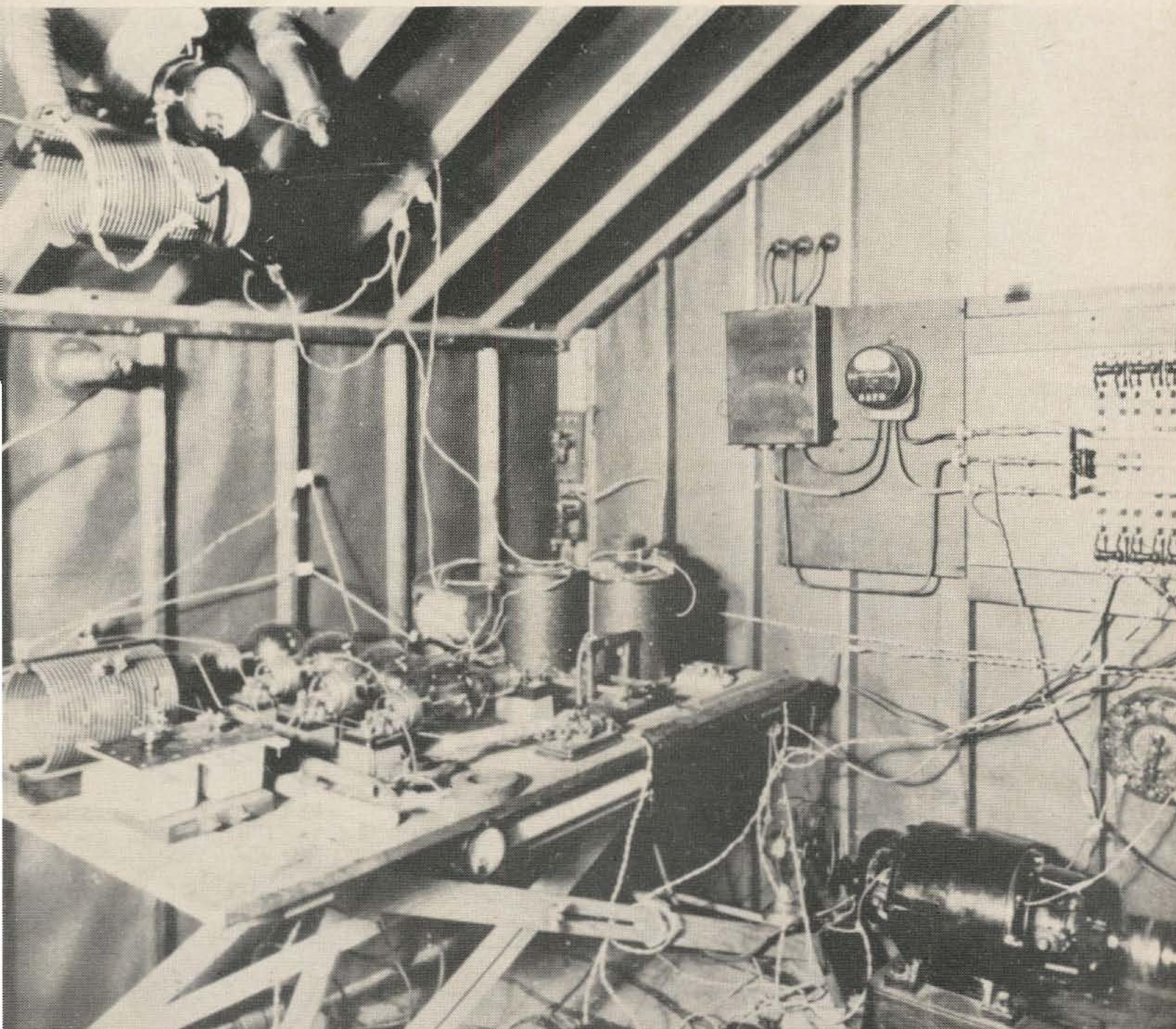
73

Amateur Radio

NOVEMBER 1965
A Special 50¢



Devoted to Home Construction

73 Magazine

Wayne Green W2NSD/1
Editor & Publisher

Paul Franson WA1CCH
Assistant Editor

November, 1965

Vol. XXXVII, No. 1

3 Magazine is published monthly (thank heavens it's not weekly) by 73, Inc., Peterborough, N. H. Zip 03458 (terrible number). The phone is 603-924-3873. Subscription rates $4.00 per year, $7.00 two years, $10 three years world wide. Second class postage is paid at Peterborough, New Hampshire and at additional mailing offices. Printed in Bristol, Conn., U.S.A. Entire contents copyright 1965 by 73, Inc. Postmasters, please send form 3579 to Good Old 73 Magazine, Peterborough, New Hampshire. Use your Zip Zone and save our shirt.

de W2NSD/1

never say die

Code

While most of you have agreed with my views on code as stated a couple months or so ago, a few took issue with me. Perhaps I should have been more explicit at that time.

At the present time it is the code exam that largely determines whether we get our amateur license or not, not the technical exam. I feel that this is the wrong approach entirely and that the deciding factor on the issuing of a license should be the passing of a technical exam, not whether someone has learned the code or not. Those of you who attended code schools during the war know that almost anyone can learn the code with a little practice. Perhaps the word "learn" is wrongly used here . . . it is a skill, not a learning process. If you practice long enough you will be able to copy code, no matter how smart or dumb you are.

My suggestion is this: stop using code speed as the major test for a ham ticket and take the emphasis off code. Fellows who enjoy CW operation will develop their code speed . . . those who don't will rapidly lose their skill anyway. Make a good technical exam the deciding factor for our licenses. Design the ham test so that it can be an open book exam that depends upon an understanding of the material and not the memorization of a bunch of "typical" questions in a license manual such as is published by QST and CQ.

