties, decides what it wants to i,tand
for, picks its own delegation and does the instruct­
ing. A campaign of education or pressure might
much better be directed at the executive arm.
Of course treaties may be ratified only with the
consent of the Senate, and amateur radio always
has available the ability to intercede and prob­
able to prevent the adoption of an unfair treaty.
It is even conceivable in this day and time that a
senate might make an advance pronouncement
of what it would or would not ratify. But unfortu­
nately the rejection of an unsatisfactory treaty by
this country alone does not result in the existence
of a satisfactory one.

July, 1935

9
This particular problem is just one aspect of the Cairo question and it is one which is going to be studied in all its potentialities by the A.R.R.L. Cairo Committee and its experts. Our A.R.R.L. is our own organization and it is the only voice through which we American amateurs may expect to be heard successfully. Upon A.R.R.L. and it alone rests the responsibility for carrying out this Cairo job. If there are things that can be accomplished via the Congress they will without doubt be part of our Board's plan. That is to say, if the idea is any good, your own organization can be counted on to employ it as part of a coordinated whole. Spurious attempts by commercial magazine publishers who are not the voice of organized amateur radio and idle chatter on the part of armchair diplomats affect the actual situation not one whit except possibly by making the A.R.R.L. job harder. Positively we've got to pull together in this thing. Let us QRX until the Cairo Committee reports its plan.

K. B. W.

Coming Examinations for Amateur Operator License

FOLLOWING is a complete schedule of all examinations for amateur operator license to be held by the F.C.C. during July, August and September. All examinations begin promptly at 9:00 a.m. local time. Examinations are not held on national holidays. Where dates or exact addresses are not shown, write the Inspector in Charge at the district headquarters as noted.

Washington, D. C., 7333 I.C.C. Bldg., every Thursday.
Boston, 7th floor, Customhouse, daily except Thursdays.
New York, 1024 Federal Bldg., 641 Washington St., every Tuesday, Thursday and Saturday.
Troy, N. Y., sometime in September. Details from New York office.
Philadelphia, 1200 New U. S. Customhouse, every Wednesday.
Baltimore, Ft. McHenry, every Wednesday and Saturday.
Norfolk, 402 New Post Office Bldg., every Friday.
Winston-Salem, N. C., August 2nd and 3rd. Details from Norfolk office.
Atlanta, 411 New Post Office Bldg., every Tuesday and Friday.
Nashville, August 16th. Details from Atlanta.
Miami, 12 New Federal Bldg., daily by appointment.
New Orleans, 326 Customhouse, every Tuesday.
Galveston, 209 Prudential Bldg., daily by appointment.
Dallas, 464 Federal Bldg., every Tuesday and Friday.
Oklahoma City, sometime in August. Details from Dallas.
Albuquerque, N. M., sometime in August. Details from Dallas.
San Antonio, sometime in September. Details from Dallas.
Los Angeles, 1105 Rives-Strong Bldg., every Monday and Saturday.
San Francisco, 328 Customhouse, every Monday.

Portland, Ore., 207 New U. S. Courthouse, every Friday.
Seattle, 808 Federal Office Bldg., every Friday.
Denver, 538 Customhouse, first and third Saturdays of each month.
Salt Lake City, sometime in September. Details from Denver office.
St. Paul, 927 New Main P. O. Bldg., first Saturday of each month.
Bismarck, N. D., sometime in August. Details from St. Paul office.
Kansas City, Mo., 410 Federal Bldg., first and third Saturdays of each month.
St. Louis, August 23rd and 24th. Details from Kansas City office.
Des Moines, July 26th and 27th. Details from Kansas City office.
Chicago, 2022 Engineering Bldg., every Saturday.
Detroit, 1025 New Federal Bldg., every Saturday.
Cincinnati, sometime in August. Details from Detroit.
Cleveland, sometime in July. Details from Detroit.
Columbus, Ohio, sometime in September. Details from Detroit.
Buffalo, September 19th, 20th, 21st. Details from Buffalo.
Honolulu, Aloha Tower, every Monday and Saturday.

The Navy is getting a great new long-wave transmitter for NSS. In the factory where it was fabricated it has been set up for test. The front panel is of aluminum, perhaps 10 feet high and getting on to 80 feet long. Throughout its length the bottom 3 feet or so of this panel is occupied by wheels, switches, gadgets, but the huge top expanse is blank. Now there are hams in this factory, as in any. One morning recently when the crew came to work they found that some ham's instinct had got into operation, for the blank top portion of the huge panel carried a large sign: "This space for QSL cards."
Design for Higher Performance in the Super-Regenerative Receiver
Details and Characteristics of a New-Type Three-Tube U.H.F. Circuit
By G. W. Fyler,* W2HLM

Although the super-regenerative type receiver has achieved wide use in u.h.f. communication, after making present popular use of these bands a practical possibility, until recently there has been little serious attention given to developing fully its inherent capabilities. The remarkable tolerance with which the super-regen is gifted, its ability to work fairly well in spite of its handling, unquestionably has encouraged this lack of development. Increasingly rigorous communication requirements now demand more, however, as our own work and that of others has clearly indicated. Can the super-regen meet these requirements, or must we revert to something derived from the more elaborate superhet? The fair answer to this question, backed by competent corroboration, now points to a continuing and brighter future for the super-regen as a generic type. Far from obsolescent, its inherent characteristics give it a long start on the superhet in the field of u.h.f. communication. More thorough development promises to keep it well up in that position.

The super-regenerative detector first described by Armstrong in 1922 was a remarkable contribution to the radio art. Although its capabilities have not been fully appreciated or realized in practice, because of its apparently temperamental idiosyncrasies, perhaps no radio circuit ever offered as much opportunity for experimentation.

Most of the circuits previously used have had serious disadvantages which limited their application in commercial practice. Complex adjustments for tuning and stability have been required, particularly for covering a wide band of frequencies. A few facts recently discovered have improved the operation of this type of detector and made possible practical commercial equipment utilizing the principle of super-regeneration. An improved super-regenerative receiver, developed by the General Electric Company in Schenectady for police communication in the ultra-high-frequency band 30 to 42 mc., has points which should be of interest to radio amateurs. The circuit is shown, with constants for the 30- to 42-mc. band,

A MOBILE RECEIVER EMPLOYING THE CIRCUIT DESCRIBED
The tube shields have been removed.

in Fig. 1. The receiver uses but three tubes, equivalent to five single-purpose tubes. By reducing the size of the coils, the frequency range may be extended to well above 60 mc.

Some of the remarkable properties of an s.r. detector are, its ability to receive a signal in the presence of ignition and other types of noise-spectrum interference, very high amplification in one tube, the "flat" and instantaneous a.v.c. characteristic possible, and uniform audio-frequency response.

QUenchING AND STABILITY
Anyone who has built super-regenerative receivers is acquainted with the various forms of instability which may result from improper adjustment of the circuits. It was found that instability in the plate-quenched detector is very frequently caused by a self-quenching action of the detector at a sub-harmonic of the plate quenching frequency. If this additional quenching action exists, the sensitivity will be very low. In other words, if the quench oscillator operates at 20 kc., the detector may self-quench at 10 kc., 6.7 kc., 5 kc., 4 kc. etc., corresponding to the 2nd, 3rd, 4th and 5th sub-harmonics of the quench oscillator frequency. This phenomenon can be demonstrated usually with the s.r.

---

*Radio Transmitter Engineering Dept., General Electric Co., Schenectady, N. Y.
circuits using a split-tank input circuit with a variable capacitor between coil sections. When tuned to an unmodulated carrier to eliminate hiss voltage, a cathode-ray oscilloscope is connected with the quench oscillator voltage on one set of plates and the amplified audio output voltage of the audio amplifier and the detector on the other set of plates. Ordinarily a small amount of quench voltage will get through a signal generator, with different points of coupling the pre-amplifier plate to the detector circuit, with various impedances in the plate-voltage supply lead to the detector tank, and with several values of grid blocking capacitors and grid leak resistors. The various a.v.c. curves indicated that maximum audio output could exist at either low or high r.f. input levels, a particular frequency giving either a direct or inverse change in audio level with increased signal level. However, when a flat a.v.c. characteristic was obtained, this characteristic fortunately existed over a wide frequency range, as shown by the three curves of Fig. 2. The grid blocking capacitor is 50 µfd. and the grid leak 2 megohms. The r.f. amplifier plate is connected to the grid end of the detector tank and the plate voltage supply lead to the detector tank is directly tapped on the third turn from the grid end of the coil, and the lead is bypassed to ground through three series-connected capacitors.

A cathode ray oscillograph was used to investigate the r.f. oscillation taking place in the detector circuit for flat a.v.c. A small amount of high frequency r.f. voltage was obtained for one

FIG. 1—CIRCUIT OF THE NEW-TYPE SUPER-REGENERATIVE RECEIVER

- L1—R.f. coil. For 30-mc. range, 12 turns No. 12 enamelled on 3/4-inch diameter Mycalex dowel, turns spaced 3/16-inch diameter of wire. Tap adjusted to suit antenna used. Total turns reduced approximately 1/4 for 50-mc. band.
- L2—Detector coil. For 30-mc. range, 9 turns No. 12 enamelled on 3/4-inch diameter Mycalex dowel, turns spaced 3/16-inch diameter of wire. Approximately 1/4 as many turns for 50 mc.
- L3—Filament choke, 22 turns No. 16 enamelled close-wound on 7/8-inch diameter bakelite dowel.

C1 and C6—50-µfd. midget tuning capacitors (Hammarlund APC).
C2—0.006 µfd. cathode r.f. by-pass.
C3—1-µfd. cathode a.f. by-pass.
C4—0.006 µfd. screen-grid by-pass.
C5—50-µfd. mica grid capacitor for detector.
C7—0.006 µfd. quench oscillator grid capacitor.
C8—0.002 µfd. fixed, quench oscillator plate tuning capacitor.
C9—0.006 µfd. audio primary by-pass.
C10—500-µfd. audio secondary by-pass.
C11—0.02 µfd. audio grid coupling capacitor.
C12—0.001-µfd. audio grid by-pass.
C13—8-µfd. audio cathode by-pass.
C14—0.05-µfd. tone-control capacitor.
C15—4-µfd. plate supply audio by-pass.
C16—0.006-µfd. plate supply r.f. by-pass.
C17—0.006-µfd. filament supply r.f. by-pass.
T1—Quench frequency oscillation transformer (National Type ORS connected as shown by circled letters).
T2—Intertage audio transformer with static shield between windings. Connect by trial for best audio quality.
T3—Pentode output transformer. (Included in speaker.)
R1—50-ohm 1/4-watt cathode bias resistor.
R2—100,000-ohm 1/4-watt screen-grid resistor.
R3—2-megohm 1/4-watt detector grid leak.
R4—10,000-ohm 1/4-watt quench oscillator grid leak.
R5—100,000-ohm 1/4-watt audio transformer load resistor.
R6—50,000-ohm 1/4-watt audio plate load resistor.
R7—100,000-ohm variable volume control.
R8—50-ohm 1/4-watt audio cathode bias resistor.
R9—25,000-ohm variable tone control.

The detector input circuit is at the upper left.
set of plates by coupling to the detector tank coil. The other set of plates was connected to the quench oscillator. The r.f. oscillation for the optimum adjustment of the detector was found to take place over a very small part of the quench frequency cycle when the plate voltage was approximately at its maximum value. The shape of the r.f. oscillation envelope was similar to a single sinusoidal half-wave. It should be realized that the quench voltage is applied to both the grid and plate of the detector, the grid coupling capacity and grid-to-plate capacity reactance being much lower in value than the grid leak impedance at the quench frequency.

With the optimum adjustment of the detector, the plate voltage may be varied over wide limits without affecting the stability of the detector. Fig. 3 shows the variation of output signal as a function of plate voltage applied to the receiver. The quality of the received signal is unchanged over this range in plate voltage. Fig. 4 summarizes audio distortion measurements made on the receiver. The distortion is substantially independent of the r.f. signal level.

Polarity in connection of the interstage audio transformer has an important bearing on distortion. The outside secondary winding tap should be connected to the grid of the first audio amplifier. Approximately three times as much audio distortion results if the wrong polarity is used in connecting the primary winding, both at 30 and 60 per cent modulation. The correct primary connection may be determined readily by a listening test, the polarity giving the best quality being the correct one.

The detector tuning element must not upset the optimum relationship between grid and plate r.f. voltages as determined by fixed, interelectrode tube, and stray capacitances of the tuned circuit. The receiver may be tuned to any frequency in the 30- to 42-mc. band by the two independent tuning controls located on the front of the panel. The upper left control tunes the r.f. amplifier and the lower left tunes the detector. No other adjustment is required for stabilizing the receiver. The lower right knob is the tone control. This enables a listener to adjust the audio frequency response of the receiver. Some improvement in the signal-to-noise ratio is also possible by this adjustment.

A flat a.v.c. characteristic within 1 db over an input signal range of approximately 10,000 to 1 microvolts was obtained for a frequency range of 30 to 42 mc.

One interesting feature of the a.v.c. characteristic is its practically instantaneous action. This is a very desirable feature for mobile service where standing waves of field strength may exist.

Thus, with reception on a frequency of 42 mc, a car travelling at 60 miles per hour may intercept eight standing waves per second. In practice the standing wave pattern is found to vary considerably in severity depending upon the reflection conditions and is least noticeable in open country. Under average standing wave conditions in large cities, the intelligibility of the received signal may be satisfactory with a super-regenerative receiver having flat a.v.c. and barely understandable with the usual superheterodyne circuits due to inherently slow and non-uniform a.v.c. action. The received signal tends to vary in amplitude over a wide range at a rapid rate.

**R.F. AND AUDIO STAGES**

The first r.f. amplifier stage is very desirable with a super-regenerative detector in order to improve the signal-to-hiss ratio for weak signals. It also isolates the detector circuit from the antenna to eliminate this variable, prevents radiation, and provides better selectivity. It is possible to operate two of these receivers within 100 feet of each other without mutual interference due to radiation. The r.f. amplifier tube is the pentode part of the 6F7 which is similar to a 78.
tube. The triode part of this tube is used for the first audio amplifier. This tube supplies sufficient audio gain to obtain full power from the output pentode. The detector uses one of the triode elements of the 6A6 tube. This tube is the 6-volt version of the 53 which is normally used for a Class-B audio output amplifier. It was chosen for its high mutual conductance and amplification factor and to permit using the other triode element for the quench oscillator. The audio output tube is the conventional 41 pentode.

One of the problems encountered in development of the audio amplifier was the reduction of quench-voltage input to the audio system. The interstage audio transformer was constructed with a shield between primary and secondary to prevent electrostatic coupling, and both the primary and secondary were suitably by-passed to prevent magnetic coupling. Further reduction of the quench voltage at the grid of the 41 is desirable to permit full utilization of this tube. It is desirable to obtain the necessary reduction in two stages rather than in one, to obtain a sharper cut-off at the quench frequency without undue attenuation of the higher voice frequencies. It should be noticed that the by-pass capacitor on the grid of the 41 tube, together with the volume control, also provides a tone-compensated volume control. At intermediate settings of the volume control, the higher audio frequencies are reduced. This is desirable for reduction of the higher hiss frequencies when no carrier is being received. The loudspeaker will deliver 2 watts of audio power for any fully modulated r.f. signal of between approximately 1 and 10,000 microvolts, with the one adjustment of the volume control.

To test for freedom from ignition interference, the super-regenerative receiver was compared with a superheterodyne having about the same sensitivity. An automobile ignition system was set up in the laboratory with a controllable amount of coupling to a receiving antenna. The super-regen receiver showed a remarkable discrimination against ignition interference in comparison to the usual superhet receiver. Furthermore, an unshielded super-regen receiver without an antenna received a good signal from a 15-watt transmitter ½ mile away when the receiver was within 6 inches of the ignition wires to spark plugs. During tests of the super-regen receiver in a large city, a satisfactory signal has been received from a police car having a 15-watt transmitter cruising throughout the city up to a maximum distance of 10 miles.

The power supply used is a dynamotor filter unit separately mounted. The receiver volume control, power switch and indicating lamp are mounted in a small unit for ease of adjustment.

An interesting mechanical feature is the plug-in chassis design with simple snap clasps permitting quick removal of the chassis for servicing with complete accessibility.
Radio Equipment of General Utility

Flexibility in the Design and Construction of Portable Station and Entertainment Apparatus

By H. A. Robinson,* W3LW

At sometime in the career of almost every radio amateur there comes a definite need for various units of transmitting, receiving or audio equipment which are considerably more flexible and portable than the usual run of amateur gear. For instance, there is frequently occasion demanding a portable audio amplifier and loud speaker unit, with provision for microphone or phonograph input, for local entertainment or public address work. The incorporation of a flexible radio receiver unit for both broadcast and short-wave bands is but a further step in the design of such equipment. And finally, of course, the portable equipment for the licensed amateur would not be complete without its effective c.w. and 'phone transmitter unit.

With flexibly designed, self-contained portable equipment of this type, the field of useful application is unlimited. There is portable amateur operation on the vacation or extended business trip; the practical demonstration of amateur radio transmission and reception to groups of Boy Scouts, clubs and similar organizations; the use of the amplifier-speaker unit for vacation entertainment and public address work on a small scale; and operation at the home station for the amateur living in the small apartment.

With this fundamental object of universality of application, as well as the usual requirements of economy in size and weight with accessibility and ruggedness accompanied by effective overall performance of each of the component units, the design and development of the equipment shown in the accompanying photographs and diagrams was carried on over a period of many months.

THE GENERAL PLAN

As shown in the photographs, the assembly comprises three distinct units, each mounted on a separate panel and sub-base. The 7- by 14-inch panel size was selected as a standard after due consideration of the requirements of each unit and the overall size of the completed equipment. The justly popular rack-panel type of construction was employed and is recommended for flexibility and accessibility. The rack of 1/4- by 1/4- by 1/2-inch brass angle is bolted into the cabinet with the front surfaces of the 1/2-inch aluminum panels flush with the edges of the cabinet. A uniform spacing of panel mounting permits interchanging units. The marking and drilling of holes and cutting of panels must be done with precision to insure a tight fit and avoid unsightly cracks between units. The details of panel mounting are shown in Fig. 1.

The cabinet (overall dimensions shown in Fig. 2) was constructed of 3/4-inch three-ply fir wood. Brass wood screws and molding strip insure a tight yet rugged carrying case. The loud speaker, mounted permanently in the rear of the cabinet, is covered with a suitable grill cloth and fitted with a readily detachable cover. At the top end of the cabinet, remote from the speaker, a hinged access door is provided for changing the plug-in receiver coils.

The cover for the cabinet was made sufficiently deep to provide clearance for all the panel control knobs. The space in the cover is utilized for holding the accessories during transportation—hand microphone and extension cord, telegraph key and plug, head telephone, resonance indicator lamp, power cord, antenna and feeder sections, insulators, etc. The cabinet is fitted with detachable hinges for the cover, a convenient carrying handle and two sets of rubber feet. It is intended to be carried on the side much like a suit case, and set upright when installed for operation, as shown in the photographs. The companion unit, an electric phonograph, is a standard type and need not be described.

Before considering each unit separately, a few general remarks influencing the design might

*Silver Lake Farm, Willow Grove, Penna.
prove of interest. The problem of power supply is of primary importance. Except for extremely low-power transmission and reception, the use of dry-battery supplies is out of the question.

While the storage-battery operated vibrator-rectifier power supply is convenient for certain applications, the general availability of 110-volt a.c. supply justified the selection of this type of power source. The a.c. power supply makes possible a substantial audio output for public address work and radio reception; and, in turn, provides sufficient modulation capability for a reasonably powered 'phone transmitter.

AUDIO AMPLIFIER POWER UNIT

The basic unit of the equipment, and likewise the heaviest, comprises the audio amplifier and the a.c. power supply. The photographs show the general construction and arrangement of the components, while the schematic diagram and circuit constants are given in Fig. 3.

A broadcast type power transformer with the required filament windings and a high-voltage winding supplying 350 volts each side of the center tap is employed. The full-wave type 80 rectifier tube has ample capabilities, since the normal current drain is approximately 55 milliamperes during reception and 60 to 90 milliamperes during transmission. The power transformer should be selected with adequate rating for the current drain during reception. The higher drain during transmission is somewhat of an overload but, being rather intermittent in nature, results in only a slight rise in the operating temperature of the transformer.

For reception and 'phone transmission a single stage of filtering is provided for the output tube utilizing the 1200-ohm speaker field coil as a choke (approximately 40 henries). This arrangement furnishes adequate field excitation for the speaker and results in a very low ripple output. Dry electrolytic capacitors are employed because of their light weight and compactness. An additional stage of resistance-capacity filtering is effective in the plate and screen supplies to the audio- and radio-frequency amplifier tubes. The detector screen-grid voltage is supplied through a neon tube voltage regulator, reducing to a negligible degree the effects of variations in the a.c. line voltage.

The audio amplifier includes a Type 57 pentode tube as the first amplifier, resistance-coupled to the Type 47 pentode output tube. The output tube is transformer-coupled to the four-ohm speaker winding for reception, or impedance-coupled to the modulated r.f. amplifier stage for 'phone transmission. A volume control is provided in the grid circuit of the first a.f. amplifier tube to control the audio level. A double-pole double-throw toggle switches the audio amplifier from radio reception to microphone or phonograph pick up. In the microphone or phonograph position this switch opens the screen supply to the detector and switches the microphone current (10 ma.). The microphone and phonograph input connections are brought out to telephone tip jacks. For added flexibility, terminal jacks, impedance-coupled to the plate of the output tube, are also provided. The headphone jack is con-
RANSMITTER

RECEIVER

FIG. 3—CIRCUIT OF THE AUDIO AMPLIFIER—POWER UNIT

Li—Speaker Field (choke)
C1—0.5 µfd.
C2—4 µfd. electrolytic
C3—0.05 µfd.
C4—500 µfd.
C5—0.02 µfd.
C6—10 µfd. electrolytic
C7—4.4 µfd. electrolytic
C8—0.5 µfd.
C9—4.4 µfd. electrolytic
C10—10 µfd. electrolytic
C11—100 µfd. electrolytic
C12—4 µfd. electrolytic
R1—100,000 ohms
R2—500,000 ohms
R3—500,000 ohms
R4—200 ohms
R5—400 ohms
R6—50 ohms, center-tapped
R7—Microphone-phonograph transformer
R8—Power transformer (see text)
R9—Output transformer
S1—S.p.s.t. power switch
S2—4-pole special switch (see text)
S3—D.p.s.t. toggle switch

Connected in the plate circuit of the first a.f. tube and, although the receiver is of rather low impedance for this tube, the telephone output level is adequate. The small coupling capacitor effectively cuts the low frequencies, reducing residual hum to a negligible value, while the jack spring opens the input to the output tube, silencing the speaker during head- phone reception. If higher output and simultaneous speaker and head telephone operation should be desired, the output tip jacks can be used. The circuit constants have been selected with particular thought to their effect upon the frequency characteristic and the overall performance of the unit.

The unusual flexibility of the equipment is made quickly available for a four-pole (Federal) switch employed as a three-position switch by bending certain contact springs, as shown in the schematic diagram. In the "Receive" position, the plate and filament supplies are removed from

FIG. 4—DIAGRAM OF THE RECEIVER UNIT

L1, L2, L3, L4, L5—See coil data
C16—0.1 µfd.
C17—0.001 µfd.
C18—0.5 µfd.
C19—0.25 µfd.
C20—100 µfd.
C21—100 µfd.
C22—0.01 µfd.
C23—0.2 µfd.
C24—4.5 µfd.
C25—100 µfd.
C26—250 µfd.
C27—250 µfd.
C28—0.001 µfd.
C29—1 megohm
R10—10,000 ohms
R11—2500 ohms
R12—15,000 ohms
R13—50,000 ohms (regen. control)
R14—40,000 ohms
R15—100,000 ohms
R16—50,000 ohms (sensitivity control)
R17—50,000 ohms
T1—Output transformer
(Spec. text)

July, 1935

17
and amplifier units. In the mid position ("Phone-Standby") this switch gives connections for low-power c.w. transmission, 'phone transmission or standby-by reception on the head-phones (or external speaker). In this position the switch opens the speaker cone circuit, applies filament power to the transmitter, connects the bias on the modulator tube and keeps the plate supply on the receiver and audio amplifier units. Also in this position, c.w. or 'phone transmission is selected by inserting or removing the plug of the telegraph key in the transmitter unit. Duplex operation, relay re-transmissions on another frequency band, or the transmission of speech or c.w. is possible.

With the switch in the "CW" position, the plate voltage is removed from the receiver and audio amplifier units, the high voltage being taken from across the first filter condenser through a low-resistance filter choke in the transmitter unit, thus providing a much higher plate supply as a result of the decreased current drain with the receiver and amplifier units and speaker field removed from the circuit. The speaker cone circuit is left open, and the transmitter filaments lighted. In this position the maximum power output is available for c.w. telegraph transmission. A more complete understanding of the flexibility of the equipment can be obtained by tracing the circuit changes accomplished by this switching.

The audio amplifier power unit, being the heaviest, is placed at the bottom of the rack, with the speaker unit directly behind and slightly above it. The components are arranged to provide ample clearance around the speaker cone. The various switches and controls are marked by lettering on the aluminum panels. Sockets are provided for the multi-conductor cables which interconnect the several units. There are three such sockets, one for the speaker cable, and one each for the transmitter and receiver units.

**THE RECEIVER UNIT**

The receiver unit is located at the top of the rack. This location was selected to reduce the tendency towards acoustic howl resulting from the speaker vibrating the plates of the tuning condenser, tubes or other circuit elements. This form of instability, so prevalent in highly selective short-wave receivers, is reduced to a negligible proportion by the use of rugged components and r.f. wiring, along with spacing of the receiver from the speaker.

The circuit, as shown in the schematic diagram of Fig. 4, comprises essentially a single stage of tuned or untuned radio frequency amplification with a Type 58 tube, inductively coupled to the regenerative detector. The detector is Type 58 tube with screen-voltage control of regeneration. A high-impedance coupling transformer (100,000 ohms, 1:1) feeds the audio output to the amplifier unit. Band-spread tuning is provided by the small 15-µfd. band-spread capacitor shunting the main tuning condenser (100-µfd.). A National Type B vernier dial serves as the band spread control and a Type BM dial provides excellent resetability and ease of adjustment of the main tuning condenser.

The plug-in coils are accessible through the door provided in the top of the cabinet. By careful coil adjustment the amateur bands are positioned to give sufficient band spread (one-half to full scale, depending on the band) while still maintaining complete frequency coverage and overlap between coils. The low-frequency coil is equipped with a built-in band switch to give coverage of 550 to 2500 kc. in two bands. In a similar manner, the r.f. tuned grid circuit is provided with a three-band switch permitting coverage from 2500 to 20,000 kc. A resistance coupling can be plugged in when untuned r.f. is employed. These arrangements minimize the number of coils required for complete frequency coverage, a point not to be overlooked when designing portable equipment. Coil data are given in the Table and Fig. 6; however, some slight adjustments...
may be necessary where circuit capacities differ. Spare sockets are provided for carrying the additional coils. A compact calibration chart for ready reference is fastened to the inner side of the coil access door. Capacitive antenna coupling permits variable adjustment (screwdriver) for widely differing antennas. Separate antennas are used for transmission and reception, since the receiving antenna is usually quite short. The panel controls include, in addition to the bandspread and main tuning, r.f. sensitivity control, r.f. tuning and the regeneration control. The r.f. sensitivity control is highly desirable to reduce the level at the regenerative detector when discriminating against strong local signals, preventing blocking or cross modulation. The arrangement of components, shielding and general construction of this unit are shown in the photographs. A seven-conductor cable, terminating in a plug, interconnects with the audio amplifier unit. It was thought that a separate shielded lead for the receiver output would be required to reduce hum pick up, but this was not found necessary with the transformer coupling. However, an improvement in hum level would undoubtedly result and shielding would be required when resistance-coupling of the detector was employed.

THE TRANSMITTER UNIT

The third and central panel supports the transmitter unit with its associated controls. A rather extensive series of measurements on a breadboard experimental layout were made to determine the most suitable transmitter arrangement, tube complement and circuit constants. A 100-ohm dummy antenna load was employed and all measurements were made at a frequency of 7 mc. The only limiting requirements were those of available power supply (300-volts 80 ma.) and tube complement (a maximum of two tubes). Circuit arrangements included self-excited t.g.t.p. (single-ended and push-pull), and oscillator-amplifier circuits; while 45, 46, 47 and 56 type tubes were tried. The general conclusions leading to the selection of the present arrangement can be summarized as follows:

(a) Low plate efficiency of self-excited arrangements at the low plate voltage (efficiencies 30 to 50%).
(b) Inadequate output of type 56 tube self-excited, at this plate voltage.
(c) Negligible difference in performance of Type 49 or Type 45.

(d) Low overall efficiency of Type 47 tubes as self-excited oscillator at this plate voltage.
(e) High amplifier plate efficiency of master oscillator arrangements (70-75%).
(f) Ability of Type 56 or 45 as an oscillator to drive adequately a Type 45 as power amplifier.
(g) Desirability of master oscillator-power amplifier arrangement for 'phone operation.
(h) Freedom of m.o.p.a. arrangement from output adjustment affecting the frequency.

Because of the low plate supply voltage, frequency doubling was not feasible; hence the master oscillator operates on the same frequency as the power amplifier. The time lag in the heater of the Type 56 oscillator made the tube unsuitable for this application, resulting in the use of the two Type 45 tubes as shown in the schematic diagram of Fig. 5.

The master oscillator uses the 45 triode at low plate voltage in a high-C Hartley circuit. This arrangement makes for convenience in neutralizing and provides band-spread for the panel control adjusting the oscillator frequency. The Type 45 power amplifier is inductively coupled to the output circuit by means of a variable coupling. A flexibility of antenna or feeder arrangements, permitting either series or parallel tuning, operation with antenna, feeders, ground or counterpoise, can easily be obtained by means of one or two flexible jumper leads (carried in the cover). The transmitter is designed for operation on three frequency bands, 3.5, 7 and 14 mc. However, excellent performance on the 1.7-mc. band can be obtained readily with somewhat larger coil forms.

The coils are wound on tube-base forms. To minimize the number of coils required for three-band operation, the circuit constants are proportioned so that the oscillator operates with a high-C tank, as desired from the standpoint of frequency stability, and the oscillator coil of any one band is of the correct value to function as the power amplifier plate tank coil of the next higher frequency band (where low-C is desired). By

this means, effective three-band operation with only four coils is achieved, a feature of considerable importance for portable equipment.

On the 14-mc. band the oscillator tank fixed capacity is reduced from 150 µµfd., as employed on the two lower bands, to 50 µµfd., and the oscillatory plate series resistor reduced to provide excitation comparable to that on the lower frequency bands. These oscillator circuit changes are accomplished automatically by arranging the coil terminals and jumpers in the tube base coil forms. (See Fig. 6.)

Closed circuit jacks permit the reading of oscillator plate current, power amplifier grid current and power amplifier plate current. A 50-ma. meter, supplied with a flexible cord and plug, is mounted on the panel and serves as a ready check on the tuning and loading, as well as on the general operation of the transmitter.

The power amplifier plate circuit jack has its closed circuit spring connected to the primary of the audio output transformer which serves as the modulation reactor for _phone transmission. For _w, transmission, the telegraph key is plugged into this jack, opening the lead to the modulator, while keying the power amplifier plate circuit. (Caution—the key is "hot" and hence should have an insulating wooden mounting base.) For _phone transmission, the key plug is removed, closing the plate circuit to the modulation reactor and audio output tube.

A separate filter with a 6-henry choke and 1-µfd. capacitor, together with the 10-µfd. first filter capacitor in the power unit, provides a very pure d.c. plate supply for the transmitter unit.