While I refuse to devote the pages of 73 to publishing a glorified crib sheet for the FCC exams, I would be proud to back up sensible license exam program with a series on all of the fundamentals of electricity and electronics which would prepare anyone interested to pass an open book exam for any level of amateur license.

Huntoon Challenged

Now I don't know what pressure Huntoon put on the New York National Convention last year to force them to refuse to permit 73 to have an exhibit. I imagine it was considerable. Rumors have been persisting that he has flatly threatened the New England Convention Committee that if they permit 73 to exhibit at the 1966 Convention not only will the League not sanction it as a National Convention, but they will remove all ARRL support (including publicity and promotion in *QST*) from the event. The League did the same thing to the Cleveland National Convention when the committee invited Clif Evans K6BX to be present and the Convention was cancelled as a result.

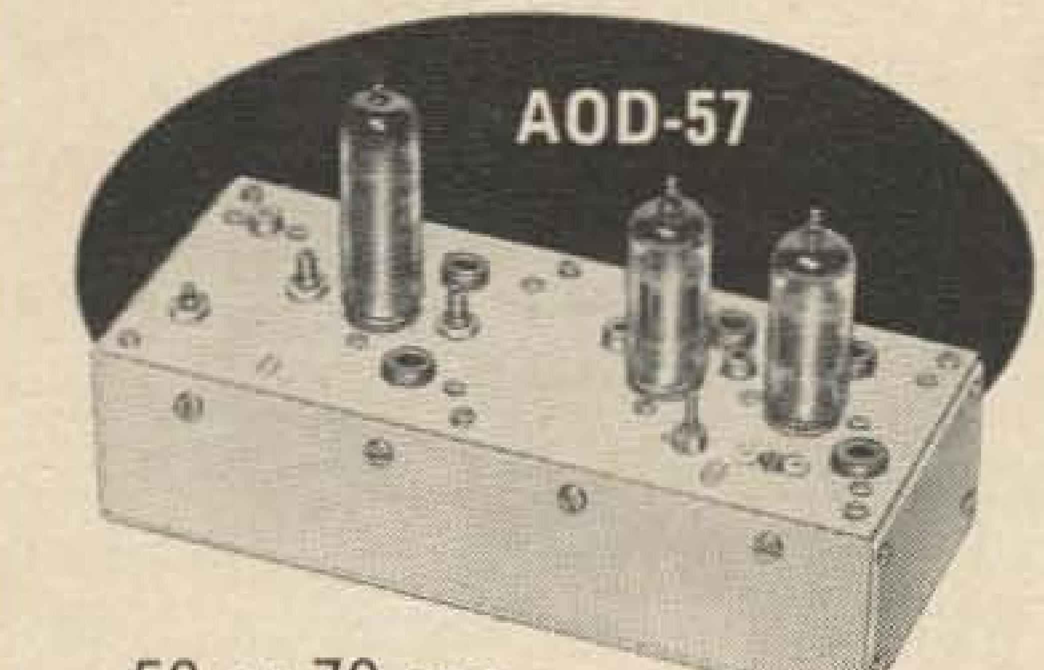
It is unfortunate that the League is so small that they cannot stand to have anyone criticize any of their actions. Clif had the gall to be critical of Huntoon . . . and a National ARRL Convention was cancelled rather than permit him to talk to anyone. I too have had the temerity to speak out against some League actions and they are threatening to cancel another National ARRL Convention if I am permitted to have a 73 exhibit. I hope all ARRL members are proud of the League's reaction to criticism. Cowards.

The official attitude is that I am spreading lies and distortions. Both of us know that everything I have been saying is the truth. There is nothing that I would relish more than to have Huntoon face me personally in front of a Convention audience and ask me to my face to explain those things that I have written in 73 that he considers to be lies and distortions. He and I know that every single point that I have made can be backed up and that it is he that has to lean on out of

NEW FROM INTERNATIONAL

VHF/UHF UNITIZED TRANSMITTERS 50 mc—420 mc

International's new unitized VHF/UHF transmitters make it extremely easy to get on the air in the 50-420 mc range with a solid signal. Start with the basic 50 or 70 mc driver. For higher frequencies add a multiplier-amplifier. All units are completely wired. Plug-in cables are used to interconnect the driver and amplifier.