This unit has the front panel hinged to the audio amplifier unit below, the hinges being tapped so that either unit can be readily removed. Thumb screws, made from the bakelite tops of binding posts, are used to secure the unit to the rack. By removing these thumb screws, the unit can be tilted forward to give access to the tubes and coils for band changing. The variable condensers for adjusting the oscillator frequency, neutralizing, and antenna or feeder tuning, are insulated from ground by mounting on a small hard rubber panel parallel to the front panel but set back approximately an inch. Insulating shafts are extended to the panel controls.

The panel controls include the following: oscillator frequency, neutralizing, amplifier tank tuning, output tuning and coupling. Air condensers were necessary for the oscillator tank fixed capacitors, a gradual drift in frequency occurring as mica fixed condensers changed their temperature in operation.

**ANTENNAS**

The antenna equipment, carried in the cover of the cabinet, comprises four light-weight insulators constructed from 1⅛-inch lengths of ½-inch bakelite tubing, a length of supporting cord for the radiating system, and the following sections of stranded insulated conductor, fitted with suitable lug terminals and supplied with screws and nuts for interconnection:

<table>
<thead>
<tr>
<th>Section</th>
<th>Conductors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-33 foot</td>
<td>1-39 &quot; &quot;</td>
</tr>
<tr>
<td>2-16 &quot; &quot;</td>
<td>1-9 &quot; &quot;</td>
</tr>
<tr>
<td>1-13 &quot; &quot;</td>
<td>1-20 &quot; twin conductor</td>
</tr>
<tr>
<td>1-3½ &quot; &quot;</td>
<td>1-3½ &quot; &quot;</td>
</tr>
</tbody>
</table>

These antenna sections, by interconnection, pro-
A Four-Band Exciter
Instant Band Changing With Circuit Switching and Fixed Tuning
By J. Herbert Hollister,* W9DRD

WITH the advent of the click-click method of changing bands in the best receiving circles, came the realization that life could mean something more than one everlasting popularized by Art Collins and others. The job of bringing order out of chaos can’t be done overnight, but by building each new piece of equipment for rack mounting, things about the old static room will soon begin to shape up.

Referring to the rear view of the exciter, shown in Fig. 2, we start at the right with six crystal holders lined up on the edge of the chassis. The mounting was made from a strip of Vicro, using wafer socket clips for contacting the holder prongs. Next, along the rear of the chassis we have the 3.5-mc. oscillator coil, the first 53, the 7-mc. coil, the 14-mc. coil, the second 53, and the 28-mc. coil. The condensers for all four coils are mounted beneath the chassis on the bakelite strip which forms the back edge of the chassis. In the center, directly behind the chassis, is the RK23 buffer with its quartette of tank circuits clustered round.

FIG. 1—BAND-CHANGING BECOMES A PLEASURE WITH AN EXCITER LIKE THIS ONE

No tuning adjustments to be gone through—simply flip the "buffer" and "exciter" switches to the band desired and select any one of six crystals on the "crystal" switch. The 53’s handle the oscillator and doubler functions; the buffer, always used as a straight amplifier, is an RK-23.

search for the right coil. The net result, of course, is that we now have more time on our hands in which not to wind coils. Then the logical extension of the same line of thought leads to the application of band switching to the transmitter where, at least in the low-power stages, the treatment may be similar to that used in many receivers.

Taking Jim Millen’s tip¹ that the 53 tube would best fill the bill as a crystal-controlled oscillator and as a doubler, the exciter-buffer unit depicted in Fig. 1 was developed. The panel is 7” by 19” for standard rack mounting, and there is a lot to be said in favor of this unit type of construction which has been

FIG. 2—SEEN FROM THE REAR, THE EXCITER LOOKS A GOOD DEAL LIKE A NEATLY-BUILT SUPERHET

But don’t be deceived by its appearance; the output on any of the four bands is sufficient for driving a pair of 800’s as modulated Class-C amplifiers. Although the oscillator and doubler coils are wound on plug-in receiving coil forms for convenience, actually they are permanent fixtures. The socket which can be glimpsed behind and to the left of the ten-meter doubler coil is for the power-supply plug.

Now, taking a quick glance at the schematic circuit (Fig. 3), the plot unfolds in all its simplicity. The grid of the first triode section of our first 53 is driven by any of the six crystals which

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* R. 1, Knox Rd., Merriam, Kansas.
¹ Millen, "A Pentode Output Transmitter With Six-Band Exciter." QST, October, 1934.
FIG. 3—CIRCUIT DIAGRAM OF THE BAND-SWITCHING EXCITER

C1—100-µfd, midget air condenser
C2, C3, C4—50-µfd, midget
C5—10-µfd, midget
C6—50-µfd, midget
C7—35-µfd, midget
C8—100-µfd, midget
C9—50-µfd, midget
G7—35-µfd, midget
C10—.001-µfd. mica condensers
C11—.01-µfd. mica condensers
R1—5000 ohms, 2-watt
R2—10,000 ohms, 2-watt
R3—20,000 ohms, 2-watt
R4, R5, R6—10,000 ohms, 2-watt
L1—1.5, mc. oscillator coil; 35 turns No. 22, diameter 1½ inches, winding length 1½ inches
L2—7-mc. doubler coil; 20 turns No. 16, diameter 1½ inches, winding length 1½ inches
L3—14-mc. doubler coil; 10 turns No. 16, diameter 1½ inches, winding length 1¼ inches
L4—28-mc. doubler coil; 3¼ turns No. 14, diameter 1½ inches
L5—3.5-mc. buffer coil; 30 turns No. 16, diameter 1½ inches, winding length 1¼ inches
L6—7-mc. buffer coil; 15 turns No. 14, diameter 1½ inches, winding length 1¼ inches
L7—14-mc. buffer coil; 9 turns No. 10, diameter 1¼ inches, winding length ¾ inch
L8—28-mc. buffer coil; 3¼ turns No. 10, diameter 1¼ inches, winding length ¾ inch
RFC—Sectional-wound chokes, high-frequency type
The tuning condensers, C1—C10, inclusive, are Cardwell Trim-Aires

Selection of harmonics for such interference-free spots as may appear in the four bands, 10, 20, 40, and 80 meters. The second triode section of the same 53 is tuned to 7 mc. The first section of the second 53 is tuned to 14 mc. and the second section of the same tube to 28 mc. These four tanks once peaked will require no retuning with crystals whose fundamental frequencies fall between 3500 kc. and 3575 kc. It will, of course, be necessary to retune for a crystal in the 3.9 mc. 'phone band, but in this case it is only the oscillator tank condenser; and, after all, it should be worth that extra effort to get to work on the 75-meter 'phone band.

The four sections of the two 53's are permitted to run constantly, and therefore we have excitation voltage in each of the four bands on tap at all times with which to drive the grid of the RK-23 buffer. Capacity feed is used, with the tap coming directly off the plates of the 53's, through a four-point switch the arm of which is hooked to the RK-23 grid.

A good deal of religion was lost in trying to use a tapped coil in the plate circuit of the RK-23. The thing was fairly easy to do, down to 28 mc.; but there it appeared that there was more inductance in the leads than in the coil itself. Accordingly, it was decided to use separate tanks, pre-tuned to the desired bands, and the tank assembly shown in Fig. 4 was tricked up. The can is by National and is not cellophane. The condenser is by Cardwell, and the coil is by winding. The coil turns indicated are quite critical; and in the case of the 14- and 28-mc. combinations, the

(Continued on page 60)
A Genemotor Crystal-Controlled Portable Using 6-Volt Tubes

By F. Waddingham,* W6EQL

The simple, crystal-controlled rig described here should appeal not only to the portable-minded but to the rural amateur as well, since both plate and filament power are obtained economically from a 6-volt storage battery. As a total battery drain of 4 amperes, the input to the amplifier stage of the transmitter is better than 6 watts. The power output can be increased by using a motor-generator of larger capacity, although the battery drain will be correspondingly increased.

—EDITOR

IT IS highly desirable that a station designed for portable work really should be capable of being carried by one person, since occasions often arise when a good location on tour is not always readily accessible to an automobile. The transmitter herein described was designed to meet this condition and at the same time to be economical in power consumption. The entire equipment, except for a 6-volt storage battery, may be carried very easily by one person. Some experimenting was necessary, however, before the final design was decided upon, because such things as suitable tubes, power supply and reasonably compact components must be given consideration.

To have low-power tubes of rugged construction, “automobile-type” tubes were selected, though 01-A tubes were also tried out. At the same voltages, these latter did not seem to be as good. The use of the 6.3-volt tubes eliminates a dropping resistor, though some of us run 01-A tubes direct anyway! Further, the transmitter may be operated on a.c. where possible and desirable.

Inasmuch as some trips mean that there will be no chance to charge a battery, battery drain is a big factor to be considered in choosing the power supply. Bearing this in mind, the plate supply is furnished by an Emerson 6/220-volt 40-ma. motor generator as used for auto-radio receivers. This bit of equipment uses 3 amperes battery current. A larger size Genemotor can be had and used, but of course will take more current. “B” batteries also can be used if desired.

The crystal-controlled oscillator, a Type 41 tube, is shunt-fed, making possible the omission of a grid choke in the amplifier input circuit. The 41 seemed to be a better oscillator than the 38, which was first tried. An 89 might be used. Jacks are provided for the measurement of screen and plate currents by use of a single meter, equipped with a plug. The “B” drain for the oscillator is about 15 ma. The amplifier is one of the new “double-triode” types, a 79, with the elements paralleled. General characteristics of this tube seem to indicate a higher output than any other 6.3-volt tube, taken singly at least. Comparisons are from such means as were at hand. When coupled to the load, the “B” drain is about 30 ma. This makes the total drain on the Genemotor quite close to the rated 40 ma., without too much voltage drop or overload, so that with the intermittent service characteristic of c.w. transmission, there should be no damage to the equipment. Tuning and neutralizing adjustments are carried out in the same way as with other simple crystal transmitters.

A three-pole double-throw three-position switch makes it possible to have the plate supply of the receiver and the transmitter filaments on, or off, and the transmitter filaments and Genemotor

THE COMPLETE PORTABLE OUTFIT INCLUDES THE TRANSMITTER-RECEIVER CASE, 6-VOLT BATTERY, GENEMOTOR, AERIAL REEL AND INSULATORS AND A CONNECTION CABLE

With the exception of the storage battery, all equipment can easily be carried by one person.

* Box 232, Manhattan Beach, Calif.
on, for receiving, out of service, and transmitting, respectively. Experience has shown it to be desirable to "cut" the receiver plate supply when out of service, because of the possibility of discharging the "B" batteries from development of leakage in condensers.

By the use of another switch or a "jumper" wire, the same antenna might be used for both transmitting and receiving. The ground connection is common—the car frame seemed to work fairly well for this purpose. Sometimes the location might be such that this would be the only available ground.

Because cabinet makers seem to make their products with shallow lids, the knob and dial arrangements and clearances must be checked very closely. Some ingenuity was needed to get the Marco dial mounted behind the panel, to attain the necessary clearance for the lid. The receiver was built into the left side of the panel for operating convenience, and to permit the key, which was fastened to the lid, to fit against the right hand side of the panel, behind which are the receiver batteries. Tube bases, modified by use of larger diameter tubing, are used for the transmitter coils, to permit flexibility of operation. The well-known Pilot midget condensers are used for tuning all circuits. The transmitter and receiver coils are all low-C.

The receiver is the conventional two-tube type, using 30's with series filament connections. A high-gain, peaked audio transformer, the old RCA Type UV-712, is used. The 40-meter coil is

FIG. 1—COMPLETE CIRCUIT OF THE PORTABLE STATION

- Filament-control jack.
- Yaxley three-pole double-throw three-position switch.

L1—30 turns No. 16 enamelled wire for 3500-kc. crystal.
L2—15 turns No. 16 enamelled wire for 7000-kc. crystal.
L4—40 turns No. 16 enamelled wire for 3500 kc.; C2 across 30 turns.
L5—20 turns No. 16 enamelled wire for 7000 kc.; C2 across 15 turns.

L4 and L5—Usual grid and tickler coils for regenerative detector. Suggestions for tube-base coils are for 3500 kc., L4, 35 turns, L5, 10 turns of No. 30 d.s.c.; for 7000 kc., L4, 15 turns, L5, 5 turns of No. 30 d.s.c.

The transmitter is on the upper deck, with the oscillator in the foreground. The crystal holder plugs into a mounting at the near corner. The neutralizing condenser is mounted on a small insulating panel near the amplifier tube. Other transmitter components can be readily identified.

The receiver is on the near half of the lower deck, with batteries in the rear.

The transmitter is on the upper deck, with the oscillator in the foreground. The crystal holder plugs into a mounting at the near corner. The neutralizing condenser is mounted on a small insulating panel near the amplifier tube. Other transmitter components can be readily identified.

The receiver is on the near half of the lower deck, with batteries in the rear.

(Continued from page 88)
An Experimental Station on Wheels
By H. Selvidge, W9BOE

A MOBILE radio laboratory which might well be called the answer to a ham's prayer has been constructed at the Cruft Laboratory, Harvard University, in Cambridge, Massachusetts. The object of the mobile unit is to enable laboratory apparatus to be carried into the field to make observations on various radio phenomena. Two main objectives will be pursued with the present apparatus installed in the truck. First, observations on the propagation characteristics of ultra-short waves will be undertaken. It is hoped that observations on several different frequencies say 60, 120 and 240 mc., will lead to a better understanding of the processes of their propagation. Second, ionosphere measurements will be made.

The ultra-high-frequency apparatus consists of a three-band receiver operating on 60, 120 and 240 mc. and is of the super-regenerative type, using self-quenching Hartley circuit detectors. There are three separate detectors, one for each band, and they feed a single audio stage. In this way a very rapid change from one band to the other can be made. The detectors for 60 and 120 mc. are 76's, while the 240-mc. detector uses a 955. A radio frequency stage will soon be added to each, using the new 954's. The audio stage consists of a 42 feeding a small dynamic speaker.

There is a 60-mc. transmitter using three of the 6A6 type tubes; one as a speech amplifier with the elements in parallel, one as a Class-B modulator, and the third as the oscillator in a t.p.t.g. circuit. A novel gadget is the r.f. indicator used with this transmitter. It consists of a flashlight bulb in the antenna lead, the filament being focussed by means of a lens on a jeweled insert in the front panel. Contrary to all predictions, it works, giving a very nice indicating light when everything is working properly. This transmitter is primarily for communication purposes, as most of the ultra-high frequency observations will be made on signals sent out from the laboratory, at a fixed location. The antenna consists of a quarter-wave aluminum rod pivoted at the bottom and mounted on the side of the truck, and is fed by a concentric feeder with the outside conductor grounded. The antenna is arranged so that it can be raised or lowered from the inside, and if it strikes an obstruction while in motion, it folds down, and then springs back up into the vertical position.

For reception on the lower frequencies, a National HRO is carried, with coils covering from 10 to 600 meters. This receiver works very well using the mobile antenna.

A relatively high-power transmitter is carried for the ionosphere measurements. It operates in the 3.5-, 7- and 14-mc. bands, as well as five experimental frequencies in that range. It consists of crystal-controlled oscillator using an RK-20. Crystal switching and plug-in coils provide the means for convenient frequency shifting. The use of AT-cut crystals insures freedom from frequency drift caused by temperature changes. The single-phase r.f. output of the oscillator unit is usually fed through a phase-splitting network which gives two-phase r.f. which is then fed to two amplifiers, each using two RK-20's in push-pull. Normally a single 59 would supply the necessary excitation for the amplifiers, but there is a loss in the phase-splitting network because of the necessity of providing a good wave form, so plenty of oscillator output is required.

(Continued on page 80)
On May 21st the F.C.C. amended the last sentence of its Rule 28 to read as follows, the new language in italics:

"Because of the large number of amateur stations, calls will be assigned thereto in regular order and requests for particular calls will not be considered, except that on formal application the Commission may reassign calls to the last holders of record."

It is the Commission's regular practice to reassign the same call to the same amateur as long as consistent with the station location, and to avoid reassignment to a different individual as long as new calls are available; and now the new language makes it possible to revive a former assignment to the last licensee of record. When an amateur moves into a different call area he of course has to give up his old call and get a new one. The recent modification of the rule makes it possible for the Commission to continue the good work it has done to preserve the stability of records and published call books by reassigning a former call if an amateur moves back into his old call area or revives a lost interest.

The Commission requests us to say for them that except in the special case of an amateur desiring to regain a former call that has never in the meantime been assigned to any other amateur, they positively will not consider any requests for special calls, and they ask that they not be burdened with unnecessary correspondence thereon. (The practice of reassigning old calls will not apply to the old four-letter ZZ group, which is in conflict with present international regulations.)

A two-letter call is a valuable thing for any amateur to hold onto. Knowing no satisfactory basis for selecting which amateur applicant should be favored with a two-letter call that may become vacant, the Commission has never originated any such assignments and has merely renewed old Department of Commerce two-letter calls. But it is interesting to note that if an amateur once held a two-letter call and now returns to the game, and the call has never in the meantime been assigned to anyone else, he may secure it again upon application. Nobody else can. What do you say, some of you old timers—isn't this inducement to get back in the game?

It is fervently to be hoped that by the time these lines appear in print the chain-letter nuisance will have disappeared from the American amateur scene. But in case it has not:

The idea itself involves hughouse mathematics, they have been declared unlawful, and any merit the idea ever may have possessed disappeared when it degenerated into a crooked racket. We are sorry to have seen some evidences of the racket angle in amateur radio. We assert that there is no place for such things in our game and that we're supposed to be fellows of sufficient discrimination not to toy with such mad ideas. Let us clean the thing instantly from our field. If that same urge to correspond could be directed to filling out a few neglected QSL cards, more joy to amateur radio would result and a similar contribution made to the reduction of Mr. Farley's deficit—the only ultimate beneficiary of the chain-letter plague.

Rumors Of all the questions that are asked us the most common one goes something like this: 'Why don't you answer in QST these charges and rumors that float around amateur circles? Some of the things said are too ridiculous to need rebuttal and almost all of them are too pointless and unfounded really to require an answer. But, just the same, why don't you fight these things in QST?'

There is, of course, an excellent answer. This League is run by a Board of Directors. We are appointed and hired by the Board. We report to that Board in extensive detail, and only to them. To us it would be unethical and a general violation of corporate practice to short-circuit the governing board in matters in which we feel abused, and take our case direct to the membership. QST is a mutually-owned publication in which the officers have no more rights than the ordinary member. They have no right to use it for their own defense, justification or glorification. At each meeting of the Board the individual directors, as well as the Board as a whole, review the annual reports of the officers, examine the conduct of the headquarters, ask such questions as may have been raised by the membership or any other commentator, and in general receive any and all information or explanations that may be necessary. If an individual amateur wants information on such matters, it is almost invariably available from his director; or if it is not, the director can and will secure it. However, all matters of important general amateur interest are regularly discussed in QST, the facts given, the policies outlined and the reasons for them. That, in fact, is just what the editorial page and this department are for. Nor can we imagine a more dreary misuse of the good QST space that might be devoted to interesting articles...
than for us to utilize it in constant reply to what Mr. Roosevelt has called "the preconceived conjectures of ill-informed commentators." We do not think that we should get excited and quit useful work when one of these amateur politicians, dizzy as a revolving door, sits him down before his tripticker and dashes off some reams of mis-statements. Nor are our headquarters equipped with a Division of Psychopathic Research. We know that the great and sound majority of American amateurs will judge their League and its directors and officers in terms of their works and the present secure status of amateur radio. However:

A Few Facts

It is currently being misstated that the League once had a constitution which limited membership to those currently holding amateur licenses, and it is implied that this was changed through some vile shenanigans. Our League started in 1914 and QST in 1915, but both had humble beginnings and did not spring full-formed from nothing. The first constitution of the League was adopted on February 28, 1917, and specified eligibility for membership in the following language: "Any one interested or engaged in radio telegraphy or telephony shall be eligible to membership." You may see this constitution printed in QST for May of 1917. The language remained in precisely this form until the adoption of the present constitution on December 18, 1923, when it was changed to read: "Any person engaged in or interested in amateur radio shall be eligible to membership." It has remained in precisely this language ever since.

QST before the war was the property of C. D. Tuska, our first secretary-editor. It was published by the QST Publishing Co., Inc., owned exclusively by Tuska except for one share of stock each in the name of his mother and of Mr. Maxim, to qualify as incorporators. In the resumption of operations in early 1919 after the war, the League bought QST from Tuska, paid him for it, dissolved the QST Publishing Company, and has been the owner and publisher since the first post-war issue in June, 1919.

The published operating statements of the League show the profit or loss from the normal operating activities of the headquarters establishment. When there is a profit from operations it goes into surplus. The surplus of course is under the control of the Board of Directors. There are important League activities not associated with headquarters operations which are managed directly by the Board from reserves set aside from such earned surplus. These activities are reported in the minutes of Board meetings, but naturally are not reflected in operating statements. The status of the surplus and appropriations therefrom is constantly known to the directors. If you have any particular questions, ask your director.

The night before these lines were dictated a well-known 'phone amateur was heard to assert on the air that to his positive knowledge the headquarters officers told the directors how to vote on every question that was before them at their recent annual meeting. This is sheer rubbish, and if any of you want to risk the honest indignation of your own director, just ask him about it! We do not like some of our orders for the coming year but nobody cares whether we like them or not. We are not running this League. The Board is running it and we are the manager or administrator, under orders that are the reflections of what the majority of you fellows said you wanted.

Ye Olde Times

Pursuing the notes on old-time frequency assignments in this department the past two months: We amateurs used to claim the right to operate on all the wavelengths below 200 meters but as far as we know no amateur was ever licensed to do so. Crack amateurs were rewarded with a Z call and the special right to use 375 or 425 meters. "General" amateurs were all assigned the specific wavelength of 200 meters and occasionally one or two other specified wavelengths such as 175 or 180 meters. "Restricted" amateurs had the same sort of license except that, living within a few miles of a government station, they were limited to a half-kilowatt input. In 1922 it was thought desirable to give c.w. some encouragement over spark so the band 150-220 meters was assigned to c.w., of which 175-200 meters was also open to spark, i.e.w. and 'phone. This year the international conference of Washington was supposed to meet but it was put off and put off. In 1923 the "plus-200" feature was eliminated and the amateur band marked down to 150-200 meters. In 1924, pending the outcome of the international conference, the short-wave bands were added, to endure in the well-known figures until the end of 1928. In 1927 the international conference finally was held and resulted in the world-wide establishment of the amateur bands as they have existed ever since 1929.

Class-A Exams

Amateurs in Alaska and Puerto Rico may now take the Class-A exam. Through the efforts of the League, the Naval District Communications Officer at San Juan, P. R., is now authorized to give Class-A examinations, and any Army official in Alaska may now secure the sealed envelopes for this examination from the inspector at Seattle and administer the exam to any applicant who so arranges with him. We reported the similar Navy arrangement for Guam a few months ago, and of course the opening of a new F.C.C. office at Honolulu. We have now succeeded in bringing the Class-A license to all our territories and possessions under the F.C.C. except for a few small islands.

(Continued on page 78)
New High-Power Transmitting Pentode

200-Watt R.F. Output With Excitation Small

A BIG brother to the RK-20 has been added to the Raytheon transmitting line—a 2000-volt pentode which offers some real advantages for amateur transmitters of the higher-power classifications. The new tube, which will be known as the RK-28, is capable of outputs of the order of 250 watts for c.w. work, and can deliver 60 watts or better of 100%-modulated 'phone carrier, using suppressor-grid modulation. The characteristic pentode economy of excitation is present to the nth degree in the RK-28.

At this writing the power ratings on the tube are only tentative, pending completion of life tests at the factory. The power figures given below therefore are on the conservative side. The plate dissipation rating of 100 watts, for instance, is probably below the actual safe rating, since the plate is a good deal larger than in present tubes having 100-watt dissipation ratings. It is expected that production tubes will come through with a bulb of larger diameter than that shown in the photograph, at which time the size of the radiating fins on the plate will be increased so that the final plate dissipation rating may be in the neighborhood of 150 watts.

The internal structure of the tube resembles that of the RK-20, all elements of course being larger. The RK-28 has its plate brought out to a cap on top of the bulb, with the filament and grids connected to a 5-prong base at the opposite end. The base, of ceramic material, is an enlarged version of the familiar 5-prong receiving tube base, being about two inches in diameter and having much heavier pins. A new type of transmitting tube socket therefore will be needed for the tube; this, however, will mean no hardship except possibly temporarily, since several manufacturers expect to bring out suitable sockets in the near future. The overall length of the new tube is about half again as great as that of the ordinary “fifty-watter”, with a bulb of larger diameter. Pin connections are the same as on the RK-20.

The RK-28 can be used for practically every type of r.f. service—crystal oscillator, c.w. power amplifier requiring no neutralization, as a Class-B linear, suppressor-modulated amplifier, control-grid modulated amplifier, and plate-modulated amplifier. Following are the tentative ratings on the tube:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>D.C. grid current</td>
<td>25 ma. max.</td>
</tr>
<tr>
<td>R.F. grid current</td>
<td>5 ma. max.</td>
</tr>
<tr>
<td>Interelectrode capacitances</td>
<td></td>
</tr>
<tr>
<td>Grid-plate</td>
<td>0.012 µfd.</td>
</tr>
<tr>
<td>Input</td>
<td>11.0 µfd.</td>
</tr>
<tr>
<td>Output</td>
<td>10.0 µfd.</td>
</tr>
</tbody>
</table>

WHAT THE NEW TUBE CAN DO

The power amplification ratio obtainable with the RK-28 is tremendous compared with that realized in triodes of similar output rating. The grid driving power required for full output is quite small—a few watts at most. A typical set of operating conditions specified by the manufacturer is given in the following table:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate voltage</td>
<td>2000 volts</td>
</tr>
<tr>
<td>Screen voltage</td>
<td>400 volts</td>
</tr>
<tr>
<td>Suppressor voltage</td>
<td>45 volts</td>
</tr>
<tr>
<td>Control-grid voltage</td>
<td>-100 volts</td>
</tr>
<tr>
<td>Plate current</td>
<td>140 ma.</td>
</tr>
<tr>
<td>Screen current</td>
<td>60 ma.</td>
</tr>
<tr>
<td>Screen dropping resistor</td>
<td>26,000 ohms</td>
</tr>
<tr>
<td>Control-grid current</td>
<td>10 ma.</td>
</tr>
<tr>
<td>R.F. driving voltage</td>
<td>180 volts</td>
</tr>
<tr>
<td>R.F. driving power</td>
<td>1.8 watts</td>
</tr>
<tr>
<td>Power output</td>
<td>200 watts</td>
</tr>
</tbody>
</table>

It should be pointed out that the measurements in the above table were made in a test set-up operating at 800 kilocycles, and it is therefore natural to expect that because of higher losses the figures would not be quite so favorable at amateur frequencies. However, the tube was given as thorough a test as the limited time permitted in the experimental rig shown in the photograph, and although no attempt was made to make actual measurement of the driving power required it was obviously very low. At 3.5 mc. the tube could easily be driven to full output by a 47 oscillator, more than 200 watts being put into a dummy load with the plate showing no color. D.C. grid current of 5 to 10 ma. represented optimum excitation (bias 90 volts); higher grid current caused a reduction in output and efficiency. Positive suppressor bias is a necessity if best operation is to be obtained; there is a very marked improvement in both output and efficiency with the suppressor about 45 volts positive. Increasing the screen voltage beyond the recommended 400 volts resulted in no apparent increase in output, although causing the plate current to rise. The control-grid bias is not critical; the 100-volt figure recommended above is broadly optimum for efficient operation. If a grid leak is used it should have a value of about 10,000 ohms. At 14 mc. the tube operated equally well, showing about the same output as at 3.5 mc. with the same d.c. grid current. Increasing the grid current beyond the region of 5 to 10
milliamperes again caused a reduction in output and efficiency.

The tube also operates well as a doubler, giving about 100 watts output without exceeding the plate rating. The excitation requirements are similar to those for straight amplification.

**SUPPRESSOR MODULATION**

Since the carrier plate efficiency with suppressor modulation is a fairly fixed quantity running between 30 and 35 percent, the fundamental factor limiting the output is the tube's rated plate dissipation, assuming the filament emission is ample. This is the case with the RK-28; at the present conservative 100-watt rating the carrier output obtainable is in the neighborhood of 60 to 65 watts. The operating conditions listed below actually represent two modulation methods; the left-hand column gives the figures for suppressor modulation alone, using fixed screen voltage; those at the right are for combined suppressor and screen modulation.

<table>
<thead>
<tr>
<th></th>
<th>Supp.</th>
<th>Supp. and Screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate voltage</td>
<td>2000</td>
<td>2000 volts</td>
</tr>
<tr>
<td>Screen voltage</td>
<td>400</td>
<td>400 volts</td>
</tr>
<tr>
<td>Grid voltage</td>
<td>-100</td>
<td>-100 volts</td>
</tr>
<tr>
<td>Suppressor voltage</td>
<td>-50</td>
<td>-50 volts</td>
</tr>
<tr>
<td>Plate current</td>
<td>80</td>
<td>85 ma.</td>
</tr>
<tr>
<td>Screen current</td>
<td>85</td>
<td>85 ma.</td>
</tr>
<tr>
<td>Grid current</td>
<td>11</td>
<td>11 ma.</td>
</tr>
<tr>
<td>Peak audio supp. voltage</td>
<td>100</td>
<td>100 volts</td>
</tr>
<tr>
<td>Peak audio screen voltage</td>
<td>-50</td>
<td>200 volts</td>
</tr>
<tr>
<td>A.F. power for full modulation</td>
<td>0.4</td>
<td>7.6 watts</td>
</tr>
<tr>
<td>R.F. driving power</td>
<td>2</td>
<td>2 watts</td>
</tr>
<tr>
<td>Carrier output</td>
<td>60</td>
<td>65 watts</td>
</tr>
</tbody>
</table>

The higher audio power required in the case of combined suppressor-screen modulation results from the demand on the audio system imposed by the rather low effective screen resistance. The audio swing on the screen is approximately twice that on the suppressor, the actual value not being critical. The combined suppressor-screen system extends and straightens the modulation characteristic, giving somewhat higher output with less distortion. In particular, it brings the characteristic down more sharply to zero, lessening the familiar "tailing off" at the lower end.

A trial of suppressor modulation in our experimental set showed that excellent quality is obtainable. Neither of the sets of conditions shown above were exactly duplicated in this test, the screen being fed through a dropping resistor of about 25,000 ohms from the plate supply and allowed to swing at an audio rate determined by the tube characteristics. This gives about the same effect as combined suppressor and screen modulation, although avoiding the necessity for a second audio source. The suppressor bias is not critical so long as it is in the region of 45 to 67 volts, although the selection of suppressor bias within this range to some extent determines the carrier output.

In connection with suppressor modulation, it should be mentioned that the excitation and loading adjustments must be made with some care. As in the case of any grid-modulated amplifier, the adjustments should not be carried out with the idea of obtaining maximum carrier output for the allowable input; this usually gives too high plate efficiency with the result that the modulation characteristic flattens off on the uppeaks. In practice this means that the antenna current does not kick up on modulation—it may kick downward—and modulation is accompanied by a drop in d.c. plate current. Using the RK-28 we found it necessary to over-excite the tube—grid current about 10 to 15 ma. against the 5 ma. or so which gave maximum output—to get a linear modulation characteristic. In general, the conditions for suppressor modulation with any r.f. pentode will differ from those for c.w. amplification by requiring somewhat more excitation, relatively high screen current, and a decrease in plate efficiency.

OTHER TYPES OF MODULATION

The RK-28 can be used as a control-grid modulated amplifier, giving a carrier output of 65 watts or more readily obtainable, the audio power required being less than one-half watt.

THE NEW RK-28 PENTODE IN AN EXPERIMENTAL TEST SET-UP

A quarter kilowatt output with only a few watts driving power is only one of the things we like about this tube. With suppressor modulation a carrier output of 65 watts or more is readily obtainable, the audio power required being less than one-half watt.

In connection with suppressor modulation, it should be mentioned that the excitation and loading adjustments must be made with some care. As in the case of any grid-modulated amplifier, the adjustments should not be carried out with the idea of obtaining maximum carrier output for the allowable input; this usually gives too high plate efficiency with the result that the modulation characteristic flattens off on the uppeaks. In practice this means that the antenna current does not kick up on modulation—it may kick downward—and modulation is accompanied by a drop in d.c. plate current. Using the RK-28 we found it necessary to over-excite the tube—grid current about 10 to 15 ma. against the 5 ma. or so which gave maximum output—to get a linear modulation characteristic. In general, the conditions for suppressor modulation with any r.f. pentode will differ from those for c.w. amplification by requiring somewhat more excitation, relatively high screen current, and a decrease in plate efficiency.

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OTHER TYPES OF MODULATION

The RK-28 can be used as a control-grid modulated amplifier, giving a carrier output of

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A Complete Battery-Operated Portable Station

A Single 28-Pound Unit Containing Everything from Transmitter and Receiver to Monitor and Tools

By E. S. Van Deusen,* W3ECP

NO DYED-IN-THE-WOOL amateur considers his station equipment complete until it includes some kind of emergency and portable equipment which can be put into operation on the popular 80-, 40- and 20-meter amateur bands when the normal power supply fails, or when traveling in territory where general power distribution is limited or of an unknown character. For those who want a complete portable station of this sort, the equipment described herein, while of very limited power, should answer a great many needs.

For the use outlined, compactness and real portability probably rank first in requirements, while completeness of the station equipment and absolute independence from any external source of power follow closely in order. We have read of after a study of the requirements and a rather extended period of experimentation, the writer decided upon a battery-operated station. The transceiver type of equipment was discarded as unsatisfactory for operation on the 3.5- and 7.0-mc. bands, although considerable success was attained with experimental equipment similar to that described by Keefer and Grant in the June, 1933, issue of QST. For purely pre-scheduled contacts the transceiver is excellent, but does not permit the advantage of fixed-frequency transmission which has been found to be almost a necessity unless contacts are limited to stations with similar equipment. Since the main objects of the equipment to be described are emergency use and the provision an opportunity to make local contacts when away from the home station, power was sacrificed to the primary considerations mentioned. It can be justly called a “flea power” outfit. Remember, however, that a flea can perform surprising feats for its size; this station is no exception to this fact.

The Case and Its Contents

The entire station is fitted into the disem-bowed case of a discarded portable Victrola, which was salvaged from younger days of canoeing in the moonlight to the strains of “The Blue Danube” waltz. The photograph shows the arrangement of the equipment. The case is 4 inches deep and the lower part nicely holds the two No. 6 dry cells used as the filament supply, together with 135 volts of standard dry “B” batteries for the plate supply, all of which are strapped into place for security during transit. There is some space left over which is handy for the storage of a small quantity of spare wire rolled to fit. Held in the battery straps is a jointed gun rod which is used as a ground rod when the station is set up in the open with the antenna guyed to a convenient tree limb or telephone pole cross arm.

and seen many so-called portable stations which answer the first requirement only if and when the corner grocer is willing to lend friend amateur the use of his delivery truck for the day. On the other hand, we have also heard glowing descriptions of midget transmitters which can be parked in the corner of a suitcase, and of companion receivers of small dimensions, designed to operate from power lines, or even from automobile or self-contained batteries, but barely have these descriptions mentioned absolutely essential accessory equipment without which operation in compliance with our regulations would be uncertain or impossible.

*Captain, Quartermaster Corps, U. S. Army, Holabird Quartermaster Depot, Baltimore, Md.
The set itself, consisting of a transmitter and a receiver which function separately but are mounted on the same 11-by-6-inch panel, is carried above the battery compartment and at the right. The wooden shelf on which it rests is provided with brass strips to lessen the wear in inserting and removing the set. At the upper left is a compartment large enough to hold a small pair of phones with their cord, plug and headband, together with the 6-foot field antenna of ordinary bell wire which is wound upon its bakelite insulators for carrying. Also accommodated are a couple of loading coils which have been found necessary at times to tune the antenna properly, and a ball of chalkline cord which has proved to be the best type of light, but strong cordage for emergency rigging of the antenna. This compartment is closed, when packed for traveling, by a bakelite panel on which the key, with its cord and plug wound upon it, is fastened.

The cover of the case, 2 inches deep, has been provided with removable-pin type hinges and can be detached from the body of the case for convenience when the station is set up. At the upper right of the cover, the monitor, which is only 1½ by 4½ by 6 inches overall dimensions, is carried on a shelf to which it is clamped for carrying. A spare plug, shorted with a resistor of 2000 ohms to match approximately the impedance of the phones used, is carried on the monitor clamp, while the two additional monitor coils are fitted into sockets under the shelf. At the lower left are a spare tube and the receiver and transmitter very useful to hold spare grid leaks, clamps, connectors, a spare filament battery for the monitor, and such small necessities. A screwdriver and a pair of pliers, always needed and so often forgotten, are mounted in the cover at such positions that they do not interfere with the dials and knobs of the set when the case is closed. A small pen-type flashlight is included in the equipment and has been very useful on several occasions. A flexible insulated lead-in strip is tucked in the cover at the top, while a ground clamp is carried with the tools; and there is space for a small log book and pencil, if desired. When completely packed as described, this equipment weighs 28 pounds, about as much as a well-fitted traveling bag. By the use of some of the newer, lighter types of batteries recently announced, this weight can be reduced somewhat at no sacrifice of battery life.

TRANSMITTER, RECEIVER AND MONITOR

The circuit used is shown in Fig. 1. A Type 19 tube, used in the receiver as a detector and one step of resistance-coupled audio amplification,
has given results superior to several "peanut" circuits tested. Another 19 tube is used as a simple, self-controlled oscillator, with its plates and grids in parallel in a conventional Hartley circuit, for the transmitting end of the set. This arrangement for the transmitter was chosen, on the score of compactness and simplicity, over push-pull operation, since experiment showed little, if any, difference in results. To date no satisfactory oscillator-amplifier circuit has been found by the writer to provide both functions in a single tube of this type. Change-over from reception to transmission, and vice-versa, is accomplished entirely by the 4-pole double-throw switch, Sw, which controls not only the antenna circuit, but also the filament and plate supplies.

The photographs show the compactness and method of construction of the set itself. The panel is cut from ½-inch aluminum. The large dial on the left controls the receiver tuning condenser. The antenna condenser for the receiver is directly above, while the knob at the extreme left is the regeneration control, which, by the way, operates very smoothly in this circuit. At the lower left is the "phone jack, of the filament control type. At the top-center are the antenna posts, small fixed condensers and resistors are underneath the sub-panel, and leads are unusually short and direct. In addition, all ground connections are made at a central point. Suitable coil shields to meet the space requirements being unavailable commercially, National flanged shields, of 2½-inch diameter, were modified for this use.

The meter, a high-grade 0-1 milliampere instrument, is arranged so that it indicates either the filament voltage, the available plate voltage, or the plate current drawn by the oscillator tube. Multiplying resistors are used for the voltmeter functions and when indicating plate current the meter is shunted by a resistor, the value of which was ascertained by the "cut and try" method, so that full scale deflection is secured at 30 milli-amperes flow.

The monitor is conventional except in size. The insertion of the plug into the jack controls its operation. The problem of batteries in the limited space was solved by using small pen-light batteries for both filament and plate supplies of the 30 tube. Three of these units in parallel are used for the filament, while twelve units supply 18 volts for the plate. The monitor coils are wound on tube bases, using No. 31 d.c.c. wire.

(Continued on page 76)
ALTHOUGH classed by the F.C.C. as a special experimental station, WIXR, amateur operated, close in frequency to the 56-mc. band and in frequent contact with amateurs, becomes a fitting subject for these pages.¹

In the fall of 1932, the Mount Washington Observatory was established upon New England’s highest and stormiest peak for the duration of what was known as the Second International Polar Year. The primary object of the privately owned observatory (along with hundreds of other stations in all parts of the world) was to collect meteorological data. Since all branches of scientific endeavor are being tied closer together as time goes on, it was hoped that the radio equipment furnished for communication might serve for other than purely utilitarian purposes. It so happens that it did.

Because of the very great difficulty in keeping up any sort of outdoor structure in high winds, especially a 132-foot sky wire, work on the lower amateur frequencies was eventually reduced to a minimum and then dropped. Another more cogent reason was responsible for this move, too. At the very start of operations, even while the old Stage Office was being renovated for our winter occupancy, Al Sise, W1ASF, and the writer opened up a 5-meter circuit between the Pinkham Notch headquarters of Joe Dodge, WIUN, director of the Observatory, and the summit (portable W1OB). Through the kindness of one of the Observatory’s best friends, Mr. Henry S. Shaw, W1FGA, a 5-meter transmitter and a receiver were built up at General Radio Company for use on the mountain. The transmitter employed a pair of 01-A tubes in a push-pull circuit, Heising modulation being accomplished by a pair of 33’s. The receiver was the conventional three-tube super-regenerative type. Similar terminal apparatus was constructed by the writer for Pinkham Notch. From that time until the present, this circuit, over a path a little off the optical, and over two and a half miles in length, has given excellent service on at least twice-daily schedules.

Power for all the transmitters, and receivers, comes from batteries. Storage batteries light the tube filaments while high voltage for the plates is supplied from dry “B” batteries. Five sets of Eveready Layerbils in parallel furnish the greater part of the push for W1XR, while battery operated vibrators ease the drain on certain occasions when less power is required.

December 28, 1932, was the eventful day on which voice signals were exchanged with W1FGA in Exeter, N. H., who had hoped to work the mountain from Stratham Hill, on an optical path, with a portable outfit. That the signal from his home, farther away (91 miles between Exeter and Mount Washington) and over a decidedly nonoptical path, should get through so well was a pleasant surprise. The signal has waxed strong with time and attention so that it has proved entirely reliable to the present day. Aside from a couple of months during the summer, daily skeds are run with W1FGA.

The spring of 1933. This circuit, 98 miles long, with many 5-meter obstacles, proved somewhat unreliable until Mr. Greenleaf W. Pickard, W1FUR, raised both his antennas and his power at which time the signals became “commercial” in both directions.

One fair March day, of that same eventful spring, Arthur E. Bent, W1COO, accompanied Al Sise up Great Blue Hill (near Boston) to see what might be done towards establishing communication between the Blue Hill Observatory of Harvard University and its sister station on
the mountain. Luckily, excellent voice signals were exchanged between W1CSP portable and W1FEX. The distance is 142.5 miles and the right-of-way must be littered with obstacles. Blue Hill’s 635 feet of elevation and Mount Washington’s 6284 feet above sea level made possible the reception of weak signals emanating from low-power transmitters. It was soon discovered, however, that these signals were weaker at some times than they were at others, and on this

![Image: THE HOME OF W1BPI-W1XR — 6284 FEET ABOVE SEA LEVEL](image)

discovery was built up a program of signal measurements. This phase of the work has been recently augmented by a photo-recorder to plot a curve of continuous signal strength from W1XAV, located at Squantum, Mass. After the permanent establishment of a station on Blue Hill, the circuit between there and Mount Washington became, and remains, the longest consistent ultra-high frequency radio circuit ever operated!

Blue Hill became Boston’s famed W1XW on 60.5 megacycles; Mount Washington acquired the call W1XR (now on 60.5, 53 and 42 mc.) to go with the amateur calls W1BPI and W1FEX (also W1FMG this winter), and started modulating the 71-A’s Class-B. Mr. Pickard added to W1FUR the call W1XZ (same frequency as XR). W1FGA at Exeter adopted the frequency of 60 mc., developed a transmitter which would maintain it to within a few kilocycles and procured a crystal monitor as a further check.

Since January of this year great progress has been made at W1XR in the region of 2.5 meters. Daily contacts with W1FGA are mostly duplex using 2.5 meters one way and 5 meters coming back. The transmitters employ a single 71-A tube as oscillator, Class-B modulated by the same outfit which runs the 5-meter transmitters. The receivers are really adapters plugged into the detector sockets of the five meter super-regeneratives.

A few weak signals have been exchanged between W1XR and W1XZ, but the real DX has been between Blue Hill and the mountain. Needless to say, the pair of 800’s at W1XW pump more signals north than the 71-A is able to push to the south. In fact, the W1XR signal is merely audible. The 2.5-meter path from Blue Hill has been very reliable over a period of weeks. Interestingly, when the 5-meter signal from W1XW was entirely inaudible for almost fifteen minutes on the morning of March 5, during one of the thrice-experienced complete fadeouts, the shorter wave came through as well as ever!

Briefly, this is the history of ultra-high frequency progress on Mount Washington. It doesn’t include all the big thrills or all the fun. For instance, how would you like to climb onto a water tank perched atop the very summit of the mountain to readjust a transmitter or to reconnect a broken feeder wire, assuming, of course, a wind of 90–100 m.p.h. and a temperature, let’s say, — 10 F.? To be sure, it gets windier (last April 12th we measured a gust of 231 m.p.h.) and the temperature has been known to get down near — 50 F., but we usually find it convenient to postpone our delicate tasks until more moderate weather.

Although there are other transmitters, one in the hotel building and several in the Observatory proper, the water tank seems to be the prize location for good communication with Blue Hill. A four-foot square box houses the transmitters on 2.5 and 5 meters besides providing a cable vault for the 300 feet of ten pair cable to the Observatory.

Even the present water tank antenna, well-guyed with wood braces, the feeders fastened to a wooden “messenger,” is often subject to damage. There have been memorable QSO’s, too. In splendid isolation there stands the 5-meter chat with Ross Hull who pushed a signal through the 190 odd miles between West Hartford and Mount Washington for several hours one night last fall. What a thrill!

Before that, we had thought that the message sent via 5-meter relays from the mountain to New York City, or the QSO’s with W1FGA portable on Mount Cadillac, Maine (151 miles distant), were pretty good. Voice relays have afforded a lot of fun up here. Besides the thrill of sitting up on a lonely mountain monitoring a conversation between two urban centers such as Portland, Maine, and Boston (relay distance via Mount Washington about 210 miles), there is valuable experience gained in the practical application of the ultra-high frequencies to communications problems. Sometimes wire lines enter the relay network. An observer visiting the Base Station at the western foot of the mountain talked successful duplex via ‘phone line and radio with a group of fellows at W1OR in Brunswick, Maine. Once, when W1XZ at Seabrook Beach wanted to talk to a friend in Belmont,
Data on the Metal-Shell Receiving Tubes

Ratings and Base Connections of Nine New Types

SINCE the announcement of the new metal-shell receiving tubes in May *QST*, data on nine types of the family have been made available by RCA Radiotron Division. With the tubes scheduled to make their appearance on the market later in the summer, this information gives us an opportunity to become acquainted with their applications in advance. Tube manufacturers are now equipped to make “tin tubes” and are going ahead with production—so it won’t be long now.

In the following summary of the tentative data, notations of approximate equivalents in present types have been included to aid in placing the individual new members. A tabulation of pin connections is also given. As stated in the May announcement, the new tubes have an entirely different pin arrangement and are not interchangeable with present glass types.

Revised Pin Connection

The fact that the octal bases differ from previous base designs in being suitable for a universal socket makes it possible to set up a universal numbering system which is believed to offer advantages in simplicity. In this new system, numbers are assigned to each of the eight possible pin positions. Numbering starts from the shell connection which is always the first pin to the left of the locating lug when the base is viewed from the bottom with the lug toward the observer. Numbering is clockwise on the basis of possible pin positions. Thus, the pin numbers for a 6-pin base are 1, 2, 3, 5, 7, and 8. The letters under the pin numbers in the table indicate the elements connecting to the respective pins, “S” for shell, “H” for heater, “P” for plate, “G” for grid, and “K” for cathode.

6A8 Pentagrid Converter

(Continued from page 84)

<table>
<thead>
<tr>
<th>Tube Type</th>
<th>Pin Positions and Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>1  2  3  4  5  6  7  8</td>
</tr>
<tr>
<td>6A8</td>
<td>S  H  P  G3  &amp;  G5  G1  G2  H  K</td>
</tr>
<tr>
<td>6C5</td>
<td>S  H  P  —  G1  —  H  K</td>
</tr>
<tr>
<td>6D5</td>
<td>S  H  P  —  G1  —  H  K</td>
</tr>
<tr>
<td>6F6</td>
<td>S  H  P  G2  G1  —  H  K &amp; G3</td>
</tr>
<tr>
<td>6H6</td>
<td>S  H  P2  K2  P1  —  H  K1</td>
</tr>
<tr>
<td>6L7</td>
<td>S  H  P  G2  G3  —  H  K</td>
</tr>
<tr>
<td>6K7</td>
<td>S  H  P  G2  G3  —  H  K</td>
</tr>
<tr>
<td>6L7</td>
<td>S  H  P  G2  G4  G3  —  H  K &amp; g5</td>
</tr>
<tr>
<td>5Z4</td>
<td>S  H  —  P2  —  P1  —  H  &amp; K</td>
</tr>
</tbody>
</table>

6C5 Triode Detector-Amplifier

(Continued from triode section of present diode-triodes)

<table>
<thead>
<tr>
<th>Tube Type</th>
<th>Pin Positions and Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>1  2  3  4  5  6  7  8</td>
</tr>
<tr>
<td>6C5</td>
<td>S  H  P  G3  &amp;  G5  G1  G2  H  K</td>
</tr>
<tr>
<td>6D5</td>
<td>S  H  P  —  G1  —  H  K</td>
</tr>
<tr>
<td>6F6</td>
<td>S  H  P  G2  G1  —  H  K &amp; G3</td>
</tr>
<tr>
<td>6H6</td>
<td>S  H  P2  K2  P1  —  H  K1</td>
</tr>
<tr>
<td>6L7</td>
<td>S  H  P  G2  G3  —  H  K</td>
</tr>
<tr>
<td>6K7</td>
<td>S  H  P  G2  G3  —  H  K</td>
</tr>
<tr>
<td>6L7</td>
<td>S  H  P  G2  G4  G3  —  H  K &amp; g5</td>
</tr>
<tr>
<td>5Z4</td>
<td>S  H  —  P2  —  P1  —  H  &amp; K</td>
</tr>
</tbody>
</table>

6D5 Power Amplifier Triode

(Continued from present power pentodes triode connected)

<table>
<thead>
<tr>
<th>Tube Type</th>
<th>Pin Positions and Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>1  2  3  4  5  6  7  8</td>
</tr>
<tr>
<td>6D5</td>
<td>S  H  P  G3  &amp;  G5  G1  G2  H  K</td>
</tr>
<tr>
<td>6D5</td>
<td>S  H  P  —  G1  —  H  K</td>
</tr>
<tr>
<td>6F6</td>
<td>S  H  P  G2  G1  —  H  K &amp; G3</td>
</tr>
<tr>
<td>6H6</td>
<td>S  H  P2  K2  P1  —  H  K1</td>
</tr>
<tr>
<td>6L7</td>
<td>S  H  P  G2  G3  —  H  K</td>
</tr>
<tr>
<td>6K7</td>
<td>S  H  P  G2  G3  —  H  K</td>
</tr>
<tr>
<td>6L7</td>
<td>S  H  P  G2  G4  G3  —  H  K &amp; g5</td>
</tr>
<tr>
<td>5Z4</td>
<td>S  H  —  P2  —  P1  —  H  &amp; K</td>
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</table>

Single-Tube Class A Amplifier

<table>
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<tr>
<th>Tube Type</th>
<th>Pin Positions and Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>1  2  3  4  5  6  7  8</td>
</tr>
<tr>
<td>6D5</td>
<td>S  H  P  G3  &amp;  G5  G1  G2  H  K</td>
</tr>
<tr>
<td>6D5</td>
<td>S  H  P  —  G1  —  H  K</td>
</tr>
<tr>
<td>6F6</td>
<td>S  H  P  G2  G1  —  H  K &amp; G3</td>
</tr>
<tr>
<td>6H6</td>
<td>S  H  P2  K2  P1  —  H  K1</td>
</tr>
<tr>
<td>6L7</td>
<td>S  H  P  G2  G3  —  H  K</td>
</tr>
<tr>
<td>6K7</td>
<td>S  H  P  G2  G3  —  H  K</td>
</tr>
<tr>
<td>6L7</td>
<td>S  H  P  G2  G4  G3  —  H  K &amp; g5</td>
</tr>
<tr>
<td>5Z4</td>
<td>S  H  —  P2  —  P1  —  H  &amp; K</td>
</tr>
</tbody>
</table>

Push-pull Class AB Amplifier (Two Tubes)

<table>
<thead>
<tr>
<th>Tube Type</th>
<th>Pin Positions and Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>1  2  3  4  5  6  7  8</td>
</tr>
<tr>
<td>6D5</td>
<td>S  H  P  G3  &amp;  G5  G1  G2  H  K</td>
</tr>
<tr>
<td>6D5</td>
<td>S  H  P  —  G1  —  H  K</td>
</tr>
<tr>
<td>6F6</td>
<td>S  H  P  G2  G1  —  H  K &amp; G3</td>
</tr>
<tr>
<td>6H6</td>
<td>S  H  P2  K2  P1  —  H  K1</td>
</tr>
<tr>
<td>6L7</td>
<td>S  H  P  G2  G3  —  H  K</td>
</tr>
<tr>
<td>6K7</td>
<td>S  H  P  G2  G3  —  H  K</td>
</tr>
<tr>
<td>6L7</td>
<td>S  H  P  G2  G4  G3  —  H  K &amp; g5</td>
</tr>
<tr>
<td>5Z4</td>
<td>S  H  —  P2  —  P1  —  H  &amp; K</td>
</tr>
</tbody>
</table>

(Continued on page 88)
ENSIGN LEROY HALEY, W9GNK, commanding officer of Section 8, Twelfth Naval District, U.S.N.R., runs the proverbial one-man town. He is the postmaster, forest-fire warden, weather man, hotel keeper, school director, and superintendent of the hydro-electric plant at Tacoma, Colo. His amateur career began in Kansas in 1911, to be interrupted by the War with its “ten million miles of walking carrying a telephone on my back.” Returning in 1919, he continued his studies until 1922 when he married and entered the employ of a utility company as operating engineer. In 1926 he went to “cactus land”—Arizona—where he was employed on construction and operating of hydro-electric projects, retaining the “6” call acquired on the West Coast in 1924. In 1928 he came to the Rockies and the position he now holds, the call W9GNK following two years later. In 1931 he was commissioned Ensign C-V (S) and assigned as unit commander. In 1934 he became Section Commander of all Colorado’s Naval Reserve. Now he’s on 75-meter ‘phone and Navy c.w.—a real ham, and his section members think him a great fellow.

WILLIAM M. ATKINS, W9TJ, is known on four bands as “Bill,” so we’ll call him that, too. He was started in amateur radio in 1920 by 9RR, with a Benwood Rotary breaking 1 kw. Since that time he has had over 29,000 QSO’s, worked 97 countries (39 with inputs less than 20 watts), and achieved international contacts on five amateur bands. Outstanding is his current work on 28 mc., his regular sked with ON4AU, and his desire to establish test skeds with all others interested in 28-mc. communication. In the past Bill’s done about everything: city manager of Kansas City in the old Inkslingers, O.R.S., O.B.S., R.M., Asst S.C.M., R.C.C., R.O.W.H., CRM U.S.N.R., and Radiotelegraph 1st Class, Radiotelephone 1st Class and Amateur Extra 1st Class licensee. His proud possessions include a beautifully framed stamp collection presented by K5AA; an almost complete file of QST’s; and a remarkable monitor that rings bells, waves arms and shouts “Stop!” when the transmitter frequency drifts outside the band.

THE brother-and-sister station of Buffalo, N. Y., W8KYR-W8AOM, is owned and operated by Clara Reger and John Eichman, Jr. With separate transmitters in the same house, they operate simultaneously without interference; but whenever anyone speaks of W8AOM they are sure to ask for W8KYR. John was licensed in 1927, Class A in 1930, and now operates 4-mc. ‘phone. He modulates a ’10 with an 845. Clara got in the game when John discovered her voice was just dandy to outride QRM, some two years ago. When she got on the air, though, in late 1933, she turned to 7013-ke. c.w., liking that better. Hams tell her she has an FB fist; being a piano teacher, that seems logical. We got a break; we’re the first ham to whom she’s sent a picture without having had at least ten QSO’s; by then, she says, they’re her friends. Both Clara and John are real amateurs, consistently on the air, well-liked and widely known.

MARK L. MACADAM—“Mac” to the boys and W1ZK to you—has travelled the road from spark and crystal detector all the way to 56-mc. ‘phone. He has pounded brass on 600 meters as a commercial, operated a broadcasting station, installed and tested radio equipment for the Navy, handled over 10,000 words of amateur traffic for MacMillan in the Arctic, built the Massachusetts State Police Radio System, is Section Control in (Continued on page 47)
Further Controlled-Carrier 'Phone Systems
Suppressor-Grid and Class-C Excitation Methods

The principle of controlled carrier, initially described for Class-B plate-modulated transmitters in Jan. QST, can be applied to suppressor-modulated pentodes, as has been demonstrated by W. E. Davison, VE2BC. The system is essentially simple; enough fixed negative bias is applied to the suppressor so that the plate current is brought almost to zero, and the output thereby reduced to a very low value, when the carrier is unmodulated; a bucking voltage, the value of which depends on the average speech amplitude, is then introduced into the suppressor biasing circuit so that the carrier amplitude rises and falls with the average speech amplitude. The bucking voltage should reach a value under maximum speech conditions such that the resultant bias is the optimum operating value for the particular type of tube used.

The practical circuit diagram used by VE2BC is shown in Fig. 1. In this rig a 2A5 is used to modulate an RK20. The modulation transformer, T1, is an ordinary output transformer designed to work from a 2A5 into a 4000-ohm load; the 4000-ohm resistor tied across the transformer secondary provides the proper load resistance. The bucking voltage is obtained from a second transformer, T2, having a 1:1 ratio, and a full-wave rectifier using two 25Z5 tubes in bridge. The resistor R and condenser C should be of values suitable to give a satisfactory time constant for the syllabic modulation; VE2BC used 4000 ohms at R and 0.1 µfd. at C in his experimental set-up. To illustrate the control range obtained, the unmodulated antenna current obtained under normal conditions—optimum bias, carrier not controlled—was 0.42 amp. at VE2BC. With the control system in operation, antenna current with no modulation was 0.05 amp.; with full modulation, 0.5 amp.

It is important that the speech be "washed out" completely in the bucking or control circuit. This can be checked by connecting the suppressor grid temporarily to the positive terminal of the bucking circuit so that the modulation does not get to the suppressor from the regular modulation transformer. Under these conditions, it should be possible to cause the antenna current to swing from the minimum value (with no speech) to the normal unmodulated value by speaking into the microphone, although no voice modulation should be discernible on the carrier. Possibly some experimenting with the values of R and C will be needed to meet this condition. The resistor R can be made fairly high in value so that relatively little additional load is thrown on the modulator by the rectifier circuit. When R is high, however, condenser C must have relatively low reactance for audio frequencies to prevent audio distortion which might result from current flow in R when the suppressor swings positive on the audio peaks. The small audio suppressor current must flow through the bucking circuit as well as through the bias source and suppressor-cathode circuit itself.

**GRID BIAS CONTROL**

A system of carrier control applicable to plate-modulated transmitters and having the advantage that a high-voltage plate supply is not required, as in the case where the Class-B modulator performs the control function, has been used successfully by Ted C. Reid, W7HR. Its operating principles are somewhat similar to the suppressor-modulation system described above, the carrier control being obtained by varying the grid bias on the Class-C stage. The control voltage is obtained by rectifying and filtering part of the speech-amplifier output! W7HR describes it as follows:

"The trick is accomplished with a 56 audio detector or rectifier acting as a control tube in the grid-bias circuit of the modulated amplifier. As shown in Fig. 2, audio voltage from a suitable level in the speech amplifier is fed into the detector's grid; this in turn varies the average plate resistance in proportion to the input signal's..."
amplitude. This varying resistance is used to swing the modulated amplifier's bias between complete cut off and normal operating value.

"The condenser \( C_1 \) serves to filter out the audio pulsations and give a smooth and even control of the bias. If this condenser is made too large there is a slight lag in the carrier's building up on sharp syllables of speech, and consequently overmodulation is apt to occur; also, there is a delay in the carrier going out at the end of a word. On the other hand, if the capacity is insufficient there is danger of distortion from unwanted grid modulation. A value of 1 or 2 \( \mu \text{fd.} \) has been found quite satisfactory.

"It was found that considerable current still flowed in the r.f. amplifier plate circuit even with its grid completely open, so an external bias supply of around 250 volts was fed through variable resistor \( R_3 \) to pull the grid still farther negative and obtain more complete cut off when no modulation is present. The proper adjustment of \( R_2 \) was determined experimentally.

"Preliminary adjustments were made with the Class-B tubes removed from their sockets. With the gain control set at normal value, the modulated amplifier plate meter can be kicked around at will by speaking into the mike. However, no audio modulation should be present on the carrier when checked on the monitor at this stage. Everything functioning properly, the Class-B tubes were replaced and the revamped signal put on the air. Resistor \( R_3 \) is shunted across the modulation transformer for protection against sudden surges at times when there is no load on the Class-B tubes.

"A switch has been provided to change from automatic control to regular bias.

"With a little patience and ingenuity this arrangement should be made adaptable to any existing 'phone transmitter. Reports on the signals resulting from this system have been very interesting. Reduction of carrier hiss and background at the receiving end greatly improved the intelligibility when working DX. A most peculiar effect takes place when QRM settles on W7HR's frequency. Heterodyne whistles are reported to disappear completely between syllables of speech, leaving a sort of 'crink-a-nope' effect. More general use of this system of automatic control should prove a godsend in our congested 'phone bands.'

**FIG. 2—GRID-BIAS CARRIER CONTROL OF A PLATE-MODULATED AMPLIFIER**

\[
\begin{align*}
C_1 &= 1 \text{ to } 2 \mu \text{fd.}, 400-\text{volt rating.} \\
C_2 &= 0.05 \mu \text{fd.} \\
R_1 &= 100,000 \text{ ohms.} \\
R_3 &= \text{High-resistance variable grid leak.} \\
R_a &= 25,000 \text{ ohms}, 5-\text{watt rating.}
\end{align*}
\]

Circuit parts not listed above are usual for the type of transmitter shown; in this case a pair of 40's modulate a 10 Class-C amplifier. For other powers some modification of the values shown may be desirable.

is a slight lag in the carrier's building up on sharp syllables of speech, and consequently overmodulation is apt to occur; also, there is a delay in the carrier going out at the end of a word. On the other hand, if the capacity is insufficient there is danger of distortion from unwanted grid modulation. A value of 1 or 2 \( \mu \text{fd.} \) has been found quite satisfactory.

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**Silent Keys**

It is with deep regret that we record the passing of these amateurs:

- William A. Coday, Jr., W5EAO, Albuquerque, N. M.
- Curtis G. Docherty, WIBML, Providence, R. I.
- Arthur K. Forsyth, W2QW, New Brunswick, N. J.
- Herbert W. Ingersoll, W2BWB, Ossining, N. Y.
- Joseph Schwartz, W2CIH, New York City
- William Roy Smith, W9AQL, Chicago, Ill.
- Eugene Swenumson, W9HKJ, Baldwin, Wis.
- Wilbur M. Taylor, W2BMZ, ex-2ATY, Newburgh, N. Y.

**Strays**

Here's one for the book: Reading his local newspaper, W9GGZ ran across a reference to a chap by the name of Guy Wire!

Add to odd coincidences: First station worked by VE3AAW after a layoff of several years was W3AAY!

W8MJR suggests coating crystals with Higgins Waterproof Drawing Ink to lower the frequency. Frequency changes of as much as 12 kilocycles have been obtained by putting a few thin coats on each side of the crystal. The thicker the coat the greater the frequency change. The ink, which can be obtained from stationery stores or drafting-supply houses, can be washed off readily with alcohol or ether.
San Diego Radio Fiesta

FIESTA! A word symbolic of joy at peak voltage in sunny California on the border of old Mexico. Ham doin’s mixed with charming senoritas, technical radio, nudists, the world’s believe-it-or-not, people of all nations, cities of magic, a man-made flaming aurora borealis, old world atmosphere, architectural splendor, magnificent palaces, modern marvels ‘neath tropic skies. That’s a kaleidoscope picture of the gigantic Radio Fiesta scheduled for July 2oth and 21st in the heart of the World’s greatest Exposition, Balboa Park, San Diego, California.