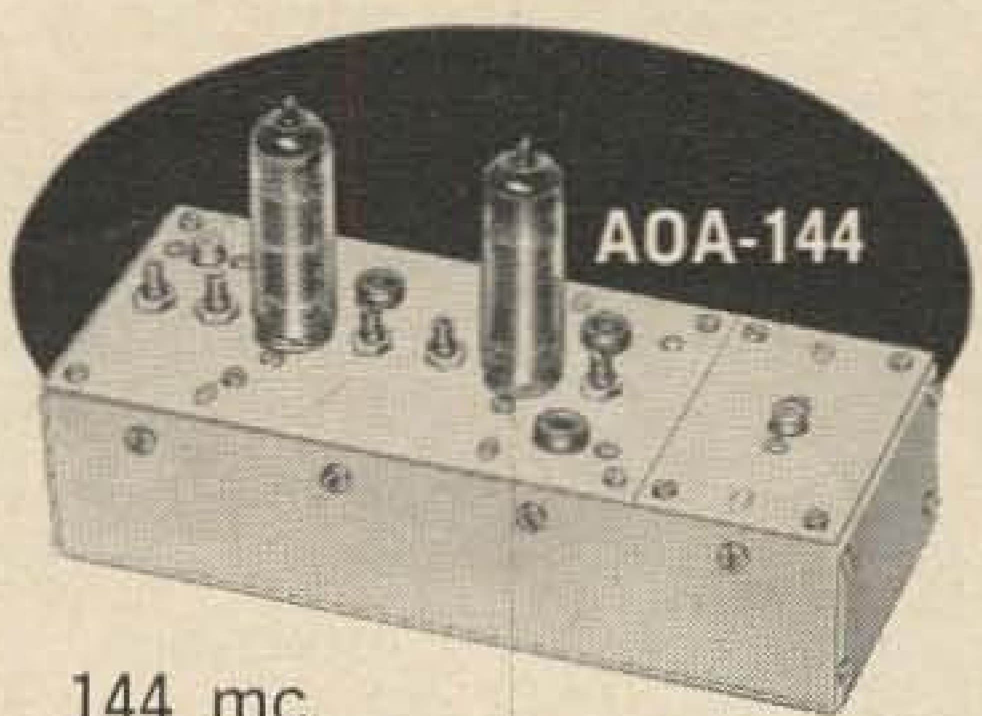


50 or 70 mc

DRIVER/TRANSMITTER

The AOD-57 completely wired with one 6360 tube, two 12BY7 tubes and crystal (specify frequency). Heater power: 6.3 volts @ 1.2 amps. Plate power: 250 vdc @ 50 ma.

AOD-57 complete $69.50

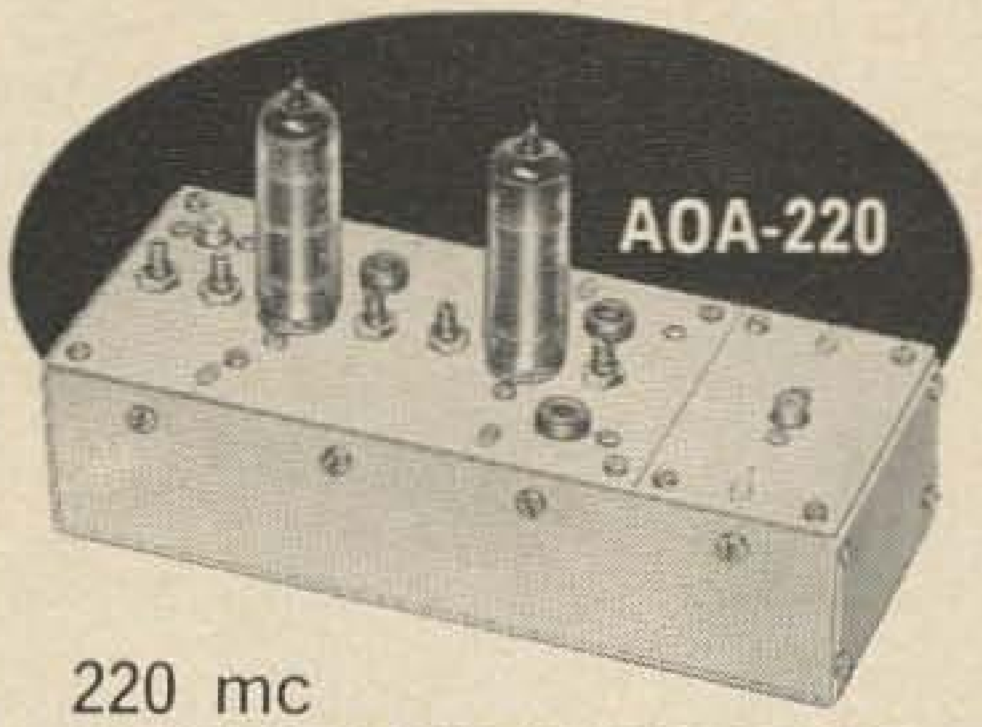


144 mc

MULTIPLIER/AMPLIFIER

The AOA-144 uses two 6360 tubes providing 6 to 10 watts output. Requires AOD-57 for driver. Heater power: 6.3 volts @ 1.64 amps. Plate power: 250 vdc @ 180 ma.

AOA-144 complete $39.50

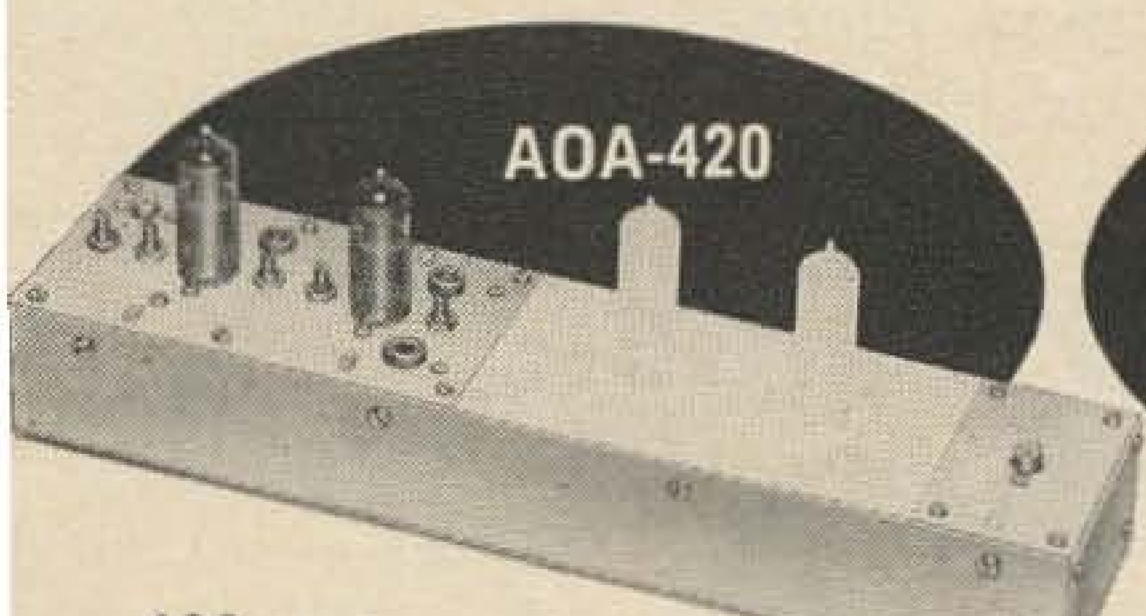


220 mc

MULTIPLIER/AMPLIFIER

The AOA-220 uses two 6360 tubes providing 6 to 8 watts output on 220 mc. Requires AOD-57 for driver. Heater power: 6.3 volts @ 1.64 amps. Plate: 250 vdc @ 150 ma.