One thousand dollars worth of prizes! At least, one grand of iron dollars is being spent by the San Diego ham population for an array of radio prizes such as has never been seen at a similar occasion. Setting a minimum of a carbon-plate type '10 bottle or its equivalent as the lowest prize, the local gang have made positive that the prize you carry home to your shack will be worthwhile. All prizes except those awarded for the many contests will be door prizes. No fiesta profits are anticipated and every dime is being put into rewards for those who attend. At least one thousand amateurs are expected. Hams from all over the western United States have signified their intention of being on deck for the big celebration. The more attendance, the more prizes—there is no upper limit.

Contests galore are on schedule, many new and different. Instead of the usual code speed contest this feature will consist of a QRM readability test. Several different stations will be fed into the p.a. system along with a little broadcast QRM for good measure. The contestant must copy a certain station through this interference.

Ambitious YL’s and XXL’s with melodious voices will be given a chance for competition in the Mike Audition judged by a real expert, Gary Breckner, well-known C.B.S. radio announcer and KGB station executive, who, by the way, is also master of ceremonies for the ham festivities.

Contributing to ham progress in emergency communication is the big portable contest. These will be judged for design, workmanship, appearance and originality. Both d.c. and “pansey” (a.c.) types of portables are welcomed.

Other contests include a tug-of-war; ‘Phone vs. C.W. hams, a hidden 56-mc. transmitter hunt, a prize to the ham coming from the greatest distance, and many other contests that the fertile minds of the Fiesta committee will evolve in the interim.

Trips include a visit to the giant Navy radio station NPL, harbor trips to ships and navy vessels, radio inspection of military radio at North Island where is situated the Navy’s largest flying field and the famed Rockwell Field of the Army; trip to a local brewery (with samples), journey to old Mexico to Agua Caliente and Tia Juana, fishing trips, local broadcasting stations and other attractions.

This year’s W6USA, official ham station of the exposition, affords tremendous interest. A powerful one-kilowatt rig of no mean proportions offers amateurs an opportunity to pound the key or use the mike attached thereto. Other transmitters will also be on exhibition. Portable operation will take place before the thousands of visitors to the Expo and offers hamdom a real chance for the publicity it needs.

Railroads, shiplines, and bus companies are joining with San Diego hotels in making rates the lowest possible for those who attend the Fiesta. The women folk of visiting hams who see “no sense” in radio shop talk will find a ten-ring circus in the wonders of the Expo. Mrs. W6FQU will serve as hostess.

The exact schedule for the two-day events are:

Saturday, July 20th
9:00 a.m. Beginning of Registration.
12:00 to 2:00 p.m. Inspection trip to ABC Brewery. Retire to Exposition.
3:00 to 5:00 Ultra-high-frequency equipment contest in Expo grounds.
5:00 to ? p.m. Visit Expo exhibits. Technical talks in House of Hospitality. Visit W6USA.

Sunday, July 21st
9:00 a.m. to 1:00 p.m. Agua Caliente. Rockwell Field, Naval Air Stn. NPL Receiving and Transmitting Stations. Naval Vessels.
2:00 p.m. to 5:00 p.m. Novelty Code Contest. Tug of War—‘Phone vs. C.W. Ladies’ Audition Contest.
6:30 p.m. Meet at Pier—Ft. of Broadway.
7:00 p.m. to 11:00 Banquet. Speakers, drawing of door prizes, delivery of contest prizes.
The Fiesta Headquarters will be at the San Diego Hotel, where accommodations may be had for as low as $1.50 per person or $2.50 for two persons. The center of operation, which is in the Exposition, will be at the House of Hospitality.

Tickets for the two-day celebration are $3.00, and include everything, such as two tickets (one each day) to the Exposition, the banquet, other eats, etc. There will be a $2.00 ticket, which will include one ticket to the Exposition, a chance in contest and banquet only. (This ticket will not give you a chance at the door prizes.)

Request for reservation tickets and other information should be addressed to the San Diego Radio Amateurs Association, 2340 University Avenue, San Diego, California.

A Burlesque

By M. L. Connes

LISTENING on one of the 'phone bands the writer was greatly impressed with many things—chiefly that a QSO may last one hour, and the final good-byes about twice as long. The following is purely caricature—friendly, because the writer hopes soon to join the ranks. The characters are purely fictitious, but it should not be difficult to recognize the types.

W2XXX comes on the air about 11 p.m. He hopes to work a few DX stations before retiring. Alone in his shack, he has put a pot of coffee on the gas range in the kitchen, two rooms away from his transmitter. He is very patient and unwilling to sign off, fearing to hurt the other fellow's feelings. He has been hooked up with W3YYY for the past three hours, and is becoming both tired and very, very hungry.

W2XXX (a bit wearily)—Well, old man, I hope you got all that dope on the antenna you should use. It's now 2 o'clock a.m., and we've been at this now for about three hours. I'm starved and I need some 'shut-eye'. Must be up bright and early. I still have a job—I hope. What do you say? 2XXX over to 3YYY.

W3YYY—2XXX, 3YYY back. I don't think I got the last part, old man. I didn't hear you say something about getting a job next week. Say—a funny thing just happened. Remember giving me the measurements of that new antenna and feeder system about an hour ago? I wrote it down carefully, and what do you think? A gust of wind suddenly came up from nowhere and blew the dope right out of the window. Would you mind giving me the measurements of that new antenna and feeder system? I'm now about 10 inches away from the microphone. What say? 2XXX, 3YYY by.

W2XXX (Sighing)—2XXX back. I'm sorry, but I think we should end this QSO. I'll send you the dope by mail. I put some coffee on the

---

*1501 Broadway, New York, N. Y.
Radio Equipment of General Utility
(Continued from page 80)

vide radiating lengths of $\frac{1}{4}$- or $\frac{1}{2}$-wave length for the 7- and 14-mc. bands, and $\frac{1}{2}$-wave length for the 3.5-mc. band (operating against ground). The shorter lengths are for ground connections, receiving antenna or substitution for different antenna lengths. The twin conductor sections can be employed for feeders, key or microphone extension leads, and similar purposes.

A six-volt dial lamp with socket is also carried in the cover and connected in series in the antenna or feeder lead as a resonance indicator during the preliminary transmitter adjustments. Final adjustments are made with this indicator removed and by noting the milliammeter in the power amplifier plate circuit.

The power cord length of 2C feet permits installing the equipment at a vantage point within that distance of the power outlet.

OPERATION AND PERFORMANCE

In the preceding description of the design and construction of the several units, a number of the operating features, indicative of the extreme flexibility of this type of equipment, have been brought out. However, the ease with which the several units can be adapted to the various functions of transmission, reception and amplification can only be fully appreciated by actual service tests.

The usual functions of the units need no further emphasis. However, the flexibility and ease of adjustment may not be so readily apparent. In tuning the transmitter, for example, after selecting the coils for the desired frequency band, the receiver coil for a higher or lower frequency band is plugged into the detector and the master oscillator frequency adjusted by beating harmonics, the oscillator band-spread insuring that a harmonic received in the amateur bands (lower or higher than the frequency of the transmitter) will result in the correct frequency adjustment, due allowance being made for the overlapping of the assigned frequency bands and their harmonics. The above adjustment of oscillator frequency is made with the selector switch in the mid position—"Phone or Standby"—and with the key plugged into the power amplifier plate circuit and the key open. During this monitoring adjustment the speaker cone circuit is open, requiring the use of the headset.

The transmitter is neutralized in this same manner by listening to the reaction of the power amplifier plate tank tuning upon the oscillator frequency and adjusting the neutralizing condenser for minimum reaction. These adjustments can be made very readily, leaving only the final tuning of the power amplifier plate tank and load circuits. For these adjustments the key is removed from the p.a. plate circuit jack and the milliammeter plugged in. The p.a. plate tank is first tuned for the pronounced minimum dip, then the load circuit tuning and coupling are adjusted to load the power amplifier as indicated by the usual rise in plate current, always keeping the p.a. tank tuned for the minimum dip. The antenna or feeder tank indicator prove helpful in securing an approximate adjustment and in coarsely checking the position of the voltage control for satisfactory 'phone modulation; however, the final tuning adjustments should be made with this lamp removed.

The various ratings of this equipment are summarized as follows:

- Receiver Frequency Range: 550 to 22,000 kc.
- Audio Power Output: 2.5 watts
- Amplifier Input Impedance: 200 and 100,000 ohms
- Transmitter Frequency Bands: 3.5, 7 and 14 mc.
- Input to r.f. Power Amplifier: 14 watts—c.w.; 3.2 watts—phone
- Phone Modulation Capability: 90 per cent.

It is the sincere hope of the writer that the notes on this general utility portable equipment may serve as a stimulus to other members of the radio amateur fraternity in the design and construction of the type of apparatus which meets so many and varied applications.

July, 1935
THE season of outdoor activities is at hand. Many clubs report opening their summer "doings" by taking portable gear up into the hills, to the seashore, or out "under the apple tree" to participate in the Third Annual A.R.R.L. Field Day. This type of club program meets wide approval at this time of year.

COMING EVENTS

At Ocean City, Maryland, July 13th-14th: A real hammy hamfest will be held at the George Washington Hotel under the auspices of the Del-Mar-Va Amateur Radio Club. Wonderful bathing, fine fishing, famous Maryland fried chicken, dancing, prizes—these are just a few of the inducements offered by the committee. Price—$3.00 per person, with special hotel rates to those who stay overnight. Special discount, if tickets are purchased before July 11th. Write W3BAK, Laurel, Delaware, for advance reservations.

At San Diego, California, July 20th-21st: The San Diego Radio Amateurs' Association promises a memorable time to all who attend the Radio Fiesta at the California Pacific International Exposition. See details elsewhere in this issue.

At Aurora, Illinois, August 4th: The eighth annual hamfest of the Fox River Radio League will take place at Exposition Park. All amateurs and their YFs and YLs are invited.

AMATEUR RADIO AT SPEEDWAY

The Indianapolis Radio Club exhibited an amateur station, under the club call W9JP, at the famous Indianapolis Speedway during the 1935 auto race. A collection of photos and QSLs was on display. A p.a. system was used to attract the attention of the crowd, and proved very valuable to this end. Operators at W9JP were W9SDQ, W9DSC, W9TE, W9SPB, W9AUT and W9DNQ. W9MPR and W9UT assisted with "public relations" work. Several hundred messages were handled, being routed through W9JRK, Indianapolis trunk line station. Attendance at the race was about 157,000.

VISIT THE CLUBS

One good feature of the majority of ham clubs is that they don't require a visiting ham to produce a long list of credentials before entering the club portals. By and large, any ham is welcome at any ham club, so don't be bashful about dropping in your local society. Clubs are splendid places to get acquainted with other amateurs and to participate in interesting discussions on amateur radio. At headquarters we have recorded the addresses of the several hundred amateur radio clubs affiliated with A.R.R.L., their places and times of meeting. Do you want to be put in touch with a club in your vicinity? Would you like to attend a club meeting in another city you are visiting? Address the Communications Manager (enclosing 3¢ stamp, please) for data on Affiliated Clubs in your vicinity.

ACKNOWLEDGEMENTS

Among the clubs affiliated during the 1935 Board meeting is the very active Akron (Ohio) Progressive Short Wave Radio Association. W8MLV is the station of this association, operating crystal controlled on 1820 kcs. Circulation of "The Aerial," club paper, is now in the vicinity of 500; this paper not only includes local Akron items but also covers activities of clubs and individual amateurs throughout the entire state of Ohio. The Buckeye Short Wave Club of Akron is holding quarterly meetings with the A.P.S.W.R.A. to strengthen cooperation and understanding between the members of the two clubs. Firm in the belief that "in union there is strength" Akron amateurs are moving forward!

ANTHRACITE A.R.C. HAMFEST

Amateur Night at last joins hands with Amateur Radio ... at least the Anthracite Amateur Radio Club (Wilkes-Barre, Pa.) successfully incorporated "amateur night" entertainment into its First Annual Hamfest held March 30th. It met with the approval of the gang and was thoroughly enjoyed. Club entertainment committees might try a little amateur talent, or, more interesting, might enlist the talent from the club membership and thereby have a true "amateur" program ... the kind the gang could appreciate!!! In addition to the entertainment, good speakers, dancing, prize distribution and an excellent dinner kept everyone happy, and there were over 250 hams, YLs and YFs in attendance. Those responsible for the success of the affair: W8EJS, club president; W8KQB, secretary; A. Marth, vice-president; W. Zaverzenz, treasurer; W8EGK and W8GHN. Visitors are always welcome at the club meetings, held on alternate Fridays at W8EGK, 39 South Main St., Wilkes-Barre, Pa.

MILWAUKEE RADIO AMATEURS' CLUB

The highlight of the annual QSO Party Hamfest of the Milwaukee Radio Amateurs' Club on May 18th was a talk by Central Division Director Roberts, W8HC. Nearly 300 hams were present. The club has three grades of membership: (1) Junior Member—anyone under 18 years...
of age, (2) Associate Member—anyone over 18 years having a bona fide interest in amateur radio, (3) Regular Member—anyone holding an amateur operators license, who also is a member of A.R.R.L. Only Regular Members are eligible for election to the club's board of directors. At the annual meeting on May 23rd the following were elected to the board: W9HRM, W9GHN, W9RH, W9LJU, W9GSP, W9ANA, W9GVL, W9DJJ. The new officers are: W9HRM, president; W9DJJ, vice president; W9GSP, secretary; W9LJU, treasurer.

**SOUTH HILLS BRASS POUNDERS AND MODULATORS**

One hundred and twenty hams attended the hamfest under the auspices of the South Hills Brass Pounders and Modulators League of Pittsburgh, Pa., on April 2nd. The general run of hamfest activities kept enthusiasm high. Prizes and good eats left nothing to be desired. The South Hills League has a membership of about fifty, most of which is licensed and active on the air. Officers: W8PX, president; W8GQX, vice president; W8GJM, treasurer; E. J. Port, secretary; W. H. Martin and W8CKO, directors; W8AMY, W8AKJ, W8LCI and W8UK, committee members.

**CENTRAL DIVISION HAMFESTS**

All attendance records were shattered at the Dinner Dance Hamfest of the Chicago Area Radio Club Council and Mid-West Radio Mart held at the Congress Hotel, Chicago on March 30th. Reports have it that 3000 individuals (hams and their guests) were present!! A decidedly "huge" success! We wonder if it will ever be equaled—except in Chicago!

The Motor City Radio Club of Detroit, Mich., was host to about 500 hams, YLs, YFs, etc., at its hamfest on March 24th. Speakers included Director Roberts, W8HC, Fred Schnell, W9UZ, Dr. Simpson, W8CPC and A. L. Budlong. The entire program was fast moving and there was no lull from start to finish. Entertainment featured artists from local broadcast stations. The M.C.R.C. plans to make the hamfest an annual affair.

**56 MC. AT BOAT REGATTA**

The St. Joseph Valley Amateur Radio Club (Mishawaka, Ind.) provided communication between the judges' stand, drivers' dock and observers' posts during the annual St. Joseph river regatta, an outboard motor boat race program. 56 mc. was used throughout. W9CRZ at the official float and W9LG at the drivers' tent assisted in dispatching trouble boats to aid racers in distress and in conveying other information to the race officials. W9AB operated in an automobible kept watch at the north end of the course. W9FHB was operated in a boat; this station was kept very busy cruising hither and yon with supplies, instructions, etc. Transceivers were used at all stations.

**MISCELLANY**

A low power contest, conducted by the Delaware Amateur Radio Club, was won by W3DIA with 12,442 miles, W3FFF second, W3DUK, third. Maximum input allowed was 5 watts. During April a contest was held to determine which member could contact the greatest number of states. Officers of the D.A.R.C.—W3DUK, Chairman; W3DNI, Secretary... The Oakland (Calif.) Radio Club held a 28-mc. contest in May. About 75 members of the club were on that band during the contest... The Springfield (Mase.) Radio Association, W1BY, celebrated its fifteenth anniversary on June 1st... On April 28th the Columbus (Ohio) Amateur Radio Association conducted a 56-mc. treasure hunt. The first prize winners located the hidden transmitter within about 150 feet on the first attempt... The Connecticut Brassounders' Association reports making a trip through a local gas and electric plant one meeting night. This is passed along to other clubs as a suggested way to pass an interesting and instructive evening... 

--- E. L. B. 

**Strays**

*A Neutralizing Kink*

A note from W6IY gives a useful hint on neutralizing buffer stages: "A wrinkle borrowed from Ole Friend Commercial Practice has to do with the neutralization of a stubborn buffer stage in a 47-10-203-A rig as described in current Handbooks and in QST some months ago. Using an r.f. galvanometer as an indicator it was impossible to remove all traces of r.f. from the buffer tank. The final amplifier, with its split-stator tank, neutralized perfectly. The 10 stage was stable enough to allow its use as a driver to neutralize the final, which was done according to Hoyle. Then plate voltage was removed from the buffer and full plate voltage applied to the final. If the final is biased to cut-off or slightly beyond, any current flowing in its plate circuit is the result of excitation fed through from the unneutralized buffer stage. In my case, this current could be reduced to zero by adjusting the buffer neutralizing condenser, keeping all tank circuits in resonance throughout the operation, of course. A final check made on the buffer tank with the r.f. meter showed just a trace of residual r.f., the source of which is unknown (probably because coupling the r.f. indicator caused a slight unbalance—Ed.), but the whole set operates stably at all frequencies and in a perfectly normal manner."
THE second A.R.R.L. 'Phone-C.W. QSO Party/Contest was held on the two weekends, February 9th-10th and 16th-17th. It was a test to see which 'phone operator could contact the greatest number of c.w. stations, and similarly to ascertain which telegrapher could work the greatest number of 'phone stations. Not only was it an interesting activity from a competitive angle but it made possible QSO's between voice and telegraph operated stations in much greater abundance than in the course of everyday operating. It was in a sense a "get acquainted" party for voice operators and telegraphers, who normally have but few contacts due to the difference between their two modes of communication. To many it brought home the fact that telegraphing and voice-operating amateurs can inter-communicate, and that all amateurs could very well make 'phone-c.w. contacts a regular part of operating routine, rather than something that just happens "during a contest," or "when a choice bit of DX is coming through via the other type of communication." Aside from other considerations, the contest was "different" and proved highly interesting and enjoyable.

Reports were received from 53 voice-operated and 113 key-operated stations. Actual participation witnessed during the contest indicates that the proportion of telegraph to voice work was even more marked than these figures indicate. W1SZ, leading 'phone operator, worked 199 different c.w. stations! W1EZ, leading c.w. operator, worked 50 different 'phone stations. These records, better than any other medium, will give an idea of the number of c.w. operators participating as compared to 'phone operators.

While working 199 different c.w. stations, W1SZ actually made 223 contacts during the contest!! W1EZ, on the other hand, actually made 72 contacts with 'phones. The tabulation of the accomplishments of the leaders will tell its own story. WII, 'phone, worked 182 different c.w. stations; W2DC, 'phone, worked 164, and WSBTP worked 156. Among the telegraphers, W8JTT made the second greatest number of contacts with different 'phones—39, followed by W8BYM with

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| W8DPY    | 576  | 26             | 36       | 16       | 3.5              |
| W8MOU    | 532  | 33             | 38       | 14       | 3.5              |
| W8DVS    | 518  | 29             | 37       | 14       | 3.5              |
| W9AYO    | 532  | 28             | 28       | 16       | 1.7, 3.5, 14.    |
| W2GFW    | 496  | 31             | 31       | 16       | 1.7 & 3.5         |

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| W9HVV    | 4035 | 114            | 115      | 35       | 3.9              |
| W9HSP    | 3906 | 123            | 126      | 31       | 3.9              |
| W9HGH    | 3630 | 95             | 101      | 30       | 3.9 & 14.        |
| W8VZ     | 2464 | 103            | 112      | 22       | 3.9              |
| W9OZS    | 2340 | 90             | 90       | 26       | 14.              |

1 W1DMD using c.w. made 66 additional points. 2 W1AGA using c.w. made 70 additional points. 3 W3MG using c.w. worked one additional station. 4 VE64G using c.w. made 9 additional points. 5 Two operators at W1OR, W3CBF and W2FSE. 6 Operator at W1MK Hal Bubb. 7 W1BDI using 'phone worked one additional station.

QST for
who worked stations in 37 sections! W9HVW worked 36 sections, W9HSF 31, and W9HQH 30; 22 of W8TTT’s 39 contacts with ‘phones were with different sections—a good percentage!

Scoring was simple. Each station worked counted one point, total points being multiplied by the number of different sections worked. Credit was given for more than one QSO with the same station, although in future contests it is the general feeling that this should not be allowed. The main idea of the competition in these ‘phone-c.w. contests is to see who can work the greatest number of stations; it helps to decentralize and broaden the scope of contest activities.

SIDELIGHTS

W9BRX, 'phone operator, says, “More ‘phone men should work code stations...” W9EVK, c.w. operator calls many ‘phone stations with no success he tends to lose enthusiasm for ‘even listening to’ ‘phones.” Says W9HQH, ‘phone: “Towards the last part of the contest we would stand by after a contact and hear as many as ten c.w. stations calling us.” W9HVW used only 50 watts input to final stage to make one of the leading ‘phone scores. W9CPM heard 18 c.w. stations calling him after one CQ! He worked all U. S. and one Canadian District in the first hour and twelve minutes. In 7½ hours operating time on 3.9 mc., with 10 to 15 watts carrier power, W3MG averaged a c.w. QSO every twelve minutes! “It was a great contest—enough to make any ‘phone man hoarse—despite the number of speech amplifiers.”—W2AVS. The following members of the Radio Operators Association of New Bedford, Mass., submitted scores: W1AGA, W1AGW, W1BLUE, W1CBZ and W1IKU, who made the best score. Approximately 23% of all ‘phone participants are holders of O.P.S. appointments. 31% of all c.w. participants hold O.R.S. tickets. W1SZ made 22 QSO’s in his “fastest hour!” Input at W1EZ, c.w. leader, was only 40 watts.

(Continued on page 76)
ONE of the chief objections to the use of a self-excited oscillator is that the ordinary low-voltage power pack has such poor regulation that it is difficult to eliminate chirps. Also, in an m.o.p.a. rig, to get a clear note it is usually necessary to use a separate power pack for the oscillator.

We have been trying for some time to improve the regulation of the standard power pack without installing large chokes, which would increase the cost considerably. At first it was thought possible to use an ordinary mechanical keying relay arranged so that a resistance load was put on the power pack when the transmitter was off, thereby keeping a constant load on the power pack and holding the voltage constant. However, the ordinary relay does not operate rapidly enough to prevent the voltage from rising to the no-load value during the interval while the contacts are moving. This necessitates a higher voltage rating on the filter condensers, and would still give key thumps and chirps.

It finally dawned on us that in a grid-leak biased oscillator or amplifier, the bias voltage could be used to operate a vacuum-tube relay, as shown in the diagram of the transmitters of W7BTA, Fig. 1, and W7ERT, Fig. 2. The operation is as follows: When the key is open, there is no bias on the oscillator or regulator tubes, since there is no grid current flowing in the grid leak.

The oscillator tubes cannot of course take current, but the regulator tube takes a current which depends on the value of the series resistor, $R$. Therefore $R$ determines the "no-load" voltage of the power pack, permitting regulation of this voltage to a value higher or lower than the full-load voltage. The instant the key is closed, all three tubes take current, thus momentarily lowering the voltage until the oscillations have reached full strength and biased the regulator tube to cut-off. This momentary lowering of the voltage prevents the oscillations from building up as fast as they would if the no-load voltage was much higher than the full-load voltage, and practically eliminates key clicks and thumps. By the time the oscillations have reached full strength—in other words, the transmitter is transmitting—the voltage has reached the constant value and there is no audible chirp. It will be seen that a power pack with poor regulation from actual no-load to full-load would give a greater momentary drop in voltage than one with a better regulation, thus giving greater protection against key clicks and thumps. The regulator tube operates as rapidly as the oscillator tubes do when keyed.

The transmitter shown in Fig. 1 has a full-load voltage of 450, with a plate current of 100 mils to the two 45's. The no-load voltage without the regulator tube is 650 volts, using a 550-volt transformer. With the regulator tube in $R$ set at approximately 3000 ohms, the "no-load" (key open) voltage was also 450 volts. It is well to note that a poor tube will work fine as a regulator tube, if it has any emission at all, since the plate voltage is low when taking current (150 volts in this case). The regulator tube used in the transmitter shown in Fig. 1 is a gassy 45 which would...
not oscillate reliably. The only requirement of this circuit is a separate filament winding for the regulator tube when using center-tap keying.

The circuit shown in Fig. 2, using indirectly-heated tubes (2A6's) obviates this necessity. At first thought it might appear that the full plate voltage would be applied between cathodes and heaters when the key is open. This is not the case, since the only voltage appearing here is the cut-off voltage, or approximately 30 volts with a screen voltage of 150. Also, due to the large dropping resistor in the screen lead, the screen voltage is reduced very much below normal when the key is open. This is not the case, since the only voltage appearing here is the cut-off voltage, or approximately 30 volts with a screen voltage of 150. Also, due to the large dropping resistor in the screen lead, the screen voltage is reduced very much below normal when the key is first closed and all three tubes are taking current, thus more thoroughly suppressing key clicks and thumps. In fact, key clicks did not appear in an ordinary broadcast receiver sitting on the same shelf with the transmitter.

New High-Power Pentode
(Continued from page 89)

about 75 watts. Plate and screen voltage are the recommended maximum values, the screen being supplied from the plate power source through an 80,000-ohm dropping resistor. The screen current under these conditions is about 20 milliamperes. The suppressor should be operated 45 volts positive. The control grid should be biased 140 volts negative and supplied with a peak r.f. voltage of 160 volts. Grid current under no-modulation conditions is less than 2 milliamperes. The peak audio grid swing required is 60 volts. Plate current should be adjusted through loading to 38 milliamperes. Excitation requirements are the same as for suppressor modulation.

As a Class-B linear amplifier the grid bias should be -38 volts, assuming plate and screen voltages of 2000 and 400, respectively. The suppressor should be connected back to filament center-tap. The screen will take 30 milliamperes through a 55,000 ohm dropping resistor. With plate load adjusted to make the tube draw 75 milliamperes, the carrier output is approximately 50 watts. The driving power, exclusive of power dissipated in a regulating resistor, is about one watt.

The tube also can be plate modulated provided the screen is simultaneously modulated as with screen-grid tubes. Present ratings for this type of service specify the maximum plate voltage as 1500, the carrier output being approximately 100 watts. The pure-tone audio power needed for complete modulation is 82 watts for the plate (1500 volts d.c. at 110 ma.) plus 18 watts for the screen; or, if the screen is supplied through a dropping resistor which also consumes audio power, a total of 150 watts. We have operated the tube as a plate-screen modulated amplifier with 2000 on the plate, exceeding the present rating by 500 volts, with no sign of breakdown. The excitation requirements are quite low, running in the vicinity of a few watts. The question of plate modulation of pentodes will be discussed more completely in an early issue.

Circuits

The RK-28 can be used in any of the circuits which are employed with other r.f. pentodes. Partly for this reason and partly because sample tubes were received at such a late hour that time did not permit running through preliminary tests on the tubes and getting drawings made in time for this issue, none are shown here. The experimental rig shown in the photograph was built up so that all kinds of circuits could be tried without necessitating rewiring, and hence is equipped with a large number of plugs and jacks for circuit changing which would not be required in an ordinary layout.

No shielding about the tube was found necessary, since it has shown no tendency toward self-oscillation when driven from a separate source. By supplying a small amount of feedback—such as bringing a wire from the plate near a similar wire from the grid—the tube will function excellently as a pentode crystal oscillator. Using 2000 volts on the plate and with the feedback "condenser" adjusted so that the r.f. crystal current was less than 100 mils under no-load conditions, an output of 200 watts or better was readily obtainable. The crystal was under no more strain than when used in the ordinary 47 circuit with 400 or so on the plate. Operation of this type illustrates the ease with which the tube can be excited.

As a Tri-Tet oscillator the tube behaves about like the RK-20. Time did not permit a very complete investigation of its suitability for this type of work. The plate voltage was not raised beyond 1000 at which voltage the output was about the same as that obtainable from the RK-20.

With the new tube it should be no trouble at all to build a multi-band 250-watt c.w. transmitter using only receiving tubes at low voltages in the exciter. In such a rig band-switching does not appear so nebulous—in fact, it should be readily attainable. We have something of the sort in mind for an early QST issue.

——G.G.

Hamdom
(Continued from page 86)

the 160-meter Army Net, member of the original OT5 chapter, member of the I.R.E., A.R.R.L. Phone Activities Manager, director in the New England Division Radiophone Association, chairman of the planning board of the South Shore Radio Club, lieutenant in the Massachusetts National Guard, and—but that's all we have space to tell. Except that you can call him "Mark," instead of "Mac," and he'll still know you're calling.
Improving Detector Stability

A note from Griffin Chiles, W5TR, offers what seems to be a good suggestion for freeing the regenerative detector from frequency variations with regeneration-control settings and variations in line voltage:

"The sketch of Fig. 1 shows an improved electron-coupled detector arrangement. The oscillating portions of the circuit (I used a 24-A) are orthodox; the improvement lies in the regeneration control."

"The voltage divider consists of two fixed resistors chosen to meet the following requirements: first, to divide the 'B' voltage so as to provide proper screen voltage; second, to draw sufficient current from the 'B' supply to cause appreciable voltage drop across variable resistor $R_3$, which is used to control regeneration.

"The voltage divider circuit is incorporated in the detector circuit wiring, and is entirely separate from other voltage dividing equipment."

"It will be seen that this is a true electron-coupled oscillating circuit and, inasmuch as oscillation starts each time with the same voltage applied across $R_1-R_2$, the calibration is substantially constant. The regeneration control has negligible effect on tuning, and an increase of 20 or 30 volts in the 'B' supply shifts the frequency only slightly. A decrease of course will take the detector out of oscillation, but on reducing $R_3$ it comes back in on the same frequency. This makes line fluctuations harmless."

If the variable resistor $R_3$ is 50,000 ohms, a common value, the total resistance of $R_1$ and $R_2$ probably should not exceed 50,000 ohms, and preferably should be less for most effective control. Some experimenting with resistor values may be needed for maximum sensitivity and smoothest control. A fair starting point would be to make $R_1$ about one-fourth the resistance of $R_2$.

Reducing Power

Two simple methods of reducing power for tuning, local work, etc., are given in Figs. 2 and 3. The arrangement of Fig. 2 is used by Harry E. Hurley, W6QF, who has found it particularly useful for those tuning operations (such as adjustment of an antenna filter) during which the amplifier tank circuit is likely to get out of resonance. Since the crystal power supply, usually quite low voltage, is connected to all stages when the switch is thrown to the left, the off-resonance amplifier plate current is limited to a fairly low value, thus prolonging the life of the tubes.

The second circuit, in use at W4CBV, uses a s.p.d.t. switch to change a bridge rectifier to the center-tap arrangement so that either full or half voltage can be obtained. In the particular circuit shown, 83's are used in bridge with a transformer giving 550 volts each side of center tap. With the choke-input filter, the d.c. output voltage is 960 with the switch on the upper contact, and 480 with the switch on the lower contact.

A Garage-Top Mast

If there are other amateurs who simply have to put up a mast on a typical American two-car pyramidal-roofed garage, they may be interested in my experience. In my case the garage lay in the only direction I could run the antennas and have the feeders clear the house. If I put the mast on the near side of the garage I could not get span...
enough; if I put it on the far side, which was the property line, there was no place to run the guys. There was nothing to it but to put the mast on the garage. Besides, why not use that initial height?