AOA-220 complete $39.50



420 mc

MULTIPLIER/AMPLIFIER

The AOA-420 uses two 6939 tubes providing 4 to 8 watts output on 420 mc. Requires AOA-57 plus AOA-144 for drive. Heater: 6.3 volts @ 1.2 amps. Plate: 220 vdc @ 130 ma.

AOA-420 complete $69.50

RELAY BOX

Four circuit double throw. Includes coil rectifier for 6.3 vac operation.

ARY-4 Relay Box complete $12.50

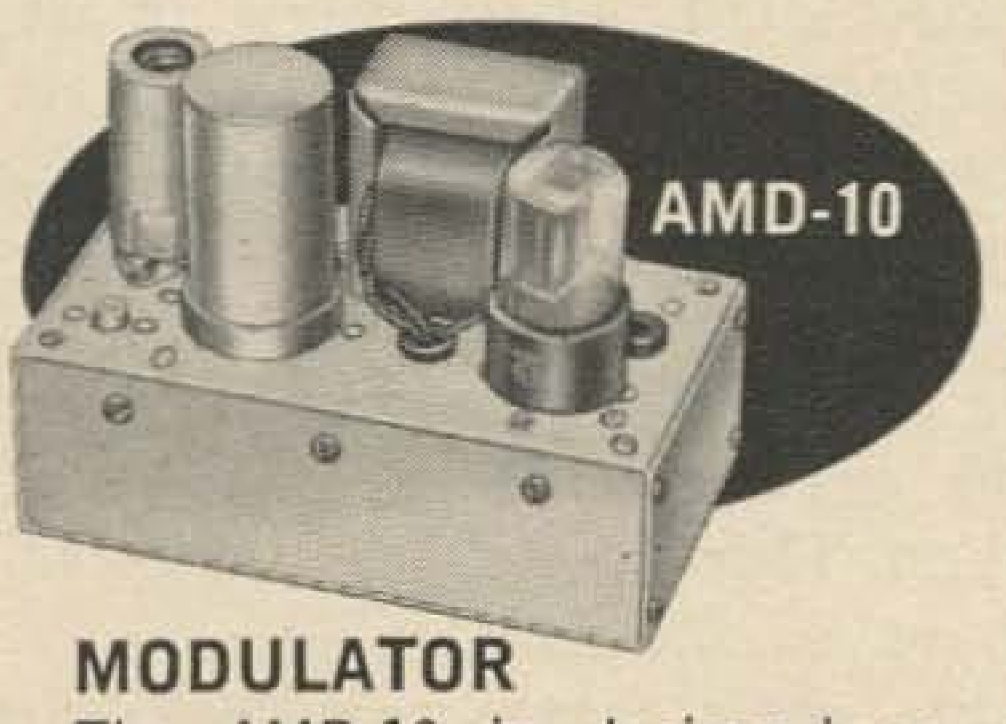
FILAMENT SUPPLY

The APD-610 provides 6.3 vac @ 10 amperes.

APD-610 complete $9.50

COMPLETE TRANSMITTER

6 METERS	50 mc	AOD-57
2 METERS	144 mc	AOD-57 PLUS AOA-144
	220 mc	AOD-57 PLUS AOA-220
	420 mc	AOD-57 PLUS AOA-144 PLUS AOA-420



MODULATOR

The AMD-10 is designed as a companion unit to the AOA series of transmitters. Uses 6AN8 speech amplifier and driver, 1635 modulator. Output: 10 watts. Input: crystal mic. (High Imped.) Requires 300 vdc 20 ma, no signal, 70 ma peak: 6.3 vac @ 1.05 amps.

AMD-10 complete $24.50

INTERNATIONAL CRYSTAL MFG. CO. INC.
18 NORTH LEE — OKLA. CITY, OKLA.

Order Direct from International

context quotes to even attempt to refute my statements. I say that the League cannot stand honest criticism and I challenge John Huntoon to debate with me in front of a Convention audience my criticisms of the League . . . without prepared written speeches, *please*. We don't want to sit and listen to John read two years worth of *QST* editorials verbatim, a favorite strategem of his.

Either I know what I am talking about or I am a fraud . . . let's uncover the truth once and for all. How about it John, have you the courage to back up what you have been saying about me in front of an audience?

In the meanwhile I predict that the New England Convention Committee will knuckle under to Huntoon and refuse to permit 73 to exhibit at the 1966 Boston ARRL National Convention. I will bet money on it . . . any takers?

ASRA

Several fellows have written me asking what I know about an American Society of Radio Amateurs, an outfit or person apparently soliciting funds from hams to fight incentive licensing. Since I have not had any correspondence from the "Society" I am *very* suspicious.

ARRL vs QST

A great many amateurs have a picture of the League that is similar to the one I used to have: a huge organization of nearly 100,000 amateurs plus a small group at HQ in Connecticut that puts out the monthly club magazine QST and other helpful publications.