The mast, with guys attached, was easily stood up against one side of the garage. A "cattle-walk" was temporarily laid down on one slope of the garage and lashed in place. A ladder was leaned against the side of the garage alongside the mast, its upper end reaching to the "cattle-walk." With four fellows to hold the lower guys (the upper back-stays dangling loose), two fellows on the roof readily lifted the mast vertically hand over hand, it being rested on the rungs of the ladder while fresh grips were taken. With the foot of the mast lifted to the edge of the roof, it was then a simple matter to walk it, a foot at a time, up the "cattle-walk" and place it in its step, the guys meanwhile supporting it. Although some days had been spent in preparation, the mast went up in ten minutes and in another fifteen minutes the guys were fast and true. The result is a thoroughly practical and inexpensive fifty-footer.

The usual two-car garage is 20 feet square. Because of the slope of the roof, the actual effect of guys placed on the diagonals is as if they were but 8 feet from the base of the mast. While this sounds perilously little, it has proved entirely ample.

I had on hand a 20-foot 3 by 4. To this I bolted an 18-foot 2½ by 2½', with an overlap of 2 feet. Four guys run from the splice to the four corners of the garage. Two back-guys work against the pull of the antenna, but are not at all necessary to support the mast itself. Short pieces of guy wire go through the corners of the roof to the scantlings inside and terminate in turnbuckles immediately outside, to which the guys are made fast. A shallow "nest" surmounts the peak of the pyramid and acts as a footing for the mast; it holds itself in place without fastening.

While conducting some tests on 56 mc., we found a real need for a very sensitive r.f. meter. The ordinary absorption meter caused a shift in oscillator frequency because of power drain and coupling; a neon tube also was unusable since small variations in power level aren't noticeable, especially during daylight. The problem was solved by building a vacuum-tube indicator of the type shown in Fig. 5.

It is essential that the grid-plate return be connected to the negative side of the filament since a slight negative bias is needed. If the instrument is to be calibrated for laboratory measurements, the filament voltage should be kept constant. Also, it would be necessary to put a potentiometer across the filament...
battery with the arm connected to the grid-plate return. The potentiometer is then adjusted for a small positive meter reading.

On our tests, we set the meter near the feeder input to the antenna and adjusted the oscillator

The apparatus, exclusive of the sliding wire and $L_1$ and $L_2$, can be put in a metal can or box, making it easily portable. The small-sized flashlight dry cells were used for plate and filament supply as they could be employed to fit in odd shaped cans and increase the flexibility and portability of the locator. Of interest perhaps is the high value assigned to the grid condenser $C_1$. This value was found to give the greatest dip in plate current when the sliding wire $L_1$ was at the peak of a voltage node. The node could be detected within a probable accuracy of five millimeters.

"This method would also be useful in searching for unwanted standing-waves in transmission lines. Incidentally most of the parts are to be found in any ham's junk-box!"

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A Four-Band Exciter

(Continued from page 28)

Don't forget that the FIVE-HUNDRED-DOLLAR GRUNOW COMPETITION

Closes August 31

Full Details were given in March QST on page 15.
O.F.C.S.:

The First A.R.L. International Test was held in 1928 for the purpose of selecting American Official Foreign Contact Stations for reliable communication with other lands. Utilization of the resultant organization was slight, simply because there was little foreign traffic and the handling of traffic was not permissible, except under great restriction. The organization consequently fell into decay.

To-day there is need for such an organization, to be used primarily as a medium for internal contact in the I.A.R.U. The Union has grown hugely, not only in proportions but in the significance and responsibility of its actions with respect to the amateur radio world. Yet, to date, official correspondence between member-societies has been slow and erratic, since it relies on the vagaries of the international mail service.

In the present time of stress, when international planning is so vitally important, with an international conference approaching where the opinion of one nation with regard to amateur radio will count for naught but where we will require the concerted support of many nations—a support which can be achieved only through the I.A.R.U.—a swifter and more responsive means of inter-nation communication is fundamentally essential.

In recognition of this requirement, Union Headquarters has suggested to all member-societies that Official Contact Stations be appointed in the respective countries, not to handle messages, but to conduct amateur correspondence under the terms of the international treaty. At the moment of writing, this Union Network is just getting under way. If immediate response means anything, its success is assured. Already Official Contact Stations have been appointed to function between four countries and the United States:

Australia .......... VK2EL-W9UM (tentative)
Belgium ............ ON4AU-W2GOX
New Zealand ....... ZL3CI-W5QL (tentative)
Switzerland ......... HB9J-W6ENV

Mail service with England being more prompt and reliable than with any other member-society outside the American continents, the R.S.G.B. feels that amateur radio is primarily useful only for urgent matters, in which case use will be made of amateur channels.

The cooperation of all amateurs in this matter.

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is requested, either in direct handling of correspondence or by facilitating its handling by others where possible. The O.C.S. stations are not a fixed and inflexible group; any American amateur can expect to have important information handed to him from abroad if he happens to QSO at the crucial moment; similarly, American information can be given to any reliable station in the country addressed. But the responsibility for the work, and the bulk of it, will rest with the O.C.S. To them, now as well as later when they will actually be functioning, we offer a vote of thanks for the beneficial job they will be doing on behalf of all amateur radio.

QSL:

On June 1st the headquarters of the R.E.F. were moved. The address is now as follows: Réseau des Emetteurs Français, 6 square de la Dordogne, Paris 17°, France. This address applies to all services, headquarters, QSL, official organ—everything. The old address, 17 rue Mayet, has been abandoned.

The R.E.F. also asks all QSL bureaus to note that only cards for Morocco (CN) should be sent to the A.A.E.M., B. P. 50, Casablanca, Morocco. All QSL cards for France (F), Algeria (FM8), Tunisia (FM4), and the French colonies (all other intermediates with F), must be sent to the R.E.F. in Paris. Cards for FM amateurs should not be sent to Morocco, as indicated in previous instructions in this department.

John G. McIntosh, VU2LJ, Baghjan T. E., Doom Dooma P. O., Assam, Northern India, writes: "I note in the I.A.R.U. News, page 90, of the April issue of QST that the QSL Bureau is given as Bombay. This is a mistake as the cards have been handled here by me for the last two years, and is entered as such in the Call Book."

As the B.E.R.U. representative in the Federal Malay States, Reginald J. Bec, VS2AG, Malayan Public Works Service, Kuala Kangsar, Perak, P.M.S., will handle QSL cards for that region, which presumably includes the Straits Settlements.

General:

Latest WAC-on-phone certificate goes to Baron Louis Bonaert de la Roche, ON4HM . . . . . . Another one coming up for Marcel Meyvaert, ON4VC . . . . . Why are all the outstanding international DX 'phone stations apparently located in Belgium? . . . . . . Wray A. Gillette, QA4AA, believes he has set a record, having received 58 QSL’s in one mail . . . . . . F. H. Pettit, SU1SG, has been appointed official B.E.R.U. representative for Egypt, Sudan and Palestine . . . . . . As noted last month, he handles QSL’s for SU, ST, and ZC . . . . . . Egypt has up to the present been a ham's paradise, with operation on any frequency and no licenses or interference by the government . . . . . . The advent of the Egyptian Broadcasting Company has put a stop to this happy state of affairs, however, and all operators must now be in possession of an experimental license costing about two pounds yearly plus one shill-
In May QST in this column we reported the relative registered interest in each of the several different frequency bands assigned to amateurs. The final questionnaire return reported from 2500 amateurs changed our figures considerably but slightly. Interest based on the complete return is indicated in the following. The highest percentage of operating interest registered was for 80-meter telegraph (30.16%). In order, follow the interest in 40-meter telegraph (29.2%), 20-meter telegraph (11.4%), 80-meter 'phone (9.4%), 160-meter 'phone (7.4%), 30-meter 'phone (6.1%), 50-mc. 'phone (3.6%), and 100-meter telegraph (1.2%). 10-meter 'phone and telegraph registered interest are equal (4.1%) and 6-meter telegraph (9.4%). The remainder is distributed over the 114 and 214 meter regions, both 'phone and telegraph.

The above takes into consideration the degree of use of each form of activity by each registrant. With the advent of band switching for amateur transmitters and receivers and the average ham is better able to change activity from one band to another at will; most of us use two bands, and many can work on three bands. The percentage of all amateurs interested to some extent in using our major interest bands is for 80-meter telegraph (29%), 20-meter telegraph (11.8%), 80-meter 'phone (9.4%), 160-meter 'phone (7.4%), 20-meter 'phone and 'phone (25%), average each form of activity by each registrant. With the advent of 40-meter telegraph, 50% use 20-meter telegraph when conditions are right, 25% employ 160-meter 'phone, 25% likewise 80-meter 'phone, 20% use 20-meter 'phone and 25% of all of us amateurs go strong, among other radio interests, for 55-mc. 'phone.

It was about 55-mc. work that we wanted to talk this month. Our analysis of questionnaires returned showed for the first time a "major interest" group using 55-mc. 'phone. There is now a substantial 55-mc. interest, which of course is greatest in the more populated centers. There is eight times as much 'phone interest as telegraph interest in 55 mc., for the cheapness of apparatus here equals or exceeds that of telegraph sets; there are no bothersome and expense-causing restrictions such as on 3.5- and 7-mc. bands. The freedom from regulation makes this band "common" and the chance of the unexpected happening adds to the fun on 55 mc. We are in the middle of the biggest 55-mc. year in history.

March QST mentioned a thesis on amateur radio growth and diffusion. The author traced the initial rise of the American institution which we know as amateur radio in the states bordering on the oceans, and its subsequent diffusion inland in an interesting manner. Since the transmission of intelligence without wires first and last is a major necessity for mariners, it was natural that the first wireless appeared in the press in marine oceans. Here are statistics showing the extent of 56-mc. diffusion inland in an interesting manner. Since the transmission of intelligence without wires first and last is a major necessity for mariners, it was natural that the first wireless appeared in the press in marine oceans.

F. E. Handy, Communications Manager

E. L. Battey, Asst. Communications Manager

Improving Club Interest

By Gedney M. Rigor, W3QL*

Every locality has a little different club problem than another locality. To promote technical discussions, improve understanding and cooperation, and add to the strength of amateur radio, the local club is a necessity. Various problems can be met best by a local, well-organized and active club, where all those interested in amateur radio as a hobby can get together, exchange valuable ideas, help others, get better acquainted and learn more about radio.

It appears that the mortality of radio clubs has become higher than it should. Many good clubs go on the rocks of disorganization, for reasons that we shall state. Now, how can this be avoided? How can this disintegration be prevented before irreparable damage is suffered? When the entire membership of any club realizes that the things that break up splendid clubs are some of the following, they will have made the first start towards betterment: (1) One-man domination; (2) petty jealousies and unpleasant personal digs from one member to another during meetings; (3) long-winded arguments over nothing vital, bickering over petty things; (4) non-cooperation; (5) Army vs. Navy arguments; (6) 'phone and c.w. squabbles; (7) finances; (8) selfishness.

If members will use their heads, and endeavor to remedy such situations by taking definite steps to swallow their own egos (avoiding political expression at every minute of meetings), attendance will increase, membership go upwards, the treasury will be enhanced and the club become more successful. All these things are necessary for a going club. What is about to be suggested is no idle dream or "Utopia," but has been proven successful. By instilling proper changes, the club membership may be made happier and meetings will become a joy for all attending.

The first step is the organization of a board of directors, officers becoming automatically members of the board and a given number elected from the membership. Elections should be held on a yearly basis. These men should be entrusted with the full powers to run the business of the club. All new ideas or business should be submitted to the secretary or any director for discussion at the directors' meetings, but never discussed on the floor of the club, excepting a change

*412 Second Avenue, Haddon Heights, N. J.
in the By-Laws. Directors should meet once a week before the regular club meeting, planning the entire program, taking care of all business. But never that is in the directors' meeting should never be rehearsed on the floor. Directors who miss more than three consecutive meetings without due cause should be replaced by another member of the club.

The majority of the board ought to be licensed radio amateurs.

Any personal animosities, squabbles, hard feelings and troubles with members, should come before the club's directors, who will never allow it to go any further than their own home, thus eliminating all that trash from coming before the entire membership.

Endeavor to make every regular meeting of the entire membership a miniature "Hamfest." The business meeting should be limited to one-half hour, adjournment automatic at the end of that time. During this period, the reading of the minutes of the last regular meeting should be approved. All committees reports should be accepted, new committees and changes in committees announced. The reading of the minutes of the club's Board of Directors' meeting should be read to the club as approved by the directors. A financial statement by the treasurer should be given at the end of the meeting. The president should aim to give all new members a welcome into the club and introduce visitors from other clubs, or prospective new members at each meeting.

No discussion irrelevant to the club's business should be permitted, nor arguments between members aired before the members. The bone of contention should be limited to one circuit to work in his hobby, he very quickly gets another one tried out.

Do not allow your club to degenerate into a social club, where members become "twelled" before the young high school and college crowd. It is not ham radio. There are fine gatherings in this flood, but old members and young members are here to stay, and that it is up to each and every man in the organization to help his less fortunate associates, thereby helping himself and acquiring many warm friends, together with having a happier outlook on his hobby, which we all know is the best in the world.

There is nothing idealistic about the above; given a fair trial in every club that has a membership of ten or more, headquarters is seldom to be found, and the members are so glad that the club is run on this basis. All that was necessary was intelligence, hard work and a final realization that all forms of communication are here to stay, and that it is up to each and every man in the organization to help his less fortunate associates, thereby helping himself and acquiring many warm friends, together with having a happier outlook on his hobby, which we all know is the best in the world.

Flood Emergency Work

At this issue goes to press word is received that amateurs assisted greatly in providing communication during the period of the severe floods in western states. In Colorado, W2LF, W9HDI, W9HUB, W9RMA, W9WLD, W9NUP, W9JFD, W9UEK and others did excellent work, handling many important messages for police, army and individuals. In Nebraska, W9CRB, McCook, puts a battery operated transmitter on the air and opened communication between W9BAE, W9BBS and W9FWC of North Platte. With telegraph wires down and only partial telephone service a large volume of traffic was handled. W7EDW, Casper, Wyoming, writes that he heard W9CRB's cw signals in the middle of the 3.5 mc.,phone band giving out a call of distress and farthering the story of isolation, death and destruction. One station after another lumped up to aid in handling the only means of communication from the sanctuary areas. Those cooperating in this were W9DCY, W9PWU, W9SVL, W9M0V, W0EIE, W9BBS and W9RQX, who acted as key station. W7EDW acted as "op," chasing CQ hounds off the frequencies where the important emergency work was taking place. Further details of the fine work of amateur radio in this flood emergency are expected for the next issue.

W2ASF of New York City took a portable outfit to Pine Camp, New York, with the 101st Cavalry, which is stationed there the last two weeks of June. W2FL, W2QCX, W2GPB and W2HAN are handling schedules with W2ASF for handling traffic into N. Y. C. The main schedules will be maintained on 3.5 mc. connections into the metropolitan area being via the N. Y. C. 55-mc net. If you hear W2ASF P22, give him a buzz.

License Exams at Columbus

Examinations for amateur operator licenses will be conducted in Columbus, Ohio (Council Chamber, 2nd Floor City Hall) June 14th and 15th at 9:00 a.m. and 2:00 p.m. local time.

The Baltimore F.C.C. office advises that examinations for amateur licenses are conducted each Wednesday as well as every Saturday as announced in June QST.
Scores were as follows: a real honor. We are proud to present full data on the achievements of these leading operators.

Donated by W2WK for second-high searer, and is putting it evidently to the O.R.S. winning it three times. It has been held

Sections. W40G operating at W4NC had 185 QSOs (178 O.R.S. and 7 O.P.S.), and W9MN (previous cup holder) rolled up 169 contacts. Hal at W1MK came within one of making his January record of 160 QSOs (the previous high)!

Section to its ideal. Two way voice work, rather than any imitation of broadcasting efforts is stressed. There is no place for standards for snappy operating, that give a different form of enjoyment from that that obtains in daily sked-keeping. Those amateurs who take a pride in the way messages are handled through their stations partake in traffic activity because this end of the game is their chief pride and joy... their thanks come in the knowledge of a job well done.

While not breaking new high records, the competition for O.R.S. and O.P.S. appointment requires it we know, that during O.R.S. doings or at any time, an O.R.S. may be depended on to QSP time, an O.R.S. may be depended on to QSP.

Members who hold O.P.S. appointment receive quarterly bulletins through which they exchange information and receive data from Headquarters. O.P.S. are asked to subscribe to a code of good voice operating ethics, and just as the prospective O.R.S. is examined as to the operating technique of the applicant phone stations to see in advance of appointment that adequate means exist to tell when modulation over 100% exists, and that in normal operation it does not occur. Hams using any 'phone band, restricted or unrestricted bands, are eligible to hold this appointment. Blankets will be sent gladly on request. The O.R.S. activities of both groups of stations are designed to

For the quarterly activities of the Official Relay Station and Official Phone Station appointees are scheduled for late July. The quarterly July bulletin will be issued in the early part of that month with full information on current matters. The activities of both groups of stations are designed to create opportunity (1) to test station performance, and (2) make new friendships and contacts. Official Relay Stations (O.R.S.) and Official Phone Stations (O.P.S.) are active stations at all times, operating technique above the average, these are the real meanings in A.R.R.L. O.R.S. and O.P.S. appointment.

League member stations that specialize in traffic handling are invited to become members of the Official Relay Station group, and to get in touch with Section Managers (see address of your S.C.M. on page 6). The quarterly activities for O.R.S. do not stress traffic handling, the first enjoyable duty of O.R.S. but are designed to make a new acquaintance, to see in advance of appointment that adequate means exist to tell when modulation over 100% exists, and that in normal operation it does not occur. Hams using any 'phone band, restricted or unrestricted bands, are eligible to hold this appointment, and when appointed, take part in the operating activities which assist in station testing as well as build fraternalism and strength to a growing national group.

Official Relay Station Scores

While not breaking new high records, the competition for first place in the April activities of the A.R.R.L. national 'phone group was extremely keen. A battle between W8ICF, W8JZ and W8JJA for best operating results on this occasion was decided in favor of W8ICF with a score of 1380 to his credit, and that of the Ohio Section. The leading scores were as follows:

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ANNOUNCEMENT TO OFFICIAL PHONE STATIONS

July 8-10 will be the dates of the next national O.P.S. QSO-party. Rules for scoring are as follows: 5 points for each O.P.S. worked, 2 points for each O.P.S. heard but not worked, 5 points for O.R.S. contacts. The sum of all points so made is to be multiplied by the number of A.R.R.L. Sections (see list on page 6) worked. Any or all 'phone band frequencies may be used. The majority of this work has been in the past been in the 1800-2000 and 3900-4000 kc. bands. Eleven a.m. to one p.m. on Sunday (local time) has been suggested as the best time to try the 14 mc. band. The first 15-minutes of each hour has been suggested as the best hour for operating O.R.S. and O.P.S. as a good time for 'phone-telegraph QSO's, but use of this period is optional with the individual.

Starting time for the Party is 5 p.m. P.S.T., 4 p.m. M.S.T., 5 p.m. C.S.T. or 8 p.m. E.S.T. Stations reported must all take place before the close of the activities 12:01 a.m. P.S.T., 1:01 a.m. M.S.T., 2:01 a.m. C.S.T. or

All frequency bands, as usual may be used by O.R.S. in the coming summer activities, but several new factors are being tried out in the summer party, and work on 7000-7300 kc. will be suggested to get around the QRN difficulties incident to the season. We mention the subject in this advance announcement so that O.R.S. may have time to follow the suggestions made by our A.R.R.L. Board of Directors in modifying our transmitters to employ “band switching” and other devices that will make it easy to go from band to band to get the most out of O.R.S. party operating time, and use the frequency assignment most appropriate to the area. More of which information we hope to include in the July O.R.S. Bulletin!

The W3AUI O.R.S. Trophy Cup will be up for the following purpose: the operator who makes the leading score at any Official Relay Station. Three different men have their calls inscribed on a card cup date as token of their individual operating achievement. Will one of them win it a second time? Whose call will make the cup next? Remember, this trophy goes permanently to any operator who can win it three times! A new scoring plan will be tested in the July Party which is designed to equalize opportunity for participants in the eastern and mid-western stations and in the western parts of the country, insofar as this may be possible.

A Model 321 Triplet! milliammeter (any standard scale chosen) will be awarded to the leading O.R.S. operator in the following licensing areas, following the above rules, at the close of the party, for the sum of all points will be multiplied by the number of A.R.R.L. Sections worked. Late scores will be chronicled, but all scores to be considered for the Cup Trophy, or milliammeter awards in the coastal areas, must be mailed to A.R.R.L. Headquarters within ten days of the close of the party.

As usual, O.R.S. parties mean swell operating guaranteed. You may be next to win the O.R.S. Cup, but if you don’t, you will be repaid by dozens of solid enjoyable contacts with real operators! Use all bands, but don’t forget the premium for 7 mc. work—because this is a summer 7 mc. party. Here’s luck, O.R.S., and more dope coming in the summer bulletin soon to be mailed.

New 56-mc. Records in the Making

Thanks to the efforts of some twenty amateurs in the Philadelphia and New York areas, all ready to sacrifice time and contribute efforts, new 5-meter accomplishments of a major nature are on the horizon. Though not often given the acid test, 56-mc. work has high practical value. Beginners as well as old timers find the band a relative haven for a “bee-utiful” rag-chew, free from the drawbacks of the lower frequencies. The band is large enough to permit comfortable duplex work, and duplexing is a major aid in relaying. With auxiliary 5-meter equipment the last 20 or 30 miles of a relay necessary to connect two stations in large metropolitan districts can be easily covered.

Long distance 56-mc. relays can take place with good consistency between stations in high places, and this work is greatly facilitated by use of directional transmitters which multiply the effective power of a receiving or transmitting station many times. One of the aims of east coast experimenters has been to maintain a successful traffic net for emergency and other work to facilitate local deliveries. Another objective close to accomplishment is the creation of an Atlantic coast relay route following completion of the 56-mc. New York-Philadelphia link.

To prepare the way for this 100-mile link the following stalwarts arranged a first test for the date of May 25th. Starting at midnight N. Y. stations called “Philly” for the first five minutes, the next five minute period being assigned for listening for calls from the third districts stations participating. Naturally beans were called into service for the big effort, and stations using beans will be indicated with an asterisk. W3EPO put up a thirty foot tower. Other stations were installed in the highest available locations. W2GHJ*, W2CVP, W2EKC*, W2GOY*, W2ETU, W2AMJ, W2AZB, W2DLG, W3AG*, W3BQJ*, W3AIF, W3AVY, W3FGN, W3EFE, W3CQI and W3GS* all cooperated similarly for the endeavor.

Full details of the first test are not available from all who took part at this early date. However, precisely at the scheduled time things happened. It was marvelous to listen over the band and hear not a trace of locals normally making the 56-mc. band a dud in either big city, but cooperating because of knowledge of the tests through numerous QSTs transmitted on the subject. W3FGN in Philadelphia was heard by W2EKO and W2ETU in New York and W2DLG (using a pr. of 801s) on top of the Hotel New Yorker was heard and called by W3FGN, operating portable on top of City Hall, Philadelphia, 547 feet above the sea. Super-regos’ receivers were used. A half-wave vertical antenna with 100-foot Zepp feeders was used at W3FGN, with 51 watts input to a pair ‘o 10s. A pair of vertical rods, appropriately oriented were used at W2DLG. But let us quote W2EKO’s account of the tests:

“Everything was in working order by about 10 p.m. May 25th and at midnight sharp I started calling Philly. Five minutes of this and I listened, bombing the band 12:05 to 12:10 a.m., but N.D. At 12:10 a.m. another five-minute call started. Better luck this time. As I tuned down to 57 mc., W3FGN was heard. W3EKO was calling CQ-NY and announcing that he was hearing W2DLG. Immediately I started calling W2DLG to tell him that he was being called. As my beam was set on Philly I wasn’t getting into N. Y. C. v. well. No answer from W2DLG so I started to W3FGN again to ask for myself. However, W2DLG was called by W2ETU who heard W3FGN’s call for DLG, and a three way QSO followed, using W2DLG for transmitting and W2ETU for relaying...
what W3FGN was reporting. I kept W3FGN tuned in but was unable to raise him after he signed with W2DLG. ... W3FGN was Q8AS R6, very FB and perfectly 100% here on Long Island."

—Herb Gordon, W1IBY

Timing Ski Races via 56 mc.

On Sunday, January 20th, a snow train left Schenectady, N.Y., with a gang of winter sports lovers for North Creek up in the Adirondacks. Stowed aboard were W2ACB, W2ALP and G2KB of the Schenectady Amateur Radio Association, with their 56-mc. gear, prepared to time the ski races. The races were held on Gore Mountain. To reach the starting point of the race W2ALP had to pack his two watt transceiver four miles up the mountain! W2ACB set up his equipment at the finishing point. Transmission and reception were perfect. W2ACB could hear the starter giving the skier the OK, and the starter was several feet from W2ALP’s mike. An Eastman Timer was used at W2ACB. When he heard the starter say “Go,” the time registered was noted and likewise it was noted again when the skier crossed the finish line, the clapsed time giving the exact time each racer took to negotiate the course. Many comments were received on the efficient manner in which the races were handled and timed via 56 mc.

The Dartmouth College (N. H.) Radio Association provided accurate timing for the skiing races at the Silver Anniversary of the Dartmouth Winter Carnival. 56-mc. transceivers were used for timing and worked to perfection. All timing was done from the finish line. The starter at the top would stand by the contestant at the starting line, listen in his headphones to the operator at the finish counting off “20, 15, 10, 5, 4, 3, 2, 1, go!”, and give the skier a shove at the proper moment. At minute intervals some 70 skiers were sent hurtling down the steep 30-degree slope without a single interruption. After each start the timer would turn it over to the operator at the top for a brief OK—“62 of, 65 up, take it away.” The need for accurate timing was well shown by freshman Dick Durrence’s time of 58.2 seconds, better than a mile a minute! Amateur radio was on the job, assisting in police work, calling officials and competitors to their proper stations and offering a convenient message service. W1CYF, W1FHE, W1FZB and W1AXH were the amateurs putting this work across.

Operators Wanted

The U. S. Coast Guard is in need of about sixty radiomen, most of whom will be rated radio men third class as soon as they qualify. Necessary requirements are: clean fist, ability to receive about twenty words per minute, good knowledge of radio and physically and morally fitted for the service. Write Lieutenant (j.g.) E. E. Comstock, U. S. Coast Guard Headquarters, Washington, D. C., giving qualifications, education, etc.

The Newfoundland Amateur Radio Association was formed at a hamfest at St. John’s, Newfoundland, on November 12, 1934. Officers elected for the first year: VOSAW (now VO2J), president; VOS8 (now VO2Z), vice-president; VOSN (now VO1H), secretary-treasurer. Present at the organization meeting were VOSH, VOSW, VOSK, VOSZ and VOSAW. During the “hamfest” portion of the activities various ham shacks were visited as well as VONF, broadcast station, and VON, commercial rig. A banquet was enjoyed by all in the evening. The gang is looking forward to a future get-together at which they hope to have all VO’s present. Much credit is due VOSH (VO1H) for a major part in organizing Newfoundland amateurs.

George Bonadio, Watertown, N. Y., after listening in considerably, thinks it would be helpful to make it an “unwritten law” to cover the band before going on the air. It certainly would help greatly, if every operator would at least listen on his own frequency before opening up to make sure he is not going to cause unnecessary QRM, and every good operator always covers the band before CQing.

Station plaque, natural wood letters and carvings on natural wood background. This is the handiwork of John A Kreher, 404 South Second St., Clearfield, Pa. These plaques are also furnished with aluminum letters on bakelite back-ground. Mr. Kreher offers a complete line of plaques and aluminum or wood letters (for microphone, auto radiator, transmitter, etc.). Prices vary according to size of plaques or letters. Write for quotations.

Operating Savvy

Why do telegraphing amateurs insist on repeating so much after minor mistakes in ordinary conversation? Hams of ordinary intelligence catch on even if a word is missed. Amateurs should correct ONLY the word erroneously sent anyway, but many repeat the whole sentence! That is not making for better operating!

Another thing, amateurs know QRZ as “something about being called by someone.” In reality it means, without the absolutely necessary question mark, “You are being called by.” QRZ means “BY WHOM AM I BEING CALLED?” Use the question when you want this meaning. Amateurs should familiarize themselves with all “Q-Sigs.”

By consistent mispractice other operators are misled, many following as the proverbial sheep in the flock. Let us think while operating. If an operator is listening—in (many don’t, as should, they CQ instead) and hears a station in the vicinity for which he has a message, said operator is able to call this station if it ends with QRZ?.

How many times does this station that put out the familiar QRZ? really cover the band? If not, then why send “QRZ?” “But on the other hand it is with great pleasure that an operator listens in to hear an operator “coming” back to him after he has put in a few minutes of calling, after said operator has exercised the good faith and thorough tuning a “QRZ?” warrants. The whole thing dwindles down to SAVVY! Not every operator will have it, but it is all a part of good operating which even the newest amateur will acknowledge as the best policy.

SAVVY goes a long way in operating. Haven’t you heard and admired some fast operators in the amateur bands going like blazes, never a slip between the dots and the dashes? Doesn’t it make you want to slide into their stride? Secretly it must.

Study your own individual operating and profit by experience of others. Study and understand Q-sigs as questions or replies depending on whether a question mark is sent. Savvy only comes to one who wants it to. Do you?

—Kenneth Isbell, W6BOQ

July, 1935

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Hamfest at Clinton, Iowa

The third annual hamfest under the auspices of the amateurs of Clinton, Iowa, was held on the evening of April 19th in the shack of W9JZM. 110 hams enjoyed the festivities, which included good speakers, free lunch and refreshments, a grab bag, from which everyone received a prize, and a regular prize drawing. W9JZM is located in a theatre, which made an excellent place to seat the 'delegates'! The fest lasted until 5:00 a.m. The only regret in connection with this affair was the year's wait until the 1936 get-together!!

On a 5000 mile automobile trip to Canada and return W6AM worked 65 hams on 56 mc, enroute. Transmitter was a 50-watt mobile outfit, which is permanently installed in the car. San Francisco hams picked up W6AM 75 miles away; contact was established within 36 miles of the city.

A rush message from W1MK addressed to Maplewood, N.J., was given to W3BWT one evening on regular schedule. W3BWT passed it along to W2GFW (three miles from destination) who made delivery the same night.

On a golden dais, beneath a silken canopy, the Dixie Squinch Owl peers from its priceless ruby eyes upon a sea of hams who bend a reverent knee. The Squinch Owl's shrine is at Fort McPherson, Georgia. There you can see the life sized statue of this symbolic varmint carved in the living cocoa-nut. Only by seeing can one appreciate the really fine points of this work of art. The sculptor is Francis Carroll, W4OK. A platinum plate, studded with precious gems, proclaims as follows: "The Dixie Squinch Owl. Caught by W4AWO/ W2EQH, Lake Worth, Florida, January 21, 1935." All this is extracted from issue No. 85 of "The Dixie Squinch Owl," a paper which is in class by itself. For further details see your nearest Army Amateur, or ask W4IR!

Legion of Frontiersmen

Hugh L. Bennett, VE4SD, 2727 90th Street, Edmonton, Alberta, is organizing a radio unit within "The Legion of Frontiersmen," a semi-military organization of fellows who have served the British Empire and who are handed together to keep themselves fit to help again in any emergency. VE4SD is attempting the organization of a Radio Unit for the purpose of being of use in any emergency (QRR work, etc.). He proposes to keep the key stations in shape by running daily schedules and handling ordinary message traffic. Any Canadian amateurs interested in co-operating in such an endeavor are urged to get in touch with VE4SD, giving a brief summary of equipment available, frequencies used, etc.

An excellent demonstration of amateur radio was given to the El Paso (Tex.) Rotary Club on February 7th by W5EQH, with the assistance of other local hams. W5AEC moved his 14 mc. 'phone to the bathroom of the Hotel Paso del Norte in downtown El Paso and set up for transmission, using an antenna approximately 250 feet above the ground. W5ESL's rig was also set up for transmission. A schedule was made with W5FJ, Chicago, and arrangements were made to have a representative of Chicago Rotary send greetings to the El Paso Club. Like arrangements were made with W9BJ, St. Louis, in order that two El Paso Rotary members could speak to their friends in the meeting. At the appointed time contact was made with W5EJL and the W5BQ was 100%. Following this W9BJ was contacted and everything went off according to plans. W5AOT received the 14 mc. signals at his shack and retransmitted to the hotel on 3.9 mc. to insure better reception in the downtown area. W5DE and W5EDD were standing by at W5EQH ready to take over the retransmission, if anything went wrong. Each amateur co-operating in this demonstration deserves much commendation.

W3EAP and W3E2L of Alexandria, Va., rendered valuable service during the January sleet storm. Early on the morning of the 23rd contact was established with W2BYA, Clifton Forge, Va., and maintained all of that day. On the 24th and 25th contact was established with Salisbury, Md., W3VJ. Numerous extremely important messages were handled for the Virginia Public Service Company. W3EAP did much of the operating at W3E2L.

Oddities, submitted by R. G. Sumners, Buffalo, N. Y.: WREIT, M. E. Jenkins, lives on Jenkins Street ... W8MDK may be a Rug, but don't try to walk on him ... W8SOP lives at Green Lake—a wet combination. ... W9ARK has M. J. McKee for skipper.

W8LJJ, Glen Falls, N. Y., W8MST, Logan, W. Va., and WORIZ, Agra, Kansas, are all ready to join the "Police Net" endeavor, WORIZ having already made some arrangements with his local department.

A note from W6ASQ brings up a point about eliminating broadcast interference which is not likely to occur to the harassed ham. In investigating a receiver on which his 5500-ke. 'phone caused interference, cleaning up a doubtful-looking splice in the antenna leading to the receiver completely wiped out the 'phone signal, which had been riding in on top of the local b.c. station. His explanation, which seems reasonable, is that the poor splice probably was acting as a copper-oxide rectifier and giving cross modulation.

Would-be hams in Chicago will be interested to know that a course in amateur radio is offered at the Crane Evening School. The dope comes from W9SFR.

We neglected to mention, in the stray which caused all the rumpus resulting in "Shootin' the Works" in the January issue, that the air rifle used should be a high-power affair like the Benjamins. Our contributor, now W2HBX, also writes that when the gun is .22 the long-rifle cartridge should be used. We repeat, don't forget the backstop!

W5DGV says that after counting up the cost of ham radio for the past two years and then dividing it by the number of QSO's, he finds he could have done it cheaper by Western Union!

Almost any crowd will have its quota of hams. While ice-skating one night during the past winter, W3DUN had the inspiration to whistle a CQ to see who might be "on." Two calls and a signature raised W3DML, and then in rapid succession the following were "worked": ex-30J, W3CIZ's son, an op from WAR, an ex-7, and ex-W8AQV! A number of others were heard but couldn't be located in the dark.

W9SYH should be a first-class brass pounder. He pounds brass all day in a horn factory, all evening on 80 meters, and all night in a brass bed! — W9TE

QST for
July DX Contest

The Endes das Enviadora Portuguese (Rua 1 de Desembro, 33-3, Lisbon, Portugal) announces a contest starting at 0000 Greenwich and ending at 2400 on each of the following days: 6th, 7th, 13th, 14th, 20th and 21st of July. All amateur frequency bands can be used. Each Portuguese amateur will send a distinctive five letter group that must be received "hot" time on 14 me. He worked AR8MO and YL3FB at 14250 kc., and YL7RR on 14300 kc., both with 5 points.

"It seems as though we amateurs are defeating our purpose of bringing all notes 'up-to-date' by resorting to the low racket of 'apple-polishing.' If an amateur has a punk note, tell him about it instead of fishing for a good report in return to satisfy that big conceit. It is only a matter of time before the gang would only be more critical of notes instead of casually pleading could be avoided if his so-called 'brother' ham..."

A record "round table" QSO on June 7th included these nine stations: W5DIU, W6FZZ, W7BST, W7BSU, W7BVE, W8UW, W9AUT, W9RYD, W6JT.

28 Mc.

The following calls were heard on 28 mc. by LUAEP between 1730 and 1950 on June 2nd: W2AER, W5AFV, W4MR, WSACW, W9EEU, ON4AU, D4BFW, PA0QQ. This information received via W8TVI is followed by further advances, that on June 9th LUAEP was QSO ON4AU X1AY, W6VQ and W5JVII. This represents what is believed to be the first 28 mc. contact between U.S.A. and South America.
BRASS POUNDERS' LEAGUE

(Apr. 16th—May 15th)

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MORE-TAN-ONE-OPERATOR STATIONS

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<td>W5YEN</td>
<td>301</td>
<td>321</td>
<td>1024</td>
<td>1255</td>
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<tr>
<td>K6VH</td>
<td>663</td>
<td>420</td>
<td>782</td>
<td>1201</td>
</tr>
<tr>
<td>W5YX</td>
<td>92</td>
<td>65</td>
<td>587</td>
<td>1084</td>
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<tr>
<td>W9PH</td>
<td>99</td>
<td>184</td>
<td>412</td>
<td>506</td>
</tr>
<tr>
<td>W9YO</td>
<td>469</td>
<td>24</td>
<td>344</td>
<td>509</td>
</tr>
</tbody>
</table>

These stations "make" the B.P.L. with totals of 500 or over. Many "rate" extra credit for one hundred or more deliveries. The following one-operator stations make the B.P.L. for delivering 100 or more messages: the number of deliveries is as follows: Deliveries count: W9BYD, 202; W8YR, 143; W9SBS, 104; K9DQ, 82; W5VH, 61; W5WQ, 35; W5XW, 15; W5YS, 30; W5DRT, 9; W9VZ, 17; W5BN, 10; W9S, 6; W9I, 3; W9Z, 0; W9B, 0.

Those directly responsible for planning and executing the affair: W4CCP, W4BSL, W4DJO, W4CVW, W4DNI, W7IW, W4DJU, and their "better halves." A.A.R.L. STATIONS

<table>
<thead>
<tr>
<th>Call</th>
<th>Orig.</th>
<th>Det.</th>
<th>Rel.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>W5LMS (W9BZ)</td>
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<td>27</td>
<td>1783</td>
<td>1816</td>
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<tr>
<td>W5MD (W4F)</td>
<td>287</td>
<td>220</td>
<td></td>
<td>507</td>
</tr>
<tr>
<td>W9NB (W9BQ)</td>
<td>* 21</td>
<td>119</td>
<td>96</td>
<td>236</td>
</tr>
</tbody>
</table>

MORE-TAN-ONE-OPERATOR STATIONS

<table>
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<tr>
<th>Call</th>
<th>Orig.</th>
<th>Det.</th>
<th>Rel.</th>
<th>Total</th>
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<tr>
<td>W3MC</td>
<td>293</td>
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<tr>
<td>W5YW</td>
<td>178</td>
<td>241</td>
<td>2834</td>
<td>2834</td>
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<tr>
<td>W5VQ</td>
<td>311</td>
<td>109</td>
<td>410</td>
<td>626</td>
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<tr>
<td>W5LY</td>
<td>274</td>
<td>321</td>
<td>1156</td>
<td>1481</td>
</tr>
<tr>
<td>W5LMA (W8YA)</td>
<td>0</td>
<td>2</td>
<td>500</td>
<td>111</td>
</tr>
</tbody>
</table>

All total of 500 or more, or just 100 or more deliveries will put you in line for a place in the league. 

O. B. S.

The following is a supplement to the list of A.A.R.L. Official Broadcasting Stations in October QST (page 49): WIBNS, W5AOP, W6JTV, W8DCI, W9JZJ, W9QXP, VE1AW.

Briefs

W9RIA, So. St. Paul, Minn., heard W5AWT call CQ. He called him, and things like this happen only once in a lifetime! W5AWT came back to W9TVY, his sister in Chicago! V5SLP, Northwest Territory, is the brother of W9RIA and W9TSV—a family of hams! They maintain weekly schedules.

A hamfest will be held Sunday (all day), July 14th, under the auspices of the Amateur Radio Association of Northern Jersey, at Woodport Hotel, Lake Hopatcong, which is located between Dover and Sparta, N. J. Admission 40c. 50c. hidden transmitter hunt, other events, swimming, prizes, will all help to make it a good time. All amateurs are invited, together with their YLs and YPs.

W9GSTR, Wilmington, California, is the lucky holder of ear license 6N7 73—6 for 6th district, N for N.C.R. prefix, and 73 and 88 speak for themselves!

At the 1935 convention of the National Education Association to be held in Denver in late June one of the exhibits will be an amateur radio station. A complete station will be operated during the entire convention by amateurs who have received their training in the Denver senior high school. W9HOO and W9YHD are maintained by the Denver schools for the use of amateurs who attend the senior high schools.

Finding himself lost touring through Hollywood, Illinois, W6CVO turned on his portable 56-mc. rig in search of some one who could "help him find himself." W9PHV of Riverside worked him, and directed him corner by corner through the town and on his journey!

Gorgas Hamfest

The Gorgas (Alabama) Amateur Radio Society's hamfest on May 19th attracted 54 amateurs and YLs from Alabama and Mississippi. Trips through the Alabama Power Company's steam plants and dispatching station were features of the morning activities and a barbecue and rag chewing session occupied the afternoon. Among those present were W4KP, Alabama SCM, W4APU, Southeastern Division Director, and W4ARJ, president of the Birmingham club. Those directly responsible for planning and executing the affair: W4CCP, W4BSL, W4DJO, W4CVW, W4DNI, W4DJU, and their "better halves." During May a chess match by radio was conducted between the Easton (Pa.) High School and the Hartford (Conn.) Public High School. The amateurs handling the radio end were W1FXQ and W3EPJ. All work was on the 3.5-mc. band. Hartford High was the victor.

The Use of "ORS" After a Call

One hears more and more use of "ORS" after calls these days. The "ORS" is added after a "gimme" in the mark of a reliable operator. It helps other amateurs to know an experienced man is on the air, and ready to help in relaying traffic or making deliveries if they will but give him a call. "ORS" are known widely for their good signals, fine operating, courtesy, and general efficiency and readiness for any communicating job. "ORS" went after a sign-off is hamy and filled with fraternal spirit, in addition to its practical use in establishing "identity." It aids gummy traffic movement, too. If you have trouble, try to give it to a station that signs "ORS." A postal will bring any League member information on becoming an Official Relay Station appointee.

WIMK Schedule

Official and Special A.A.R.L. Messages to members are transmitted by the Headquarters station, WIMK, on the following schedule. All times given are E.S.T.—Sunday: 8:30 p.m. and midnight on 3825 & 7150-kc. Monday: 8:30 and 10:30 p.m. on 3875 & 7150-kc. Tuesday: 8:30 p.m. on 3875 & 7150-kc. Thursday: 8:30 p.m. and midnight on 3825 & 7150-kc. Friday: 8:30 and 10:30 p.m. on 3875 & 7150-kc. All these transmissions are at a rate of 12 or 22 words per minute, and make good code practice for the more advanced beginner.

When two "dyed-in-the-wool" hams want to go on the air, defective equipment or not, they find a way. W6ATP's receiver was "on the bum"; the transmitter at W9BYD was "ditto." But they both had telephones, so—W9BYD listened for a CQ, put the 'phone near the loudspeaker, and W6ATP copied the signals over the 'phone and called the station heard with his transmitter. Several enjoyable QSO's were carried out in this manner; break-in was F.B.; DX worked was about 1000 miles.
National Highlights

As W6EZV, Iowa SCM, puts it: "The spring fever microbes, or whatever it is that bites hams at this time of year, is among us again, and stations are being packed away in the hamfests in conjunction with Engineer's Day, May 23rd. 66 flor or whatever it is that bites hams at this time of year, few good talks, refreshments and prizes brought "a good time to all." W2GFW, msde 40,560 points!

The Yakima, Washington club plans to take a 28-mc. rig to the top of Mt. Adams (12,307 ft. high) on July 4th. The Oregon gang plan to climb Mt. Hood at the same time. A chance for some new records. W6A&M worked sixty-five 55-mc. stations while on a 4,500 mile trip to Canada and return. W2PMT, W2HQL and W2HIU are hike-hiking to Canada, a long trek! The New Mexico section has a new SCM—Mr. Joseph M. Eldred, W5CGJ, W3BIG, Mr. C. C. Morrison, is now Assistant SCM for Virginia. Since the R. I. gang got after the 56-mc. "boot-leggers" around Providence, R. I., the gang there claim there are hardly enough legitimate operators left to make operation interesting! W3DPF and W1FXQ handled the respective ends of a radio chess match between the Easton (Pa.) and Hartford (Conn.) High Schools.

The South Jersey Radio Association had an interesting booth at the Camden Hobby Show, displaying transmitting and receiving equipment, GRLs, late collection, 1929 spark transmitter, cup awards, etc. The Del-Mar-Va Communication Reserve Net, better known as the Del-Mar-Net, consisted of W3WJ (key station), W3CQS, W3DOG, W3EUK, W3YL. Arrangements for the "Kilimanjaro" expedition were made at the Monthly meeting in May. W8HIU attended the K. K. Corps. The Northern New Jersey Section QSO Contest held during April and May was a complete success; the leading scorer, W2GFW, made 40,560 points.

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SOUTHERN NEW JERSEY—SCM, E. L. Hudson. W3BAK, 3CQS-8SN-3CXL R.M.'s. 3BWT Chief R.M. The Del-mar-v-a Communication Reserve net, better known as the Del-mar net, composed of 3WJ, Key Station, 3CQS, DOG, EUE, BAK, ETU, AAWM meets each afternoon and Sunday, at 5 p.m. E.E.T. on 1.75-mc. 'phone. The Telephone Club will hold a hamfest in Ocean City, Maryland, on July 13th—14th at the George Washington Hotel. Prize—A big one for everyone. Tickets, $3.00. Special price of $2.75 if ordered at least a week in advance. Tickets on sale now at 3BAK, Laurel, Delaware. Write him. Plan to spend a week-end vacation at this seashore resort. SN is having trouble with remote control and is overhauling transmitter. CDX handled 250 messages with KTVY and WHEW during month. BWT also handled Byrd traffic; he received ten 3.5-mc. calls heard reports from Europe. ABA is going to try 28 mc. this summer. ASO had FB trip to So. Carolina. CDG is going to try 14 mc. this summer. GME is a new O.R.S. DAZ will be on 3.9-mc. 'phone soon. E0Z-EIIW has class "A" ticket. CDQ is going to get HRO receiver. DCM has pair of 50 watters. BOR built new Browning Super. "I am building bootlegged on 7 and 14 mc." this station works 3.5 mc. only.


SOUTHERN NEW JERSEY—SCM, Carroll D. Kentner, W3ZX—The South Jersey Radio Association had a very interesting time at the Camden station by transmitting and receiving equipment, QSLs, tube collection, 1920 spark transmitter, cup awards, etc. CQR will resume all his schedules June 6th. COT is wishing it was around Christmas time—he needs a new 865. ERL found he had been operating for some time with a broken feeder. BTH has joined the A.A.R.S. FIV and FJV are new hams in Atlantic City. DNL wants O.B.S. and reports that DOD is being pirated. In Phila. on 340 mc. AY3 is extending his O.P.S. activities with a new 56-mc. outfit for the summer. DQ0 recommends ETM for O.R.S. and is having receiver trouble. FBV visited DBC and had nice rag chew. The Camden Radio Club is making regular classes. C4W is instructor. EFM is assisting in the A.R.R.L. Investigation of commercial occupancy of frequencies adjoining the 7-mc. band. EMB is going 56 mc. FIV is a new ham in Absecon. AP2 reports a visit from BOB, ZI and 10 fellow hams from Trench drove down to Haddonfield to the grill meeting of the South Jersey Radio Association to hear David Grimes talk. DAF is on with 350 watts working some good DX and promises regular reports. BEI reports by radio, and says not to mention that he has not yet hooked that ASAP, FFE is going "tenny"—tens on ten meters. DOR sends in his first report, and is looking forward to some intense traffic handling. Let's hear from you regularly. OM. ZX wishes to thank the Section for the privilege of serving as C.S.C. for the next two years. We are looking forward to plenty of activity in the South Jersey Section.

Traffic: WCQCR 24 COT 2 EKL 31 BTS 6 DNU 17 CYZ 12 DQG 64 BYS 25 EPM 86 SN 29 APL 65 ZI 123 VE 51 DAI 5 BES 22 FFE 3 ZC 18.

WESTERN NEW YORK—SCM, Don Farrell, W5DEP—JTT, R.M., is going to New Mexico for the summer. DSS, R.M., had 3278 messages for the year. FS, KMC had 3278 points in O.R.S. Party. JQZ is doing very nice work in traffic. LEO has schedules 3 days per week. GWY has a new Class "A" ticket. MQX last time moving to new QRA. JE sends first report in long time, FB, OM, CDK took over JTT's schedules for summer. MBY, new man, is doing nice traffic work. AXE keeps schedules for north country. JE does all the operating at WLNE. BGO reports regularly from Gouverneur. GKM wants Sunday schedules. JOT was formerly FTB of Rochester. LUV has a new 3/2 wave doubling. KBS reports new ham, NVT at Elmira. Regularly from Gouverneur. KGM wants Sunday schedules. KBS reports new ham, NVT at Elmira. MKM wants O.R.S.; he has a fine high power station at Hilton. CFN reports that some one entered his shack and stole nearly all of his equipment; his entire station was completely wrecked in the burglary.

Traffic: WSJTT 1111 DDS S15 KMC 438 JQF 318 LUJ 61 GWY 59 MQX 59 JB 51 CDK 50 MBY 45 AXE 39 BGO 28 KGM 16 JOT-LUQ 15 KB3 12 BGL 8 HMK-LUJ 7 GWT-GLY 6.2SN's call is being called BOB-3GP.

PA/NEW ENGLAND DIVISION—SCM, C. H. Grosarth, W8CUG—ADY comes out on top this month and says the A.A.R.S. hamfest was swell. YA says the spring vacation didn't help the total! KWA had a pretty good summer. A.A.R.S. hamfest has and has acquired a pair of '3a's. EFA has a nice bunch of schedules. CUG is still trying to make the P.P. '03a's work. GUP has a new receiver under construction. MHE sends a lot of dope about the Valley gang. It had to work the day, during the hamfest. MHE reports he will be in Dubois and says the Brookville hamfest was a success. LOQ put in another buffer so he could work 14 mc. JZZ says the end of attendance were FB at Brookville. KOB says KFE is building a new rig. INE keeps the traffic moving thru St. Marys. DKL sends a newsy letter and reports much activity on 56 mc. in Erie. GSH keeps busy with A.A.R.S. work. IOH has an 830 in the final now. KFX attended the Brookville hamfest. LIG inquires about 0.8S appointment. EZT expects to be home from the east about the first of July. CMP has been appointed to serve on the Cairo committee. JZ3R attended the Brookville hamfest with IOH, NRE, and KCP. RO put in a new '03a, and got an B.W.L. card from England on 5.8-mc. 'phone. KQQ added a peak preselector to his receiver. CQA has his new receiver peaking nicely. KNB is planning to rebuild and show us some real traffic totals this fall. GUL says the Beaver Valley Amateur Radio Club is in April meeting time. GMT didn't help the total at the Brookville fest. GLA is rebuilding to eliminate B.C.L. QRM. IZD and JCE have new receivers. HDY, KBQ and XBC are giving 56 mc. a try. GUX is working again but out of town. MST and MGO are working 1.75 c.w. MSV is very busy. NR5 is a new ham in Arnold. NUF goes for 1.8-mc. 'phone. NFX threatens to put a 150 watt rig on 56 mc. LOR works 1.8-mc. 'phone. DUT is rebuilding for a pair of '52a. IBA is selling out. ASV has a new receiver and wants to W.A.C. LBP has a new 56-mc. rig going. IRY is wishing for a pair of '3a's. MJF worked France, his best DX, on 14 mc. MHO hooked an EA on 7 mc. CHF is changing to 14 mc. Keystone Radio Club news: JER is on with higher power. BFX is about to leave. CDK works 3BY, NIN, NRE, NRM, NTB, NUD. AHX is active on 3.5 mc. IWH is active on 14 and 7 mc.


NEW ENGLAND DIVISION—CONNECTICUT—SCM, Frederick Ells, Jr., W1CTI—MK leads with the only B.P.L. total this month: He received a QSL from FMSBG saying he copied MK's QST on 3.5 mc. GME continues to hold the C.B.A. traffic banner.
got a kick from working D4BAR, D4BPJ and ON4VO on spending lots of time with A.A.R.S.; he has rebuilt station, CTI 6 TD-ES-DLX 5 INP 4 HTS-IKE 3 FIE-CTB 1. 32 CJD 28 DJC 25 APZ 23 APW 17 HYF 15 AMZ-IOV 12 crystal rig for the Field Day tests. Has anybody got an idea Conference held in Houlton. FB job. IEH has new bug. cancelled schedules until fall. BNC is going strong with a from all Conn. Stations are welcomed, but please mail so as fic. Hi! IKE applies for O.R.S. GTW says 56 me. is hot. O.R.S. party. HTS suggests that chain letters count as traf­ cently. APZ thought he was too late wjth report, so QSO’ed Congrats, CJD lotsa fun. HYF handled bis total on 4 watts input. AMZ

Watch your ears when he opens them up, gang, Reports

like the long wanted station for county net in Essex County. OG
gained from high school. CONG and I have total revised

structure and see the need for a new grid on the air. TVA came down. IDY has daily schedule on 56 me. GHT, EAL,.

me. is anxious to get MD (since 1919) is anxious to get

JL and

GH is QRL digging up dough for the light bill. Hi! QW looks

the NBC convention. Boston Trade School now has eight

massachusetts-RSC, John W. Singleton, WlCDX-CDX is

is QRL

a Bay State Fisheries

massachusetts-RSC

has 1-kw. rig almost ready. BZO is expecting

电台 won't be coming to the limit. HUX believes the 59 is a good tube. ERO

transmitter well under way. AKN is getting set for big sum­

 differentiated

len's Antenna "C" traffic. The Manchester Radio Club met in

Boston, and car. ZB made W.A.C. three times this month (J2GX and

is now WLGF on 3497.5 kc., altern­

EASTERN MASSACHUSETTS—SCM, Joseph A. Mullen, W1AIS—ASI has new transmitter under way for 3.5 me. ABS is rebuilding freq. containing equipment, KH is rebuilding his antenna and is in the process of

WAC. Six graduates of the Framingham Radio Club

cancelled for May 15th. The Parkway Radio Association was formed and

Schedules may be made with other schools through the S.C.M. FRI and

are running around with fish poles extending from them. If there is any club or group of hams who would care to put on a ham fest next year and write to me for directions in putting it on, I will

ranging clock and a telephone. The Manchester
can find a man to let us know, and we will give you all the dope we can about doing it. CUN and DUK are the DX hounds of this

Traffic: WlDVY 211 BKG 201 BVR 76 (WLG 184) DIE 74 NVG 70 (WLG 174) GMM 67 (WLG 170) BVR 49 ITR 30 (WLG 225) BVR 18 ASU 11 AWG 10 (WLG 223) 10. FLE of Fitchburg is now KGMAW at Schodack Bar­

HVAR will be deeply appreciated.

36

July, 1935

56

The Hamfest Committee wants to thank the gang for the

very fine turnout for the hamfest. Manchester looked like a

meeting of the Isaac Walton League with so many cars running around with fish poles extending from them. If there is any club or group of hams who would care to put on a ham fest next year and write to me for directions in putting it on, I will

ranging clock and a telephone. The Manchester
Bassel: W4BTC 129 BRT 112 DW 75 NC 60 CXQ 37
CSO 10 AGF 22 CSD 27 CYA 15 VB 9 A I 3 DIQ-CUB-
BRK 8 CLB 7 BFB-CDQ 5 CXP 4 BV-DGV-BY-OG-
COY-CEN-BZ-JHJU 2 DKI-DKB-CCH 1 CYB 3

We are not sure when the R.L. got after the hooters there were not enough legitimate left to make it interesting. GTN is rebuilding rack and panel link coupling and will at least know what R.L. current in antenna. ETD has practically deserted O.R.S. FB, OM, CM, 25 has a new C.B. CAB at DXing on 14-me. phone daily with pair of 46's and vertical antenna. DAH is staying with CAB temporarily and helps erect masts, etc. E2W has new 56-me. superhet. BBS on 9.6-me. phone has found out the importance of inches in feeding and has overcome R.L. almanac riveted large magazine file to P.R.A. FZG is recovering from bad infected arm and hopes for O.B.S. appointment to be handled over INM.

Traffic: W4BTC 129 BRT 112 DW 75 NC 60 CXQ 37
CSO 10 AGF 22 CSD 27 CYA 15 VB 9 A I 3 DIQ-CUB-
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EASTERN NEW YORK—SCM, Robert E. Haight; W2IY—EGF adds 2nd opr., fine German Police dog to shk. LT hopes to attend Atlantic Division Convention. EFG will see you at Albany Hamfest, 29th June. FKL promises 300 watts on air with Class "A" ticket. ZZD is doing FB work from WLMG with high totals. GTW joined A.A.R.S. ATM reports new A.B. Westchester Amateur Convention. O.R.S. System, BIA is all set for next season—up with no traffic in sight. HAN is R.M. for the 56-mc. net. HCM is dreaming of his dimes coming in from dime machine. GFB gets traffic from 56-mc. net. IEC and W2FXX are in the 56-mc. net. HWY uses 10 with 1000 watts, 36 to 124 watts. CC is still going strong with VG. W9AAB visited I. stations.

NEW YORK CITY AND LONG ISLAND—SCM, E. L. Ensminger; W2AXK—EGF is on for R.M. HBR. EBA and IBT want O.R.S. HIT wants O.P.S. AVW is selling out complete 30-watt job. After five weeks of waiting GNX got Class "A" ticket. FF is lining room with Colotex for ‘phone job. HJN can’t get out of the back yard with 100 watts input. DCP has had 3510 kc. for CB. HZY, 4268; GGW, 3680; HOB, 3630; DCP, 16,590; HLS, 16,188; IAT, 15,170; GON, 12,890; GFF, 11,600; HBS, 10,410; HBJ, 9,220; HCC, 8,030; HCM, 7,840; HCP, 7,650; HJN, 7,460; HBS, 7,270; HNP, 7,080; HJN, 6,900; HBS, 6,710; HNP, 6,520; HJN, 6,330; HBS, 6,140; HNP, 5,950; HJN, 5,750; HBS, 5,550; HNP, 5,350; HJN, 5,150; HBS, 4,950; HNP, 4,750; HJN, 4,550; HBS, 4,350; HNP, 4,150; HJN, 3,950; HBS, 3,750; HNP, 3,550; HJN, 3,350; HBS, 3,150; HNP, 2,950; HJN, 2,750; HBS, 2,550; HNP, 2,350; HJN, 2,150; HBS, 1,950; HNP, 1,750; HJN, 1,550; HBS, 1,350; HNP, 1,150; HJN, 950; HBS, 750; HNP, 550; HJN, 350; HBS, 150; HNP.

MARITIME—SCM, A. M. Crowell, VE1DQ—Nova Scotia: By the time this report is in print, what now promises to be “VE1”’s biggest and best HAMFEST will be but one of the past events. From all signs at the time of writing, the gang is going to be a large and merry one. So we say, “Glads to have seen you all.” HG had 116 QSO’s in 12 days with Johnson “Q” Ant. EP is going to QRO with 211 soon. AW and AG had quite a time on 2.9 mc. talking 5 via a key. LIA will be at HIF’s house the day of the O.R.S. party! HBS is dreaming of his dimes coming in from dime machine. HBS is rebuilding transmitter. HNP is going in for a Class "A" ticket. LAW is experiencing trouble with automatic elevators.

NORTHERN NEW JERSEY—SCM, Charles J. Hambersen, W2ZFOP—BCC reports new system of traffic handling inaugurated in Second Corps Area A.A.R.S. GGE is working DX on 14 mc. DCP wants shotgun for some cranky S.W.L. neighbors. GGO now dresses in Naval Reserve uniform. HBS is rebuilding transmitter. HMP is going in for a 30-watt battle. HAY is getting parts for a 50-watt rig. GFW wants O.R.S. HEC is rebuilding shack. HGX had rig at hobby show in Verona. ECO gets QRN from new baby. YL Congrats, Lester. ICL is coaching prospective hams. IEC is operating mobile on 56 mc. HAB received two tickets last month, one Class “C,” the other Class “B.” HJN had thrill of life when he met ex-Navy Opr. Yarv. Opdy after 15 years; they were shipmates at NPF, Guam, M. I. Traffic: W2ECF 410 LU 385 FQG 41 FKL 44 BZZ 20 (WLMG 1815) GTW 39 ATM 27 BJA 26 HAN 34 HCM 21 GPB 22 IE 15 EXX 8 HTH 20 CC 14 UL 14 HBP 7 HJN 2.

NEW YORK CITY AND LONG ISLAND—SCM, Charles J. Hambersen, W2AZV—EYQ is out for R.M. HBO, IBA and BRB are W.A.C. BTB is knocking off work from WLMG with high totals. GTW Joined A.A.R.S. O.R.S. on 14 mc.; he has had about 700 QSO’s. FLX has his stuff on 14 mc. in evening. DM, back from trip, has Class B going very fine. ED and HO contact west. HCP has emergency power supply consisting of two dynamos.

ONTARIO—SCM, B. T. Trainer, Jr., VE3GT—AQG reports for himself the first time and likes good long QSO’s. OT was heard on 3.5 mc. using pair of ’45’s. PL expects to operate at VE4TA again this summer and wants us to look for him. QB suggests a cycling contest for the hams who roam the county visiting other hams. An ideal VE9AL is arranging with some of the Toronto gang to use amateur radio to aid the Toronto Flying Club Annual Pageant June 15th. VE3E3 is handling a bit of traffic. RX is most recent ham in St. Kitts. Glad to see JT back helping out on T.L. KV is keeping T.L. “I” open to GG, and has nice route through to Northern Ontario. He is needed. RX is still waiting for TM and QK to come back on the air. QK.

CANADA MARITIME DIVISION

ONTARIO—SCM, S. B. Trainer, Jr., VE3GT—AQG reports for himself the first time and likes good long QSO’s. OT was heard on 3.5 mc. using pair of ’45’s. PL expects to operate at VE4TA again this summer and wants us to look for him. QB suggests a cycling contest for the hams who roam the county visiting other hams. An ideal VE9AL is arranging with some of the Toronto gang to use amateur radio to aid the Toronto Flying Club Annual Pageant June 15th. VE3E3 is handling a bit of traffic. RX is most recent ham in St. Kitts. Glad to see JT back helping out on T.L. KV is keeping T.L. “I” open to GG, and has nice route through to Northern Ontario. He is needed. RX is still waiting for TM and QK to come back on the air. QK.
Canada and the U.S. who intend to come to the Calgary from SC, UP, UW and JC. Amateurs in other parts of communication with Calgary with equipment and operators prefer the Army, and will be at Camp Borden all summer.

Miss ton expects to get in some 56-mc. land-to-air testing when ham bunch in the Militia are very much in the fray. Edmon- on 14 me. with old low-powered rig. 3CJ is one of the gang and the boys carry on the fine work. JK and FG are both 4CG, has built a couple for the Army in Calgary, and the PH has been to the Navy School at Esquimault. PH and IZ.

soon to join the Tricolour Network again and help HT, AB
CU has a new skywire, and at last the rig is going places. LK worked a W6 for the first reported 28-mc. activity since 1930. The Lethbridge Club has a couple of 56-mc. rigs that 1934). GA, after visiting St. Paul Hamfest and many places with regret of an accident to BU's young daughter and

Traffic: VE4AG 315 TV 25 KX 25 (Mar.-Apr. VE4SO 64.)