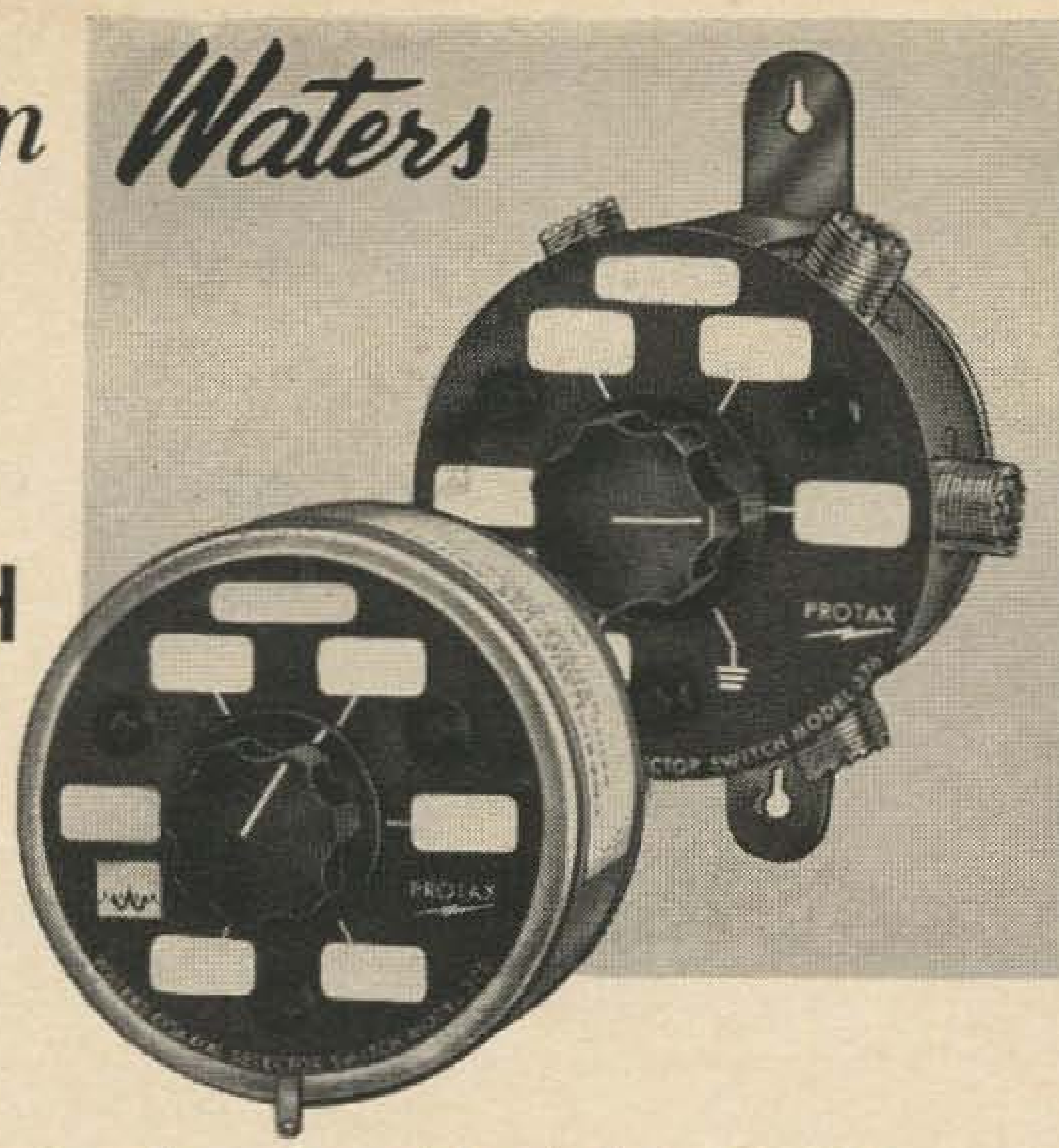
A clearer picture of the situation can be had if you will take the time to send for the free ARRL financial statement. Reading this puts things into perspective and we see the huge publishing house of QST plus an almost insignificantly small ARRL which seems to have dwindled in importance to where it is now little more than an excuse for tax privileges for the giant publishing house. In looking at the 1964 statement of operating expenses we find that of the $1,407,000 spent in 1964 only $50,000 of this was expenditures authorized by the Directors. This comes to about 2.8% for the ARRL vs 97.2% for QST.

Apparently the mess that the ruling clique has generated is still lousing things up. Incentive licensing-RM-499-Docket 15928 has not only cost untold millions of dollars in lost sales to manufacturers and distributors, it has come back to undermine QST. The financial

(*Continued on page 120*)

Another NEW from ***Waters***

PROTAX™



COAXIAL ANTENNA SWITCH

With

AUTOMATIC GROUNDING

Another first from Waters! Now, as easily as you switch from beam to dipole . . . from 40 meters to 75, you can switch your entire antenna system to ground with the newest addition to our line of coaxial switches, PROTAX, automatic-grounding coaxial antenna switch! Designed with the same advanced engineering skill that outmoded all other coaxial switches two years ago, PROTAX is another giant step forward in "Convenience Engineered" ham gear by Waters. In effect, PROTAX is two switches in one . . . a regular antenna-selector switch with power-carrying capacity of 1,000 watts that becomes a grounding switch for all antennas (leaving the receiver input open) when the rig is not in use. In two distinctive models: #375 — six position and ground with back connectors; #376 — five position and ground with connectors in radial arrangement (#376 has its own wall-mounting bracket).

Model 375 .... **$13.95** **Model 376** **$12.50**

2 and 6 meters COAXIAL FILTERS

Double-tuned resonant cavity band-pass filters for both 2 and 6 meter transmitters and receivers. Assures outgoing signals free of spurious frequencies and rejects high-level, out-of-band signals in receiver. Requires no tuning; insertion loss held to 1.5 db maximum. Nominal impedance 52 ohms . . . maximum power 100 watts, peak.

Model 373-2 (144-148mc) **$29.50**

Model 373-6 (50-52mc) **$32.50**

WATERS WIDE RANGE ATTENUATOR

Provides 61 db of attenuation in 1 db steps. Used effectively in S-Meter calibration; checking receiver sideband suppression; measuring cross-talk in switches, receiver image and IF signal rejection, relative antenna gains, etc. Maximum power ¼ watt, dc — 225mc. 371-1 has SO239 connectors; 371-2 has BNC connectors.