SASKATCHEWAN—SCM, Wilfred Skails, VE4EI—
UC, FQ, and QZ have already had local QSO's on 28 mc., and more of the gang are building 28-mc. rigs. M. R. for this province. Plenty of DX is being

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ASKATCHEWAN—SCM, Wilfred Skails, VE4EI—
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Traffic: VE4AG 315 TV 25 KX 22 (Mar.-Apr. VE4SO 64.)

PRAIRIE DIVISION

MANITOBA—SCM, A. J. R. Simpson, VE4BG—Traffic continues to hold up very well, Trunk Line station AG leading with 4384 and CG at Winnipegosis. Other points in Manitoba will shortly be hooked up as feeders with the Trunk Line. Any Manitoba station wishing to arrange schedules and traffic please communicate with Cliff Ferg, AG, Winnipeg, who is the new R.M. for this province. Plenty of DX is being

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Five-Meter Bootleggers

St. Charles, Ill.

Editor, QST:

Recently I had occasion to visit my home town of Dayton, Ohio, and was tickled pink over the thought of taking my five-meter outfit along in the car to have a few QSO's with some of my old friends. Upon my arrival, I eagerly blasted out a "CQ," signed and then tuned across the band. Lo and behold, three stations calling at once and all three turning out to be outlaws! I contacted the loudest one and asked him if the Radio Laws had suddenly been rescinded. What do you suppose his answer was? "Well, W9NN, it's like this, 55 per cent. of 64 stations operating on 56 mc. in this area are bootleggers like myself. I'm just trying this rig out to see how far I can talk with it. Where did I get this call, WSPBS? Oh, those are my initials, OM, hi!"

Being too dumbfounded to think of an answer for that crack, I pulled in my antenna and pointed the nose of the old V-8 back to Illinois!

--- Robert E. Baird, W9NN

Jacksonville, Fla.

Editor, QST:

In regard to your editorial in May QST concerning bootleg operation going on in our five-meter band, one of our licensed members operating on five meters recently contacted one of the bootleggers. At the time he was using the call letters "W4JAX" which as yet have not been assigned by the F.C.C. During the conversation the unlicensed operator stated that he intended to use his "swiped" call until he could think of a better one and even asked our member if he had any suggestions!

... The club will carry out the program suggested in your editorial to rid the five-meter band of illegal operation.

--- Jax Radio Club

218 Sheetz St., West Lafayette, Ind.

Editor, QST:

I certainly agree with you, in your May editorial, that, "There's too much bootleg operation going on in the five-meter band." However, I doubt if this is a problem which can be cured by the Wouff Hong. There are often more vital reasons for bootleg operation than merely "enjoying the thrill of doing a little 'radio broadcasting.'" The development of cheap and efficient transceivers has solved the problem of providing reliable communication in many cases where wired telephony is impractical. Among the many such examples our own case might interest you.

The Purdue University Glider Club has been using transceivers for glider instruction. Dual instruction is not practical with gliders and our radio equipment has avoided several possible accidents this spring. I am always on duty at the ground set but it would be absurd to require all of our members to secure amateur licenses before using the glider set. Many glider clubs would like to use radio equipment but do not even have a licensed operator for the ground set.

Unlicensed operation has never been a really serious problem on the lower frequencies because offenders operated from fixed stations and could generally only communicate with licensed amateurs. Faked call letters were readily discovered and it was easy to secure sufficient proof of interstate communication to get action from the F.C.C.

To-day, with transceivers selling for about ten dollars, we have a much more difficult problem. A very large portion of the illegal communication is portable or mobile work between unlicensed stations and is never detected. Even when we do detect bootlegging we are often powerless. As I understand the regulations, an amateur license is required for the operation on the amateur frequencies of any station engaging in interstate communication or capable of interfering with interstate communication. On the lower frequencies this obviously includes any transmitter in any conceivable location. However, it would certainly take a confirmed optimist to hope to get evidence for a conviction on these grounds in a case of bootleg operation of a fleapower transceiver from a location in the heart of the state of Texas!

In the East, with directive antennas, you have a different situation. However, a law which can be enforced in some cases and not in others is rather unsatisfactory. My observation is that many of these people operating illegally on five meters do not actually wish to break the law. They merely cannot spend a month or more learning the code and studying for an examination which does not specifically apply to ultra-high frequency communication.
At a recent meeting of the Purdue Amateur Radio Club I made a proposal which aroused considerable interest. The proposal is as follows:

1. That we, as licensed amateurs and members of the A.R.R.L., recognize the usefulness of trying to prevent illegal operation on five meters under the existing regulations, and sponsor such modifications of these regulations as will allow anyone readily to comply with them. This means that amateur use of these frequencies will not interfere with operation on the existing amateur frequencies. Space above 60 mc. will be cheap at present, but may not be in a few more years.

2. That power be limited to about ten watts (carrier) for operation on this band, except where a real need for greater power can be shown.

3. That the new type of license examination be taken in a manner similar to that for our present Class-C license, regardless of the candidate's location, and that it cover only the ultra-high-frequency spectrum. This should be a serious handicap.

4. That the national convention take the liberty of commenting on your editorial in May QST on bootleg operation? It seems to me that you may be somewhat unfair in your attitude toward the bootleg operators. You mention many of these persons are not interested in true amateur operation; they are not interested in the growth of the club or in the service to the public which the hobby brings; they are not interested in the development of the higher frequencies; they are not interested in the service they can give to the public. I feel that the A.R.R.L. should have everything to gain and nothing to lose by sponsoring this movement. It would serve to take the extra weight of more complicated equipment off the amateur bands.

5. That the new type of license examination be taken in a manner similar to that for our present Class-C license, regardless of the candidate's location, and that it cover only the ultra-high-frequency spectrum. This should be a serious handicap.

6. That a new and distinctive type of call be assigned these stations so that a holder of the new license could not attempt to use his call on the amateur bands.

I feel that the A.R.R.L. would have everything to gain and nothing to lose by sponsoring this movement. It would serve to protect our five-meter band from needless QRM, satisfy the FCC, hold our stations on the air, and from broadcasting.

The fact that the range is short, Mr. Warner, does have a great deal to do with it. These ultra-short waves cannot conceivably cause international interference, and therefore their allocation should be under the sole control of the national governments (in the United States, the F.C.C.). This would be the most logical, the most uniform, and the most sensible solution. If I am incorrect, perhaps we had better be prepared at the Cairo conference to claim for amateur use the frequencies between 3.75 and 7.5 X 10^12 megacycles. We would find them very handy.

—Kenneth H. Goode, W98H-W8BDF-W8BQV

How About a Truce?

527 23rd St., Manhattan Beach, Calif.

Editor, QST:

Let's have some common sense in this c.w.-phone controversy. Heated words are heard on every side, words obviously lacking the foundation of constructive thought.

This letter almost started in the same vein after hearing some of the 14-mc. phone gang give President Maxim a royal razzing to-night for voting in favor of c.w. at the recent Board meeting. Let these fellows add their aggregate years in being interested in radio and see if H.P.M. is not still the senior of the whole bunch. In other words, there are many more sides to the question than the one so clearly evident to the phone man who has just fought a QSO through a half-dozen over-modulation QRM's (or to the c.w. man trying to get a message on the third repeat). It takes someone out of the heat and temper of battle to make the big decisions; no army is ever commanded by the private in the front line.

Next, let each side know the other a bit better before lining up the firing squad. To-night W9— was overheard saying with blind conviction that DX is absolutely more consistent on phone—he for one needs to look on the c.w. side of the fence before making such false statements. The same goes for the c.w. man who characterizes all phone QSO's as so much drivel; a listen around the c.w. territory will show them plenty of QSO's handled as cleanly as any on c.w.

Though this letter was to have been non-partisan, I cannot help recalling the c.w. r.a.c. QRM of two years ago and how compulsory p.d.c. cured the situation—isn't the phone over-modulation QRM a close parallel? Let the bum 'phones first clean up their own unnecessary QRM, otherwise granting more phone frequencies will be like letting the hog out of the pen so the mud won't be so thick when spread over the whole yard.

—Chas. D. Perrine, Jr., W6GUBH

Editor's Note.—Although not yet proved from the legal standpoint, the FCC holds that all unlicensed radio operators, whether commercial or unlicensed amateurs, cannot operate in our bands or appropriate our calls.

You might be interested to know that the Mexican government sent a man to XEAW upon receipt of your complaint. I have just had the pleasure of talking to Mr. J. O. Weldon over long-distance telephone. He told me that he had found numerous "bugs" and that there should be much improvement over the whole station beginning to-night (not next year) and that the whole situation would be vastly improved, with new equipment throughout, within the coming month.

Gentlemen—that's what I call service!

Not only have I met a vj O M, but I have learned that A.R.R.L. can get action and does "give a damn," something I have heard it didn't.

(Continued on page 70)
IF THE DESIGNER knows the circuit in which a variable condenser is to be used, it is possible for him to calculate a plate shape which will make the tuning curve a straight line. However, in a different circuit the same condenser is likely to result in a curve on the calibration chart. Apparently many amateurs do not realize this, for occasionally we receive letters expressing surprise that the tuning curves of our receivers are straight for some ranges, and curved for others.

To take a specific example, our worm drive PW condenser used in the HRO is designed for a tuning range of 2 to 1. It consequently has a straight frequency line calibration only when the maximum capacity in the entire circuit is exactly four times the minimum capacity in the circuit. This corresponds to curve B. Suppose the trimming condenser is backed off so that the minimum capacity is lowered. The tuning rate with the rotors all the way in is nearly the same as before, since the rotors are providing most of the capacity in the circuit, so this part of the curve is practically unchanged. However, with the rotors out, the trimmer is all important. The tuning curve, therefore, hooks upward, as in curve A. Similarly, if the minimum capacity is increased, the calibration swings the other way, as in curve C.

Amateurs almost invariably run into this when they build wavemeters and similar equipment, because they wisely use double-spaced condensers, plus heavy padding to provide band-spread. We do not think that a non-linear calibration is particularly objectionable in such equipment, but if it is objectionable for any reason, we have two suggestions. The simplest solution is to use a condenser with straight-line-wavelength plates such as the National EM. When the normal tuning curve of such a condenser is plotted against frequency (instead of wavelength, as intended), the result will be similar to curve A above. When padded to give proper band-spread, the curve will tend to straighten out, since the padding causes curvature in the opposite direction. This very thing is done in the National “Frequency Meter Condenser,” which is a combination of EM rotor plates, plus circular plates to give the proper padding for band-spread on 80 and 160 meters.

Where high precision is required, this method is not generally useful, because modern precision condensers usually are available only with SFL plates, the PW condenser being a case in point. If such a condenser is used, the calibration can be straightened by the use of a series trimmer as well as the usual shunt padding condenser. This is, of course, the system commonly used for padding the H.F. oscillator in superheterodynes. As the procedure is described in a number of standard texts, we will omit a complete explanation here. Generally speaking, however, increasing the shunt capacity decreases the frequency at the high end, while decreasing the series capacity raises the frequency at the low end. Needless to say, these padding condensers should be good quality, air dielectric units. However, they do not need to be as precise as the main condenser, as the burden of accuracy is upon the latter.

In closing we wish to answer some specific questions on the PW condenser which have been asked often. The PW has two standard ranges — 12 to 225 mmf. and 10 to 150 mmf. per section. It cannot be made in larger capacities with present tooling, but lower capacity is available on special order. And lastly, it is available with double spacing for use in frequency meters and similar equipment.

JAMES MILLEN
GROSS CB-100

A 100-Watt Radiophone and C.W. Transmitter completely housed in an entirely enclosed floor rack of ingenious design. All units are fully accessible through the removable front gates, for coil changing, tuning, network adjustments, etc. Incorporates everything from microphone jack to impedance matching antenna network.

- **R. F. LINE UP**
  - 477 crystal oscillator.
  - two 4C's buffer, 03-A amplifier.
- **FREQUENCY COVERAGE**
  - 1.7, 3.5, 7 and 14 MC bands.
- **POWER SUPPLIES**
  - 1050 and 1200 volts at 400 MA choke input, 8 mfd Pyronal condenser used and 400 volts at 300 MA.
- **SPEECH AMPLIFIER**
  - Special four stage high gain speech amplifier self contained from microphone jack to gain control.
- **MODULATOR**
  - Two 200's are used in the C.B. Modulator. 100% modulation.
- **BIAS**
  - No bias betteries of any kind required.
- **ANTENNA UNIT**
  - Impedance matching network supplied for use with any type of antenna available.
- **OPERATING CONTROLS**
  - Terminations provided for operating all stages from operating table.
- **SIZE**
  - 60" high, 19 1/2" wide, 16" deep.

ANNOUNCING!!

NEW GROSS CB-300

Class B Modulated Radiophone Transmitter
250 Watts Output. Attractively Priced.

LEST YOU FORGET:

Gross Radio's Engineering Department is under the direct supervision of J. Gross who has had over 20 years experience in the construction of transmitters of various types. Mr. Gross has for 12 years been an entirely enclosed roof rack of ingenious design. All units are fully accessible through the removable front gates, for coil changing, tuning, network adjustments, etc. Incorporates everything from microphone jack to impedance matching antenna network.

- R. F. LINE UP
  - 477 crystal oscillator.
  - two 4C's buffer, 03-A amplifier.
- FREQUENCY COVERAGE
  - 1.7, 3.5, 7 and 14 MC bands.
- POWER SUPPLIES
  - 1050 and 1200 volts at 400 MA choke input, 8 mfd Pyronal condenser used and 400 volts at 300 MA.
- SPEECH AMPLIFIER
  - Special four stage high gain speech amplifier self contained from microphone jack to gain control.
- MODULATOR
  - Two 200's are used in the Class B Modulator. 100% modulation.
- BIAS
  - No bias batteries of any kind required.
- ANTENNA UNIT
  - Impedance matching network supplied for use with any type of antenna available.
- OPERATING CONTROLS
  - Terminations provided for operating all stages from operating table.
- SIZE
  - 60" high, 19 1/2" wide, 16" deep.

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- **OPERATING CONTROLS**
  - Terminations provided for operating all stages from operating table.
- **SIZE**
  - 60" high, 19 1/2" wide, 16" deep.
AS USUAL—IF IT'S NEW WE HAVE IT!!

THE NEW BARR DB3 CLASS B MODULATED 5 METER TRANSCEIVER

* Utilizes a Class B audio amplifier and modulator giving an output of 2.1 watts which is many times greater than that of ordinary transceivers.
* Can be operated as receiver, transmitter or both, in a car, plane, boat or while being carried for portable work.
* Working range anywhere between 2 and 100 miles depending upon the location.
* Compact convenient carrying size.
* 30 tube Audio Amplifier - 49 tube Super Regenerative Detector or Oscillator - 19 tube Class B Audio Amplifier or Modulator.

We were surprised at the marvelous value offered in this transceiver, just as you will be when you own one of them.

PRICE $16.20 less tubes, batteries and accessories. Bulletin on request.

NEW!! CARDWELL CONDENSERS MYCALEX INSULATION .200 SPACING

XC68XS .000018 ........................................ $3.23
XC69XS .00004 ........................................ $4.41
XC69XS .000065 ........................................ $5.25
XC69XS .00009 ........................................ $6.76

Split stators in above capacities available. Complete Cardwell line of new models and all regular types in stock at new low prices. There are also special prices on the large Commercial type condensers. Real "He Man" condensers now available at prices you want to pay.

Send for new Cardwell catalogue

OUTSTANDING!!

Gross Crystal Holder

WHITE CERAMIC commercial type crystal holder — priced at less than ordinary holders. Adjustable pressure, dust proof, no tools required to open. Takes crystal to 1 1/4" square. Flaps standard 1/2" spacing. Most efficient job yet........... $1.00

GROSS C C TRANSMITTER—OUTPUT 25-30 WATTS

The "CW-25" transmitter kit due to its low cost makes it possible for anyone to own a modern crystal controlled station. A schematic hook-up and parts layout sheet as well as tuning instructions are furnished, thus making the most inexperienced operator to wire and put the set on the air, for real results. The "CW-25" is supplied with a shrivel finished sturdy metal chassis under which all parts are mounted, making the wiring and components dust-proof. A plug-in crystal holder is furnished with the kit. Only one milliammeter is required for tuning the transmitter and each stage is provided with a jack for this purpose. The "CW-25" uses one 47 as crystal oscillator, one '46 as buffer or doubler and two '46's in the amplifier stage, set of three coils supplied with kit for 20, 40, 80 or 160 band. Additional coils 75c each.

$13.95

Complete kit, less tubes and crystal.

HALF WAVE TYPE TRANSCEIVER ANTENNA

Composed of an adjustable half wave rod of aluminum, with insulated mounting, Adaptable from 19" to 9 feet. Binding post for feeder...$1.95

DOUBLETT TYPE TRANSCEIVER ANTENNA

Consists of two adjustable quarter wave rods with 19" insulated brackets. Length variable from 33" to 9 feet. Binding posts for feeders...$2.95

THORDARSON CASED TRANSFORMER

600 volts each side of C.T. 200 MA 2½ V. 10 amps. C.T, 5 V. 3 amps., 7½ V. 3 amps. C.T. ........................ $2.48

THORD. CHOKE 12 H 250 MA. $1.95

NEW KELLOGG TRANSCEIVER HANDSET

Single button mike, 3,000 ohm receiver. $6.00

(See May QST P. 122)

NEW!! BLILEY LD-2 Mounted crystals
40, 80, 160 M .............................. $4.80

(See P. 103 June QST)

AMERICAN S.B. HANDM1KE WITH SWITCH

$3.95

NEW UNIVERSAL TRANSCEIVER HANDSET

Single button mike, 2,000 ohm receiver. An all bakelite job...$3.54

GROSS RADIO, INC., 51 VESEY STREET, NEW YORK CITY

Say You Saw It in QST — It Identifies You and Helps QST
Here's a "Troupe" that Wows 'Em!

Four husky boys, these, that have been on most of the world's best circuits.

Fathered by old man Radiohm himself, he and his three sons Kid Suppressor, Kid Resistor and the new member of the team, Big Boy Sound Projection Control, are in the spotlight of popularity with servicemen and experimenters everywhere.

How these boys can work! It's a pleasure to watch 'em ... smooth, efficient, noiseless and each performance as reliable as the next.

Note: Mr. Trouble Shooter . . . stock up with Centralab Replacement parts . . . the cheapest in the long run.

Centralab
Division of Globe Union Mfg. Co.
MILWAUKEE, WIS.
RADIOHMS' SUPPRESSORS RESISTORS

What the League Is Doing
(Continued from page 87)

Financial Statement

For the information of members the A.R.R.L. operating statement for the first quarter of this year is reproduced below, at the instructions of the Board of Directors.

STATEMENT OF REVENUES AND EXPENSE FOR THE THREE MONTHS ENDED MARCH 31, 1935

Revenues

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
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</thead>
<tbody>
<tr>
<td>Membership dues</td>
<td>$14,175.01</td>
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<tr>
<td>Advertising sales, QST</td>
<td>15,324.68</td>
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<td>Advertising sales, Booklets</td>
<td>340.00</td>
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<td>Newsdealer sales, QST</td>
<td>12,744.95</td>
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<tr>
<td>Handbook sales</td>
<td>12,302.08</td>
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<tr>
<td>Booklet sales</td>
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<tr>
<td>Membership supplies sales</td>
<td>2,687.03</td>
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<td>Interest earned</td>
<td>690.73</td>
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<tr>
<td>Cash discounts earned</td>
<td>198.83</td>
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<tr>
<td>Bad debts recovered</td>
<td>56.01</td>
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Deduct:

<table>
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<th>Description</th>
<th>Amount</th>
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</thead>
<tbody>
<tr>
<td>Returns and allowances</td>
<td>$4,844.73</td>
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<tr>
<td>Cash discounts on sales</td>
<td>355.42</td>
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<tr>
<td>Exchange and collection charges</td>
<td>17.10</td>
</tr>
<tr>
<td>Adjustment covering portion of miscellaneous unclassified sales taken into revenues in prior years, included in revenues for this quarter under proper classifications</td>
<td>1,603.91</td>
</tr>
</tbody>
</table>

Less reduction of provision for newsdealer returns of QST | 103.45

Net Revenues | $54,913.49

Expenses

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Publication expenses, QST</td>
<td>$14,438.85</td>
</tr>
<tr>
<td>Publication expenses, Handbook</td>
<td>4,011.34</td>
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<tr>
<td>Publication expenses, Booklets</td>
<td>1,154.71</td>
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<tr>
<td>Membership supplies expenses</td>
<td>1,440.96</td>
</tr>
<tr>
<td>Salaries</td>
<td>19,523.56</td>
</tr>
<tr>
<td>QST forwarding expenses</td>
<td>714.48</td>
</tr>
<tr>
<td>Telephone and telegraph</td>
<td>565.37</td>
</tr>
<tr>
<td>Postage</td>
<td>1,442.22</td>
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<tr>
<td>Rent, light and heat</td>
<td>825.61</td>
</tr>
<tr>
<td>Traveling expenses</td>
<td>1,179.26</td>
</tr>
<tr>
<td>Depreciation of furniture and equipment</td>
<td>223.34</td>
</tr>
<tr>
<td>Office supplies and general expenses</td>
<td>2,710.84</td>
</tr>
<tr>
<td>Communications Department field expenses</td>
<td>150.13</td>
</tr>
<tr>
<td>Headquarters station expenses</td>
<td>144.61</td>
</tr>
<tr>
<td>Bad debts written off</td>
<td>138.11</td>
</tr>
</tbody>
</table>

Total Expenses | 49,461.39

Net Gain before Expenditures against Appropriations | $5,452.10

Constitution

The constitution and by-laws of the League have been reprinted to show all amendments made to date. Any member can obtain a copy from headquarters upon request.

I.A.R.U. News
(Continued from page 68)

reports working Y12FK, but so far we've been unable to identify the operator . . . . Similarly in Egypt many of the old crowd have gone, SU1BC, SU6HL, SU1AQ, and SU6SW having
BARR DB3
CLASS B MODULATED TRANSCEIVER

The DB3 utilizes a Class B Audio amplifier and modulator giving an output of 2.1 watts, which is many times greater than that of ordinary transceivers.

AN OUTSTANDING VALUE—
LIST PRICE — less tubes and batteries $27.00
40% DISCOUNT TO AMATEURS

SPECIFICATIONS
CASE: Size 11” long x 9½” high x 6½” wide, black wrinkle finish metal, heavy leather handle. All batteries are self-contained in case. Removable side panel for easy access to the batteries and tubes. • PANEL: Beautifully finished in black enamel with silver scales and lettering. • CONTROLS, ETC: Two ceramic insulators are supplied for antenna, special large easy tuning knob, volume control on and off switch which acts as such in the receive position, and as a gain control in the transmit position, transmit and receive switch, microphone and headphone jacks.

ORDER FROM YOUR NEAREST DISTRIBUTOR —
Bond Radio Co., Detroit, Mich.
Bull dog Radio, Grand Junction, Colo.
Burstein-Applebee, Kansas City, Mo.
Bushland Radio Service, Glendale Falls, Wis.
Cameron Co., Pittsburgh, Pa.
Canadian Tire Corp., Toronto, Canada
Chicago Radio Apparatus Co., Chicago, Ill.
Cohen’s Sons Ltd., San Francisco, Calif.
Congress Radio & Battery Co., New Haven, Conn.
Cushman Radio Service, Fall River, Mass.
Dakota Electric Supply Co., Fargo, N. D.
Dymac Radio, Buffalo, N. Y.
Gifford, Young, Harrisburg, Penn.
Hunter Bros., Inc., New York, N. Y.
J. A. Young, Hartford, Conn.
Jordan Radio Laboratory, Erie, Pa.
Krauss Radio Stores, Inc., Cincinnati, Ohio.
Lamb Electric Co., Santa Barbara, Calif.
Leeder, John F., Omaha, Nebraska
Leep Bann Co., St. Paul, Minn.
Mac’s Radio Service Laboratory, Philadelphia, Pa.
Mariner Music Goods Co., Reno, Nevada
Mid West Radio Mart, Chicago, Ill.
Nutter & Cross, Boston, Mass.
Pan American Radio Co., Miami, Fla.
Petersen Lumber & Paint Co., El Paso, Texas
Power City Radio Co., Sioux Falls, S. D.
Prent & Dean Radio Co., Long Beach, Calif.
Radio Distributing Co., Detroit, Mich.
Radio Parts Co., Madison, Wis.
Radio Service & Supply Co., Manchester, N. H.
Radio Service Laboratory, New York
Rieli Bros., Chicago, Mich.
Ross Radio Co., Youngstown, Ohio
Sidles-Duda-Myers Co., Omaha, Neb.
Starr-Frank Co., Houston, Texas.
Sun Radio Co., New York City
Tel-Rad Inc., Colorado Springs, Colo.
Universal Radio Supply Co., Louisville, Ky.
Walker Ashe Radio Co., St. Louis, Mo.
Wilcox Radio Sales, Chicago, Ill.
Wilmingon Electrical Specialties, Wilmington, Dela.

BARR LABORATORIES, 1476 Broadway, New York

Radio Engineering Complete in Telegraphy-Telephony

Studio Technique and Transmitter Operating Experience Guaranteed
K P A C
500-Watt 1200 Kilocycles

In 3 to 7 months we train you to secure Commercial Telegraph Second-class, and Radiotelephone First-class government licenses. Course consists of Wireless Code, Radiophone, Microphone-Studio Technique, Service, Police, and Aeronautical Radio. We are authorized to teach RCA texts. At completion of course you receive practical studio technique experience in our commercial broadcast studios located in administration building, and experience as an operator on K-P-A-C (500-Watt Commercial transmitter located on the campus and owned and operated by the college), and WPA, 4000-Watt Commercial Wireless Station. If interested, write for Bulletin R.

PORT ARTHUR COLLEGE
Port Arthur (world-known port) Texas
Mr. E. H. Rielzke, President of CREI and originator of the first thorough course in Practical Radio Engineering.

There's Always a BETTER Job for a BETTER Man!

If you're satisfied and content with your present job, you won't be interested in CREI ... but, if you're ambitious and can see the bright opportunities that lie ahead in Radio for specialized men who have been Technically Trained ... then, CREI can help you as it has helped others out of routine jobs into top positions in the Radio industry.

"Invest" One Cent Now ... Write Today for FREE Illustrated Catalog

It will explain our Home-Study course and the one-year Resident course (new term Sept. 23) ... and explain how easy it is to pay for them. Your inquiries are invited.

CAPITOL RADIO ENGINEERING INSTITUTE
14th and Park Road, N. W., Dept. Q-7
WASHINGTON, D. C.

Demand THE NEW non-expensive non-inflammable DYKANOL

Type TA 20040
4 MFD 2000 V.D.C.
YOUR COST $6.47

Dykanol Condensers are the safest filters for that transmitter because:

DYKANOL has a higher dielectric strength and constant.

DYKANOL can be operated at higher ambient temperatures than ordinary oil impregnated condensers.

DYKANOL is non-inflammable — eliminating all fire hazards.

Write today for your copy of the 1936 Catalog describing in full this latest laboratory development.

CORNELL-DUBILIER CORPORATION
4373 BRONX BOULEVARD
NEW YORK

The departure of ZC6FF leaves Palestine without an active station ... Just before leaving, while working VE1BV on 14 mc., ZC6FF was able to reduce his input to .3 watt with his signals still audible in VE! ... Y2DIB worked four new countries on May 3rd, making a total of 86, the contacts being ZBII, FBSC, YL2BB, and TF3C; he reports SU1SG T9 on 14.4 plus ... To Frank Fitter, U.S.A.: We are holding an undeliverable communication for you from your cousin, Willy Fitter, of Bern; please advise us of your address ... We are informed by H. W. S. Caldecott, Federal Secretary of the W.I.A., that the information concerning Australian standard frequency transmissions in April QST was incorrect ... Such a service was commenced in 1926 by the New South Wales Division of W.I.A., in 1929 by the Victorian and other divisions, and these are still functioning ... W.F.S.R.A.:

The World Friendship Society of Radio Amateurs has requested publication of the following pledge, which is the sole obligation for membership in the Society:

"I hereby promise that I will, to the best of my ability, make such use of my amateur radio station as will be conducive to international friendships; that I will never voluntarily permit my station to be used as the tool of selfish nationalistic interests; and that I will do what I can, as a radio amateur and as an individual, to promote world peace and understanding. (To be followed by the signature, address, and station call.)"

Membership in the Society is open to all amateurs in all countries. All that is necessary to become a member is to copy and sign the pledge, and send it to the secretary, Duane Magill, W9DQD, 730 N. 6th St., Grand Junction, Colorado, U.S.A. Copies are preferably to be made in English or French, but may be made in the language of the member.

WIXR
(Continued from page 34)

Mass., he was relayed via WlXR to Blue Hill where he went on a regular telephone circuit to Belmont. The answer came back more directly from the Blue Hill station to Seabrook. (Reason for long relay: QRM on WlXZ at Blue Hill)

Only recently, Joe Dodge, W1UN, addressed a group celebrating the 50th anniversary of the founding of the Blue Hill Observatory. Through the WlXR relay he was heard perfectly. Then he sat back in his home in Pinkham Notch (where only one 6-meter signal ever penetrates) and listened to the rest of the speeches, which were, of course, picked off on a loudspeaker as they passed through the Mount Washington relay station.

At the time of the super-hurricane last April, we happened to be on with WlXW. By hooking up the anemometer contact with a 1000-cycle hummer, we were able to let Dr. Brookes, director
Bring Your Frequency Drift Down to U. S. Government Specifications

with the new BLILEY LD-2 CRYSTAL UNIT

All latest government specifications for crystals call for low temperature coefficient plates.

Now, with the new Bliley LD-2 Crystal Unit you can get for the first time a frequency control unit that is guaranteed to drift less than 8 cycles/megacycle/°C. that sells for only $4.80.

See the new Bliley LD-2 Crystal Unit at your nearest dealer at once. Look for the improved permanently sealed holder.

OUTSTANDING LD-2 FEATURES
2. Greatly improved sealed holder
4. Guaranteed 0.03% accurate in your transmitter
5. Supplied within 0.1% of your desired frequency, or choice from dealer's stock.
6. Costs only $4.80 at your dealer

BLILEY ELECTRIC CO.
ERIE, PENNA.

THE CRYSTAL SPECIALISTS SINCE 1925

PIEZO-ELECTRIC CRYSTALS Guaranteed Accurate to BETTER than .01%

UNCONDITIONALLY GUARANTEED CRYSTALS
1.7, 3.5 mc ± 0.5 Kc. X-cut... $2.00; Exact Kc... $3.00
7 mc ± 25 Kc. X-cut... $3.00; ± 5 Kc... $3.75
Precision Amateur Plug-in Holders... $1.00
Bulletin now ready listing our AT Crystals, 100 Kc. Bars, Amateur Ovens, Air Gap Holders and S.S. Filters.

PYRANOL

Guaranteed TWO YEARS—UNCONDITIONALLY. No restrictions as to use. Before you buy insist on this broad guarantee. $2.90

The Superiority of Our DYNAMIC MICROPHONE OVER OTHER TYPES IS MAINLY IN ITS SENSITIVITY
No high gain preamplification required. No background noise. No Power Supply. AND THE PRICE $33

U. S. PATENTS PENDING

Send for Bulletin 3011
RADIO RECEPTOR CO., INC. 110 Seventh Ave., New York City

Here's What They Say!
about
PYRANOL
2MFD-2000 Volt (Operating) FILTER CONDENSERS

Guaranteed TWO YEARS—UNCONDITIONALLY. No restrictions as to use. Before you buy insist on this broad guarantee.

THE RADIO SHACK
46 Brattle St. Boston, Mass.

Say You Saw It in QST — It Identifies You and Helps QST
USE JOHNSON DEPENDABLE
PLUGS and JACKS

Johnson Plugs and Jacks are distinguished by their sturdy precision construction, close-tolerance dimensions, excellent contacts and easy interchangeability. Yet, these high-quality trouble-proof parts are surprisingly inexpensive!

Two styles are available in two sizes—the popular "Banana-Spring" and the original Johnson heavy-duty "Sorps-sleeve" types. Complete information on request. Available from Authorized Johnson Distributors.