Model 371-1 UHF **$27.95**

Model 371-2 BNC **$29.95**

NUVERTER® . . . adds 2 and 6 meters to YOUR superhet receiver!

NUVERTER converts your ten meter-tuning superhet receiver into an HF/VHF Receiver! — and with no modifications to the receiver! No switches or relays are required, and AVC from your receiver provides automatic gain control at VHF, too! Separate all-Nuvistor converters with high-stability crystal oscillators, and built-in AC power supply. Covers lower 1.8mc in three 600 Kc segments on both 2 and 6 meter bands.

Model 346 .... **$175.**

WATERS
MANUFACTURING INC.
WAYLAND, MASSACHUSETTS

WATERS PRODUCTS ARE SOLD ONLY THROUGH WATERS QUALIFIED DISTRIBUTORS

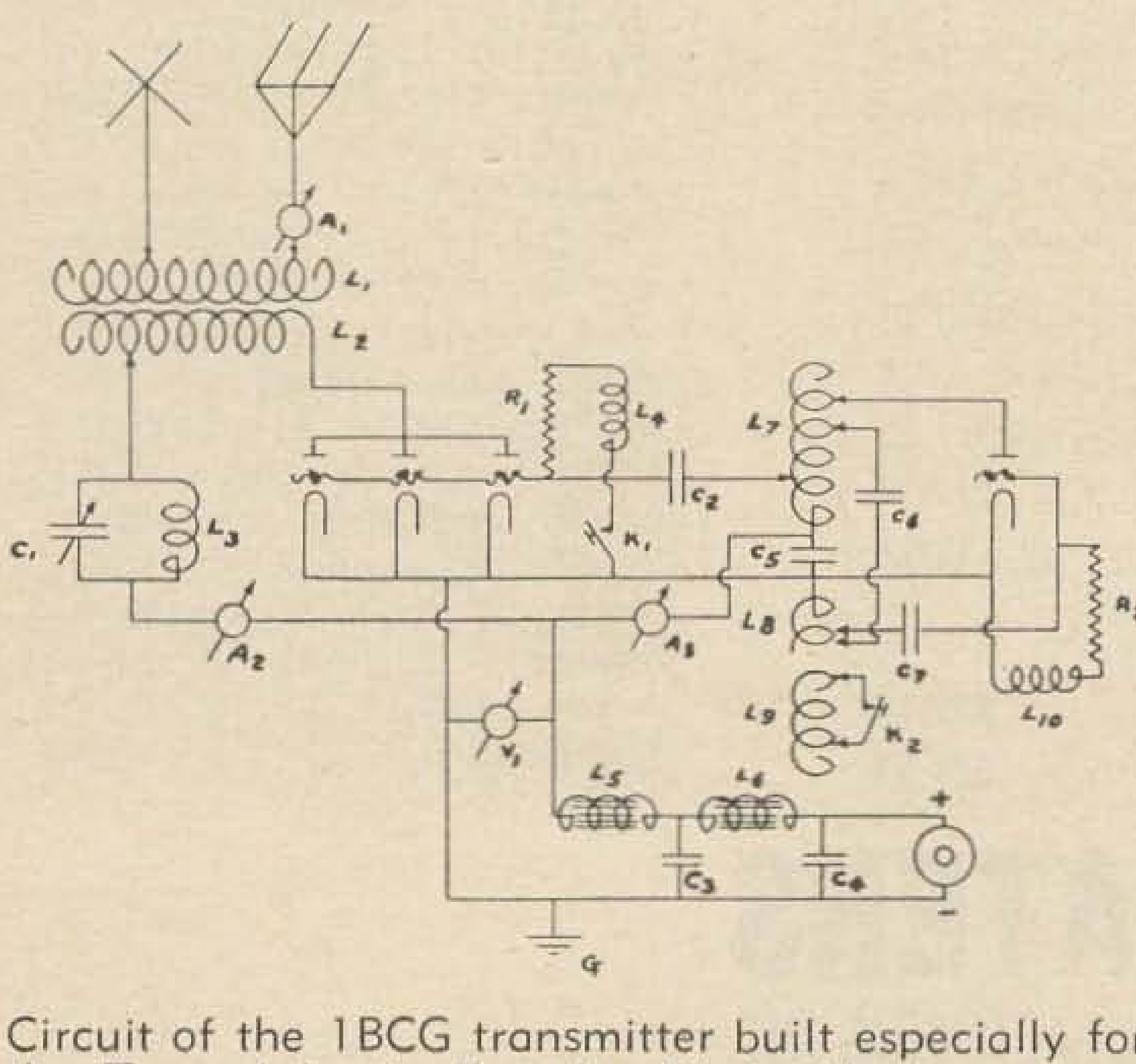
F. D. Whitmore W2AAA
223 W. Holly Ave.
Pitman, N.J.

Catching up with the Past—No. 3

We Got Across

One of the greatest thrills experienced by amateurs occurred the night their signals left this continent and landed on another. It happened nearly forty-four years ago. Commercial interests will never forget it either. Using the "useless" frequencies thrust upon them by the Licensing Act of 1912, the amateurs on December 7, 1921, taught the professionals the value of the shorter waves.

Licensing forced the amateurs out of the "choice" commercial long waves into a region of unexplored frequencies. Hams didn't like the restriction at all. Begrudgingly they erected shorter antennas and reduced the size of oscillating components. However, the trouble they went to proved well worth their while: the shorter waves worked like magic. Where before they struggled to get out of backyards or beyond neighboring states, now they QSO'd districts lying far beyond their original range.



Circuit of the 1BCG transmitter built especially for the Trans-Atlantic Test by Edwin H. Armstrong, Ernest V. Amy, George E. Burghard, Minton Cronkhite, and Walker P. Inman.

East and West coast hams strained anew to work direct. But "lady luck" just wouldn't smile. In the meantime, many hams joined in the Transcontinental Relay tests conducted by the American Radio Relay League. The ARRL ran the tests to see how quickly the amateurs could relay messages from one Coast to the other and get answers back. By the time the record dropped from hours to minutes, announcement of a new contest set hamdom all afire—a test to see if amateur signals would hop across the Atlantic.

The attempt to span the Atlantic

Although the American Radio Relay League conducted the first Trans-Atlantic Test, they didn't originate it. The radio editor of *Everyday Engineering Magazine*, M. B. Sleeper, conceived the idea and completed all the arrangements. Under the plan, about twenty-five stations located in the first, second, third, eighth and ninth districts transmitted individually assigned signals. In the United Kingdom, Philip R. Coursey, Assistant Editor of *The Radio Review* in London, organized the listening end. Over 250 British Amateurs enrolled for the tests.

Just prior to the tests, near tragedy struck: *Everyday Engineering Magazine* suspended publication! Over night the whole plan hung in jeopardy. Was all the hard work and money put forth by amateurs and others on both sides of the Atlantic to go for naught? In a final effort to save the Test so nearly ready to start, the editor of the defunct magazine called on the American Radio Relay League and asked them to take over. The ARRL readily agreed. However, time wouldn't allow them to inject any changes.

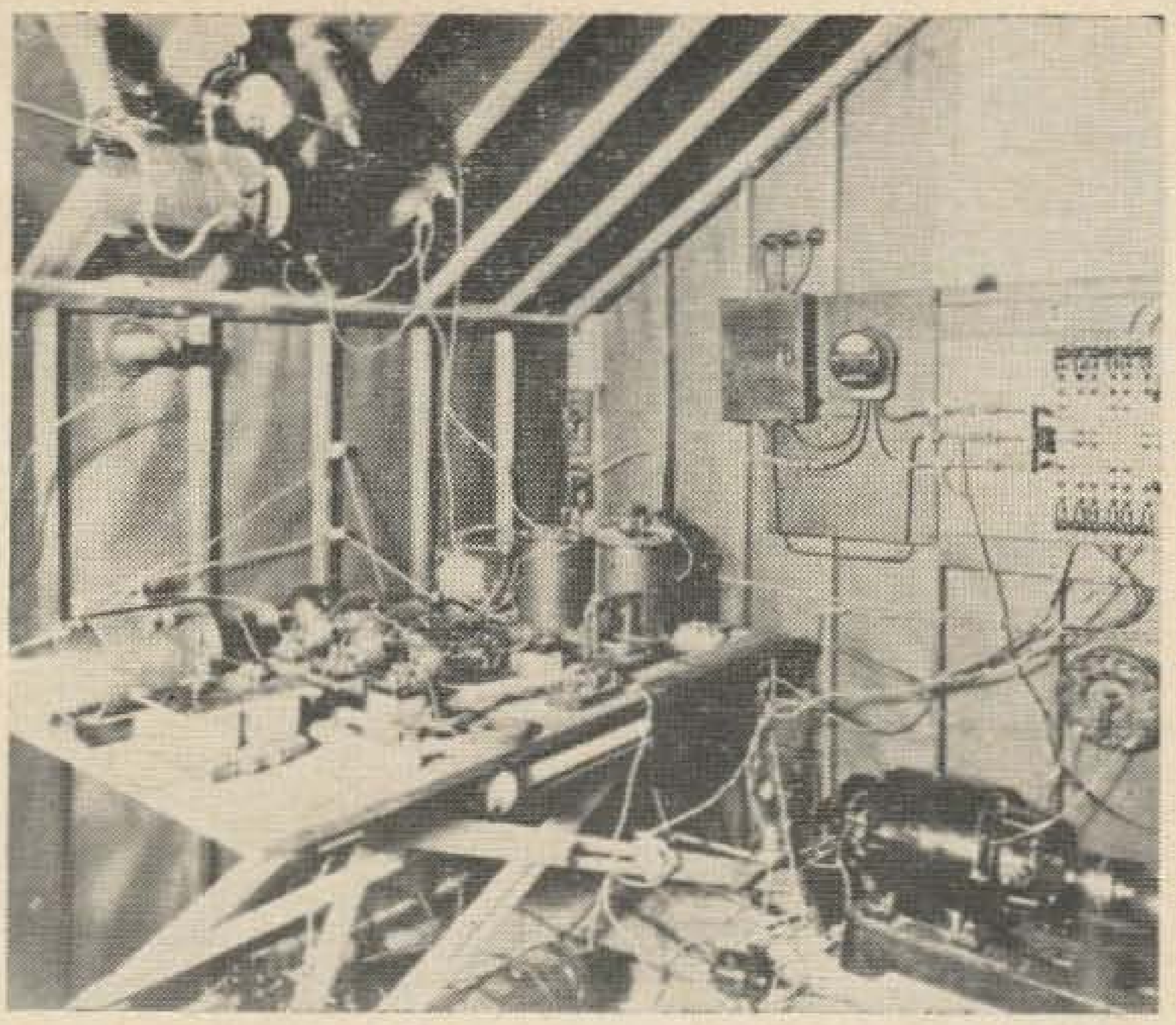
On the night of the tests, the American stations transmitted their pre-arranged signals. Prizes donated by manufacturers on both sides of the Atlantic awaited the best amateur performance. At the end of the tests, in accordance with the established plans, British amateurs submitted their logs for comparison with the confidential copy of the assigned signals. Would any jibe? Anxiously the hams on both sides of the Atlantic waited for the announced result.

Wireless World in England examined some thirty logs sent in by the British listeners. After a most careful check, the sad news came to light: The reviewers could not find one log containing a single word or signal that unquestionably matched the master copy of the assigned messages sent by the American stations. The First Trans-Atlantic Test failed.