E. F. JOHNSON COMPANY
Manufacturers of Radio Transmitting Equipment
WASECA, MINNESOTA, U. S. A.

IMMEDIATE DELIVERY
FROM RECEIVER HEADQUARTERS

<table>
<thead>
<tr>
<th>Receiver</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>NATIONAL HRO</td>
<td>$139.80</td>
</tr>
<tr>
<td>RM503x</td>
<td>$152.50</td>
</tr>
<tr>
<td>RCA ACR-136 complete</td>
<td>$69.50</td>
</tr>
<tr>
<td>FRACTING 13 complete</td>
<td>$91.00</td>
</tr>
<tr>
<td>SILVER 6G complete prepaid</td>
<td>$74.70</td>
</tr>
<tr>
<td>SUPER-SKYRIDER complete prepaid</td>
<td>$89.98</td>
</tr>
<tr>
<td>TRADE IN YOUR RECEIVER OR TRANSMITTER</td>
<td>All Collins transmitters at lowest prices</td>
</tr>
</tbody>
</table>

WE ARE JOBBERS FOR AND STOCK AN AMATEUR APPARATUS AT LOWEST PRICES!

HENRY RADIO SHOP
211-215 N. Main St.
Butler, Missouri

WHOA! Back up to page 4

Special Offer of the Blue Hill Observatory over 142 miles away, measure our wind velocity, even at that moment the highest ever recorded, and still going up!

Many pleasant QSO's have been had with the very active group of Portland, Maine, amateur 5-meter stations. Since Portland is visible on clear days, the path is, as would be expected, a good one. Interest in 2.5 meters is increasing there now, although no signals have yet been heard on the mountain.

Stations to the south are less regularly worked, perhaps because of the larger number of strong signals competing. Groups in the vicinity of Hampton Beach, N. H., stations in Lawrence, Methuen and Lowell, Mass., have been contacted. At times, when signals are especially good, stations in the Boston area become audible. Even W1VW in Fall River, Mass., sometimes puts in a "local" signal. On several occasions he has been QSO'd, but usually after signals had reached their peak and were starting rapidly downhill.

This extraordinary DX is not the usual thing. Many coming up with transceivers during the summer months are quite disappointed when their fishpoles catch even W1XW too weakly to read. Although equipment here is entirely conventional, it must be kept operating at high efficiency in order to provide the contacts that it does.

These are the high spots of activity at our high frequency vantage point. We could fill a whole copy of QST with tales of our life, our long beards, our skiing and our continual fight with the wind. Failing that we can merely say, "Come up and see us sometime."

'Phone-C.W. Contest
(Continued from page 46)

The procedure used by several of the 'phone operators in stating in which portion of the band they were going to tune was a big help to the telegraphers. This procedure should be more widely used. W8RXX and W8MQA had a private contest, laurels going to W8KVX.

—E. L. B.

Battery-Operated Portable
(Continued from page 58)

Data on the coils for both receiver and transmitter are shown in the table. On the receiver, the 3.5-mc. band spreads over nearly 60 dial divisions, the 7-mc. band over almost 20 divisions, while the 14-mc. band has a spread of more than 12 divisions. The spread of the transmitter tank condenser is, naturally, much less, but ample on all three bands, with a minimum of 4 divisions on 14 mc so that in an emergency it is quite possible to set the transmitter frequency by dial readings alone with little danger of off-band operation.

THE ANTENNA SYSTEM

Since the output circuit is designed for current
• The new Turner Mu-X (multiple crystal) microphone is a distinct advance in microphone construction. It is outstanding in appearance, performance, durability, and reliability. The Mu-X is available with 4, 6 or 8 crystal units, thus offering a microphone for every type of work.

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CRYSTAL MICROPHONES
ASTATIC MICROPHONE LABORATORY, INC. YOUNGSTOWN, OHIO

"Pioneer Manufacturers of Quality Crystal Products"

Since the filament drain of the 19 tube is comparatively high, replacement of the filament batteries is usually necessary after about 120 hours of operation. The plate batteries, however, seem never to wear out, and those at present in the case have given nearly six months' service with but negligible drop in voltage. They should be replaced when the signal of the transmitter shows a tendency to "chirp." The usual report received is "crystal note," and only when the antenna is so rigged that it can swing in the wind has any other comment on the note been received. Contacts often say that, although quite anaemic and weak, the signal from this station is easy to read through heavy interference because of its clean and steady character. While no claims for great distance coverage are offered for the station, con-
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Chicago, Illinois

contacts on the 3.5-mc. band have been made with stations over 600 miles away when operating with the field antenna, and over more than 800 miles when the more efficient home-station antenna is used. 7-mc. operation has resulted in even more distant contacts, but to date only local communication has been carried out on 14 mc.

For those who are content to rely on power lines, the circuit and assembly can be easily modified for the use of the 53 tubes, with a slight saving in space requirements if care is taken with the design of the power pack. Similarly, modifications using the 79 tubes can be made by those desiring to use the battery in the family automobile.

A very successful model of this type was used for a short time during the development of the station described, but was discarded in favor of entirely self-contained design after several disappointments in field operation when schedules were to be kept but the car and its battery were in use elsewhere.

Of course, when one has unlimited power available, communication is much more consistent; but at the same time we all know what happens in the line of interference in our crowded amateur bands. Why use high power for local work? Use high power for your long distance communication if you have it available, but save your neighbors' dispositions by the use of a minimum power for local contacts. Besides, there is a whole lot of real satisfaction in low-power accomplishments, not to mention the fact that a station such as the one described is excellent and sometimes indispensable for use in emergencies.

An Experimental Station

(Continued from page 85)

outputs are led to two half-wave Hertz antennas crossed at right angles to each other, a circularly polarized wave will be transmitted which will be used in some of the ionosphere measurements. The amplifiers can be modulated, in their suppressor grid circuits, with pulses for ionosphere measurement purposes, or voice, using the modulator from the 60-mc. transmitter. Provision is also made for c.w. operation.

The auxiliary equipment includes a cathode-ray oscilloscope, a pulse circuit for forming the pulses used in the ionosphere measurements, and a standard signal generator operating from 2.4 to 1000 meters. A portable 5 meter transceiver will also be added for possible emergency use. Recorders of various kinds will also be installed as the occasion demands.

One of the outstanding features of the outfit is that all of the apparatus can be operated from self-contained power supplies, or on external a.c. when it is available. This is accomplished by using two batteries carried on one side of the truck under the running board. One is a six volt size for lighting filaments. The other is a large twelve volt battery used for lighting the RK-20 filaments, through a dropping resistor, and running three dynamotors. One of these dynamotors gives 500 volts d.c. at 200 ma. for running the
W6ITH

Designed, constructed and operated by D. Reginald Tibbetts of 750 Spruce Street, Berkeley, Calif. Five complete transmitters are provided, one for each band.

A splendid-looking job, neat and business-like.

The popular-priced General Radio dials contribute much to the appearance of this station. These dials and many other accessories used by thousands of amateurs who take pride in the looks of their equipment as well as its operation, are described in Bulletin 936.

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is easy to acquire when you have your own Instructograph. You practice when and where you like — Book of Instructions explains each step, just as an instructor would do. Machines for sale or rent. Send Today for descriptive folder and new attractive terms. There's no obligation.

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<tr>
<th>Type</th>
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<th>2000 VDC</th>
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<tr>
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For the convenience of its members, the League maintains a QSL-card forwarding system which operates through volunteer "District QSL Managers" in each of the nine U. S. and five Canadian districts. In order to secure such foreign cards as may be received for you, send your district manager a standard No. 8 stamped envelope. If you have reason to expect a considerable number of cards, put on an extra stamp so that it has a total of six-cents postage. Your own name and address go in the customary place on the face, and your station call should be printed prominently in the upper-left-hand corner. When you receive cards, you should immediately furnish your QSL manager with another such envelope to replace the used one. List of managers follows:

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W8—F. W. Allen, W8GER, 324 Richmond Ave., Dayton, Ohio.
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VE4—Dr. J. J. Dobry, VE4DR, Killam, Alberta.
VE5—E. H. Cooper, VE5EC, 2024 Carnarvon St., Victoria, B. C.

Standard Frequency Transmissions

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<th>Date</th>
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<td>July 3</td>
<td>C W9XAN</td>
<td>Aug. 2</td>
<td>B W9XAN</td>
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<td>July 5</td>
<td>B W9XAN</td>
<td>Aug. 7</td>
<td>BB W9XAN</td>
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<td>July 10</td>
<td>BB W9XAN</td>
<td>Aug. 9</td>
<td>BB W6XK</td>
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<td>July 12</td>
<td>BB W6XK</td>
<td>Aug. 10</td>
<td>BX W6XK</td>
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<td>July 13</td>
<td>BX W6XK</td>
<td>Aug. 11</td>
<td>C W6XK</td>
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<td>July 14</td>
<td>C W6XK</td>
<td>Aug. 15</td>
<td>A W6XK</td>
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<td>July 19</td>
<td>A W6XK</td>
<td>Aug. 33</td>
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<td>July 26</td>
<td>B W9XAN</td>
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<td>Aug. 30</td>
<td>B W9XAN</td>
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(See June QST for times and schedules of transmissions)

FCC requires a record of all transmissions. Have you a separate log for your portable mobile work? You will find that a separate log will help you maintain the standards of your station in the field as you would at its base location.

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Hatry & Young

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A directory of suppliers who carry in stock the products of these dependable manufacturers.

<table>
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<th>Location</th>
<th>Address</th>
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<tbody>
<tr>
<td>NEW YORK, N. Y.</td>
<td>Wholesale Radio Service Co.</td>
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<td>NEW YORK, N. Y.</td>
<td>Sun Radio Company</td>
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<td>NORFOLK, VIRGINIA</td>
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<td>PHILADELPHIA, PENN.</td>
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<td>SYRACUSE, N. Y.</td>
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<td>WILKES-BARRE, PENNA.</td>
<td>Springfield Radio Company</td>
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<tr>
<td>WILMINGTON, DELAWARE</td>
<td>Delaware Radio Sales Company</td>
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<td>NEW BEDFORD, MASS.</td>
<td>C. E. Beckman Co.</td>
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<tr>
<td>NEW HAVEN, CONN.</td>
<td>Harry &amp; Young</td>
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<td>86 Meadow Street</td>
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<td>NEW YORK, N. Y.</td>
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<td>PITTSBURGH, PENN.</td>
<td>Camera Radio Company</td>
</tr>
<tr>
<td></td>
<td>603 Grant Street</td>
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<tr>
<td>PROVIDENCE, R. I.</td>
<td>32 Broadway</td>
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<tr>
<td>PROVIDENCE, R. I.</td>
<td>W. H. Edwards &amp; Company</td>
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<tr>
<td>PROVIDENCE, R. I.</td>
<td>Kraus &amp; Company</td>
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<td>READING, PENN.</td>
<td>89 Broadway</td>
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<td></td>
<td>Bright &amp; Company</td>
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<tr>
<td>SPRINGFIELD, MASS.</td>
<td>349 Worthington Street</td>
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<tr>
<td>SYRACUSE, N. Y.</td>
<td>T. F. Cushing</td>
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<tr>
<td></td>
<td>265 Erie Blvd., West</td>
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<tr>
<td>WILKES-BARRE, PENNA.</td>
<td>Roy C. Stage</td>
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<tr>
<td></td>
<td>50 Hazel Street</td>
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<tr>
<td>WILMINGTON, DELAWARE</td>
<td>Delaware Radio Sales Company</td>
</tr>
<tr>
<td></td>
<td>405 Delaware Avenue</td>
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</tbody>
</table>

Listings on this page do not necessarily imply endorsement by QST of the dealers or of other equipment sold by them.
Where to buy it

A directory of suppliers who carry in stock the products of these dependable manufacturers.

HARTFORD, CONN. 203 Ann Street

HARTFORD, CONN. 227 Asylum Street

JAMAICA, N. Y. 163 Jamaica Avenue

MONTREAL, CANADA 285 Craig Street, West

NEWARK, N. J. 219 Central Avenue

NEW HAVEN, CONN. 86 Meadow Street

NEW YORK, N. Y. 136 Liberty Street

NEW YORK, N. Y. 100 Sixth Avenue

PHILADELPHIA, PENN. 3145 N. Broad Street

PHILADELPHIA, PENN. N. E. Cor. 7th & Arch Streets

PITTSBURGH, PENN. 603 Grant Street

PROVIDENCE, R. I. 89 Broadway

SYRACUSE, N. Y. 265 Erie Blvd., West

WASHINGTON, D. C. 409-11th Street, N. W.

WILKES-BARRE, PENN. 50 Hazel Street

WILMINGTON, DELAWARE 405 Delaware Ave.

Baltimore, Md. 633 W. North Ave.

BOSTON, MASS. 46 Brattle Street

HARTFORD, CONN. 203 Ann Street

MONTREAL, CANADA 285 Craig Street, West

NEWARK, N. J. 219 Central Ave.

NEW HAVEN, CONN. 86 Meadow Street

NEW YORK, N. Y. 100 Sixth Avenue

PITTSBURGH, PENN. 603 Grant Street

PITTSBURGH, PENN. 620 Grant St.

READING, PENN. 404 Walnut Street

SPRINGFIELD, MASS. 349 Worthington Street

SYRACUSE, N. Y. 265 Erie Blvd., West

WILKES-BARRE, PENN. 50 Hazel Street

WILMINGTON, DELAWARE 405 Delaware Avenue

United TRANSMITTING TUBES

ALBANY, NEW YORK Uncle Dave’s Radio Shack 356 Broadway

NEW YORK, N. Y. American Sales Company 44 W. 18th St.

RICHMOND, VA. Hudson Radio Supply Co. 27th & Marshall St.

RICHMOND HILL, NEW YORK Marine Radio Company 124-11 101st Ave.

Listings on this page do not necessarily imply endorsement by QST of the dealers or of other equipment sold by them.
A Genemotor Portable
(Continued from page 54)
used for the 'phones, to make certain that the filaments are "off" when the outfit is put away or packed up. A variable rheostat also is used, and a jack permits measuring and setting the filament current to the proper value by use of the meter, which should be 0-100 ma. The Trimm head-phones manage to dodge all the knobs and binding posts on the panel when packed in the lid. Paper, pencil, and a small log are also secured to the lid, and the 'phone plugs are held by clips, so that the whole outfit is self-contained except for the antenna (which is carried on a reel), the Genemotor, 6-volt battery, and a rope for getting the antenna up into a tree. The accessories may be carried in a box of convenient size. Where trees are not available, a jointed mast might be used for supporting one end of the aerial.

Last year this outfit was operated under the call W6FXP. Reports were always "pure d.c." and "xtal" and, despite the low power (about 6 watts input), the rig got out for about 500 miles in the early morning hours. There has been very little opportunity as yet to give the set a really good workout, but the possibilities seem to be there.

Metal-Shell Receiving Tubes
(Continued from page 56)

6H6 Twin Diode
(New basic type)
- Heater voltage .................................. 6.3 volts
- Heater current ................................ 0.3 ampere
- A.c. voltage per plate (RMS) ............. 100 max. volts
- D.c. output current ............. 2 max. milliamperes
- Maximum overall length ........ 1¾"
- Maximum diameter ........ 1¾"
- Base ........................................ Small octal 7-pin

6J7 Triple-Grid Detector-Amplifier
(Similar to present 6C6)
- Heater voltage .................................. 6.3 volts
- Heater current ................................ 0.3 ampere
- Plate voltage .................................. 250 max. volts
- Screen voltage (G2) .................. 100 volts
- Grid voltage (G1) ...................... 3 volts
- Suppressor (G3) ....... Connected to cathode at socket
- Plate current ...... 2 milliamperes
- Screen current ...... 0.5 milliamperes
- Plate resistance ...... Greater than 1.6 megohms
- Amplification factor .... Greater than 1500
- Mutual conductance .... 1225 micromhos
- Maximum overall length .......... 3¾"
- Maximum diameter .......... 1¾"
- Cap ...................................... Small miniature
- Base ................................ Small octal 7-pin

6K7 Triple-Grid Variable-Mu Amplifier
(Similar to present 6D6)
- Heater voltage (a.c. or d.c.) ................. 6.3 volts
- Heater current ................................ 0.3 ampere
- Plate voltage .................................. 250 max. volts
- Screen voltage (G2) .................. 100 volts
- Grid voltage (G1) ...................... 8 volts
- Suppressor (G3) ....... Connected to cathode at socket
- Plate current ...... 7.0 milliamperes
- Screen current ...... 1.7 milliamperes
- Plate resistance ...... 0.8 megohm
- Amplification factor .... 1180
Here's Good News from Receiver Headquarters

We Are Making IMMEDIATE DELIVERY on the Following
1935 Amateur Communication Receivers—
NATIONAL HRO — SUPER SKYRIDER — BRETING 12
RCA — ACR 136 — SILVER 5C — RME9D

Down Payments Start at $16.50—Balance on Terms to Suit

Prompt Delivery on Collins Transmitters

We represent all leading manufacturers of Amateur Radio Equipment. Write at once for complete details on any equipment needed, and full information will be promptly sent you

PATTERSON PR12 AND HAMMARLUND SUPER-PRO AVAILABLE SOON

DELAWARE RADIO SALES COMPANY
405 Delaware Avenue, Wilmington, Delaware
Attn: WILLARD WILSON—W3DQ ESTABLISHED 1920

A REMINDER

Have you a goodly supply of ARRL Message Delivery Blanks so that when you handle traffic and deliver messages it will reflect credit on your station and on amateur radio as a whole? Have you a Message File designed to comply with the F.C.C. regulations which require that messages be kept for a period of one year?

THE MESSAGE FILE
has a compartment for each month of the year for easy and accurate filing, as well as space on the front for a complete record of traffic handled. You can’t beat it for a practical solution to the problem.

40c each 3 for $1.00

THE RADIOGRAM BLANKS
The radiogram blank has been revamped to allow for that much needed room for the body of the message and to facilitate copying of messages. 7½ x 8½ sheet padded 100 sheets to the pad. It will reflect credit on your station when you deliver a message on this form.

35c each 3 for $1.00

AMERICAN RADIO RELAY LEAGUE
West Hartford, Conn.

Say You Saw It in QST — It Identifies You and Helps QST
**Latest revised list of available BACK COPIES OF QST WITH INDEXES**

**98 ISSUES — $15**

See below

More exceptions noted than ever before — you had better act at once — to-morrow may be too late!

Please consult this list before ordering specific issues referred to in QST and HANDBOOK texts.

<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
<th>Price</th>
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<tr>
<td>1925</td>
<td>copies (except January, March, May and July)</td>
<td>$2.00</td>
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<tr>
<td>1926</td>
<td>copies — complete</td>
<td>2.50</td>
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<td>1927</td>
<td>copies — (except January and July)</td>
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<td>copies — (except January, February, March, April, and September)</td>
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<td>1931</td>
<td>copies — (except October and November)</td>
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<td>1932</td>
<td>copies — (except February, August, September and October)</td>
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<td>copies — (except January)</td>
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<tr>
<td>1935</td>
<td>copies — as issued, each 25c</td>
<td>$2.50</td>
</tr>
</tbody>
</table>

**Complete Set of Copies (except 1935 series) as Listed $15.00**

(Outside U.S. and Possessions, and Canada, add $3.00 for postage for the complete set.)

**Single Copies 25c Each, and Yearly Sets at Price Indicated, Postpaid**

Binders to keep these files in order are $1.50 each, postpaid. Each binder holds 12 issues of QST and index, and does not mutilate the copies.

**AMERICAN RADIO RELAY LEAGUE**

West Hartford • Connecticut
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 month due date is the 15th, but except as noted in paragraph (6) below.

(4) The checking of all must accompany copy. No cash or contract discount or agency commission will be allowed.

(5) Assistance in the handling of the publication is given when due to the second month preceding publication date.

(6) It is the intention of the publisher to advertise in any form of the products advertised.

Having made no investigation of the advertisers in the classified columns, the publishers of QST are unable to vouch for their integrity or the character or the products advertised.


CONE ST., Toledo, Ohio.


SEW SW3 coils, 4 bands, extra audio stage, $43. W1HXX. QSLs, two color, cartoons, blank, stationery, snappy service. Write for free samples to-day. W1BEF, 16 Stockbridge Ave, Lowell, Mass.

QSLs. Finest quality. Beautiful designs and colors. Samples! Made-to-order 1512 Eastern Parkway, Brooklyn 13, Y.

MAKES tions for one-spot-rates; 80M, $2.44 each, lots of 10 @ $1.50; 46M, $3.50 each, lots of 10 @ $3. Vollmer Radio Lab., 5128-515th St., San Diego, Calif.

WADN’s crystals. New high activity medium temperature coefficient cutoffs, 80, $2.25; 46, $3.25. For tripling: 60, $3.25; 30, $.40. 60 AT, $4; 80 AT, $4.

MAKE offers: A-1 849, meters, transceiver, freq-monitor, condensers. Write for list. W8HRV, York, Penna.

CRYSTALS: Zero cut. Your approximate frequency, 80 or 46 near zero without oven control. Plug-in holders 75c. Fisher Laboratory, 4252 Norwood Street, San Diego, California. "Pioneers of low priced crystals."

SWAP transmitter parts, guns, bird-dogs, microscopes for radio, speaker units and trumpets or lattice. Miller Watkins, Rte. 7, Nashville.

SELL National FXBXA receiver, complete with preselector stage, 2 volt tubes, 20, 40, 80 and 160 meter band spread of National 887B, 2 volt tubes, 20, 40, 80 and 160 meter band spread. Perfect condition. $75.90 cash only, no swaps. Miles W. Weeks, WIWV, Cheektow Hall, Mass.


WHY pay cash? Purchase your new receiver on our "Painless Payment" plan. Write for details. Wixox Radio Sales, 180 West Adams St., Chicago, Ill.

QSLs! None better! W6FZQ/W6HEU, Box 1804, Phoenix, Arizona.

NATIONAL SW-3, nearly new. Must sell. Complete with power supply, 6 sets coils, tubes, phones, speaker, $28. Zalner, 8 Judson Ave., Binghamton, N. Y.

RECEIVERS—new and used sold and traded in, as Hammarlund, National, Postal, International, etc. Schwarc Radio Service, Dumont, N. J.

FOLDER free, crystals $1.50. W9DAX, Faberadio, Sandusky, O.

SELL or swap 56 m.c. outfit complete, transmitter, modulator, receiver and power supply exactly as of QST Aug. '34 and it will works. Write for information. G. G. Tappan, 3433 Taft, Englewood, Colo.

AUTOMATIC CQ machine from phonograph. Costs nothing to make. Full dope 254. W2FIS, Milton Place, Woodmere, L. I.

SOLD used $82.70 each. W8QGCC.

CRYSTALS—guaranteed excellent oscillators; approximate frequency 80-160 meters, $1. 450-500-kc. $2. Herbert Ad- digton, 2252 North Ledaire, Chicago. Successor to W9FHS.

AUTOMOBILE call letter plates. Steel. 6"x2". Colors optional, 60¢ pair. W9DAX, York, Penna.

PHONE transmitter for sale complete. Including remote control equipment, $500. W2FIS, Milton Place, Woodmere, L. I.

SECONDARY Crystal control three-tube transmitter, $35. New Sargent 8-8 receiver, $35. Walter King, Canonsburg, Pa.

CODE machines, tapes and instruction for rent or sale. Rent may be applied on purchase if desired. Instruktograph, 912 Lockwood Place, Chicago. Low power supply, $3.50.

WAC crystal control three-tube transmitter. $35. New Sargent 8-8 receiver, $35. Walter King, Canonsburg, Pa.

CONDENSER microphones—machined of bronze, .002 dia. dia. Good frequency response. Well made and guaranteed a year. Each under $5. W8SAER, 200 Dana Ave., Columbus, Ohio.

WSG-65a tone transmitter for sale complete. Including remote control equipment.

NATIONAL—Hammarlund-Patterson used sets. 60% off list. W3DQ, 405 Delaware Ave., Wilmington, Del.

SELL May QST Super. Need cash to experiment. Hubbell, W8RUA.

RELAY racks, power equipment, to boost your output. B. R. Hoch, 564 Reckler Engineering Service, 4937 Rockwood Rd., Cleveland, Ohio.

Say You Saw It in QST—It Identifies You and Helps QST

NATIONAL, FBXA receiver, 80 meter coils, tubes. A-1 condition, used. Cash $40. W8MKM, D. F. Latham, 513 S. Albany St., Itbaca, N. Y.

WOLVERINE crystals—introductory offer continued. See NATIONAL, FBXA receiver, complete with presclector stage, 2 volt tubes, 20, 40, 80 and 160 meter band spread of National 887B, 2 volt tubes, 20, 40, 80 and 160 meter band spread. Perfect condition. $75.90 cash only, no swaps. Miles W. Weeks, WIWV, Cheektow Hall, Mass.

WHY pay cash? Purchase your new receiver on our "Painless Payment" plan. Write for details. Wixox Radio Sales, 180 West Adams St., Chicago, Ill.

QSLs! None better! W6FZQ/W6HEU, Box 1804, Phoenix, Arizona.

NATIONAL SW-3, nearly new. Must sell. Complete with power supply, 6 sets coils, tubes, phones, speaker, $28. Zalner, 8 Judson Ave., Binghamton, N. Y.

RECEIVERS—new and used sold and traded in, as Hammarlund, National, Postal, International, etc. Schwarc Radio Service, Dumont, N. J.

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SELL or swap 56 m.c. outfit complete, transmitter, modulator, receiver and power supply exactly as of QST Aug. '34 and it will works. Write for information. G. G. Tappan, 3433 Taft, Englewood, Colo.

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Say You Saw It in QST—It Identifies You and Helps QST
BARGAINS. Rebuilt 2041, new tube guarantee; $24. 866, new, $1.60. All types tubes repaired. Send for price list. W2AWZ.

QSLS, SWLS, 75¢ per hundred, two colors, samples on request. W5ECM, 519 Rosette, Little Rock, Ark.

866, $1.29, guaranteed. Transmitters constructed. Howard Radio, 5848 Race Ave., Chicago.


CRYSTALS:—1715-4000, 1", "X", within two kilocycles. $1.75. Unconditionally guaranteed. Catalogue. Ham Crystals, 1104 Lincoln Place, Brooklyn, N. Y.

SELL:—Crest Pro-crystal, AV model. 6 sets coils, tubes. Like new. W3BWX.

GUARANTEED crystals, 180-80 meters, less than 1", X or Y, within five kilocycles. $1.35. Within two kilocycles, 1", $1.75. Rough-cut blanks, 60¢, oscillating, 85¢; odds and ends, five for $1. Holders, $1.25. Speedy service. William Threm, W8EFN, 4021 Davis Ave., Cheviot, Ohio.


20 to 12,000 Cycles from the Audio-Tone
Model 12-A AUDIO FREQUENCY OSCILLATOR
with Direct Dial Calibration
Licensed, Under A. T. & T. Co., Patents
$48.00 Net, less tubes and power supply
THE AUDIO-TONE OSCILLATOR COMPANY
902 Longbrook Avenue Stratford, Connecticut

BIRNBACH
5-METER ANTENNA
For TRANSCEIVERS and BEAM ARRAYS
$2.00 and $2.50
THREE aluminum tube sections, adjustable to desired frequency from 3 ft. (closed) to 9 ft. (open). Tightly locked by brass bushings. High-resistance standoff Insulator base (4½" high). Complete with standoff, $2.50 list. Extensible antenna only, with threaded end, $2.00 list.
Write Dept. Q-7 for Details

BIRNBACH RADIO CO., Inc.
143 HUDSON STREET NEW YORK CITY

DECIBEL METER
Model No. 321 by Triplett
POWER level indicators are used to measure sound or noise levels in the amplifying systems of public address, theater, broadcasting stations, etc.—enabling the operator to make immediate adjustments and to keep the system free from distortion.
The standard range reads up 6 and down 10 decibels, 0 level, 1.73 volts, 500 ohm line, 6 milliwatts. Furnished either standard or highly damped. Other ranges to order only. Meter in moulded case, metal as desired.
Write for Free Catalog
TRIPLETT ELECTRICAL INSTRUMENT CO.
168 MAIN STREET BLUFFTON, OHIO

HOW IS YOUR SUPPLY OF IDEAS?
If they ever run low, make sure that you have a copy of HINTS & KINKS handy. It is chock full of money-saving ideas and stunts of interest to you. There are many times when you will find it invaluable. The price is 50¢ postpaid.

AMERICAN RADIO RELAY LEAGUE
West Hartford Connecticut

Say You Saw It in QST — It Identifies You and Helps QST
Your Nearest Dealer Is Your Best Friend

Your nearest dealer is entitled to your patronage. You can trust him. He is equipped with a knowledge and understanding of amateur radio. He is your logical and safe source of advice and counsel on what equipment you should buy. His stock is complete. He can supply your needs without delay. His prices are fair and consistent with the high quality of the goods he carries. He is responsible to you and interested in you.

Patronize the dealer nearest you — You can have confidence in him

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Radio Electric Service Co.
1024 Hamilton Street
Complete stocks transmitting equipment

**Baltimore, Maryland**
Radio Electric Service Co.
303 W. Baltimore Street
Everything for the amateur

**Boston, Massachusetts**
Nutter & Cross, Inc.
99A Milk Street
All OMs, OWs, and YLs welcome — W1HRF

**Brockton, Massachusetts**
Ware Radio Supply Co.
913 Centre Street
Hammarlund, Triplet, Ohmite, Raytheon, Bliley, Browning Kats

**Buffalo, New York**
Dymac Radio
216 E. Genesee St. — Tel. Cl. 2080
Complete stock Amateur Parts — Standard Discounts — W8AWK

**Buffalo, New York**
Kronson Service Company
143 East Genesee Street
Western New York's largest wholesale distributors — W8EHF

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Jordan Radio Laboratory
2512 Peach Street
Amateur, service parts, including Bliley, National, Raytheon. W8CXM

**Hartford, Connecticut**
Radio Inspection Service Company
227 Asylum Street
What do you need? We have it

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Radio Headquarters for Southeast
Distributors: RCA Victor, Stromberg-Carlson, Standard Ham Lines

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Radio Service Lab. of N. H.
1008 Elm Street — Tel. 218-W
Branches — Portland, Me. and Barre, Vt.

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Quality parts and equipment for discriminating buyers

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Ham Supplies — Replacement Parts
RCA, National, Hammarlund, and other leaders

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612 Arch Street
Ham receivers, Transmitting tubes, Collins transmitters, etc.

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Radio Electric Service Co., Inc.
N. E. Cor. Seventh & Arch Sts.
All nationally advertised lines in stock

**Philadelphia, Pennsylvania**
Eugene G. Wile
10 S. Tenth Street
Complete Stock of Quality Merchandise

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Cameradio Company
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"Ham" Headquarters for Pennsylvania-Ohio-W. Virginia

**Providence, Rhode Island**
Kraus & Company
89 Broadway
Everything for the amateur and serviceman

**Rochester, New York**
Radio Service Shop
244 Clinton Avenue, North
Complete stock amateur-BCL parts. Standard discounts

**San Antonio, Texas**
Straus-Frank Company
Distributors for nationally advertised amateur products
RCA-DeForest transmitting tubes

**Syracuse, New York**
Roy C. Stage, W8IGF
Complete stock of standard Ham & BCL parts
Standard Discounts. Free technical service

**Washington, D.C.**
George's Radio Co.
816 F Street, N.W.
Washington's largest distributor of radio parts

**Wheeling, West Virginia**
Cameradio Company
30 Twelfth Street
Complete stock of amateur Equipment at standard discounts

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Say You Saw It in QST — It Identifies You and Helps QST
You Are Protected When You Buy From QST Advertisers

"Advertising for QST is accepted only from firms who, in the publisher's opinion, are of established integrity and whose products secure the approval of the technical staff of the American Radio Relay League."

Quoted from QST's advertising rate card.

Every conceivable need of a radio amateur can be supplied by the advertisers in QST. And you will know the product has the approval of the League's technical staff.

For Your Convenience

QST'S

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