Preparations for a second test

At the First National ARRL Convention held in Chicago August 30 through September 3, 1921, the Board of Directors agreed to a proposal by their Traffic Manager to hold a second Trans-Atlantic test. Now the ARRL set out to do what they couldn't do during the first Trans-Atlantic test—send an American dyed-in-the-wool ham to England with American apparatus. No shortage of time existed this time. The test planned for early December allowed three months for preparation. Spurred by the Traffic Manager's further suggestion that the ARRL send a good ham receiver-man to England to copy the American and Canadian signals, the Board voted the money to pay the amateur's expenses.

The ARRL wanted an American listener in England so they could expand the test into a big popular event without asking the British amateurs to stay up all night every night. Only American hams qualified for the "boiled owls" club. At the same time, the opportunity to work an American receiver in competition with British receivers would furnish an excellent comparison of sensitivity. A search went out for the best practical receiver man in the country; a man used to twirling a "mean variometer" all night long. The search ended almost before it started: Paul G. Godley stood out head and shoulders above the crowd. He adapted the Armstrong regenerative circuits to short waves, created the three-circuit tuner for amateur work, and originated the variometer



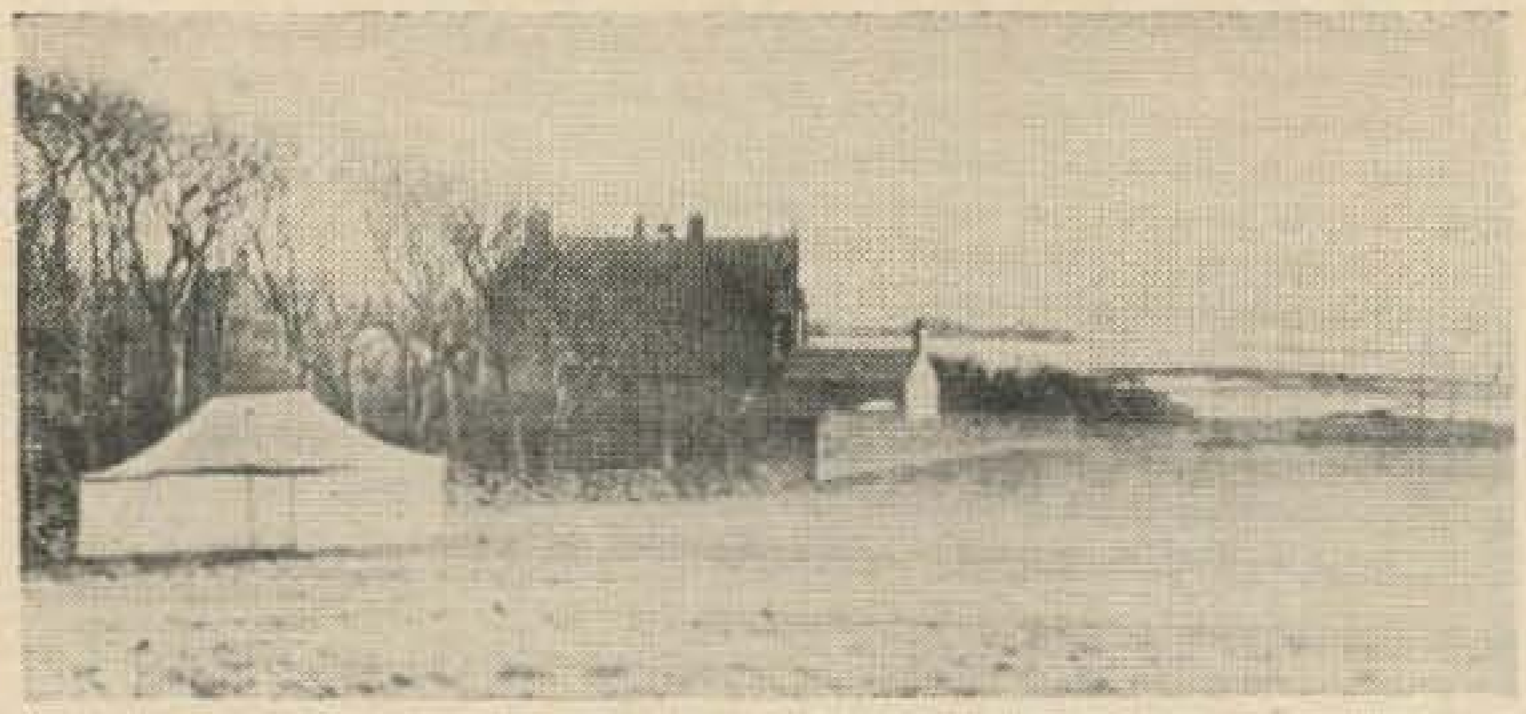
The 1BCG M.O.P.A. transmitter. A UV-204A oscillator drove three UV-204As in parallel. The motor generator supplied 2000 volts to the plates for a 990 watt input. Courtesy of the Radio Club of America.

regenerators that made possible the wonderful short-wave DX work in those days. When asked to tackle the job, Godley consented.

Amid the super-enthusiasm that greeted Godley's decision, the League dove right in to make the second Trans-Atlantic Test a controlled free-for-all. They divided the test into two parts. The first portion scheduled a 200-meter free-for-all by districts for all amateurs; the second part comprised a group of especially picked stations in each district assigned special wavelengths. To get in the second grouping, stations first passed a preliminary test conducted by the ARRL from November 1st through the 5th. All stations that showed proof they transmitted 1000 miles during that test qualified for the December test. Seventy-eight entered the preliminaries. Twenty-seven qualified.

The second Trans-Atlantic Test took place December 7th to the 16th inclusive. Tests during each of the ten nights lasted six hours. The free-for-all period ran from 7 pm until 9:30 pm EST broken up into ten periods of 15 minutes each. These periods assigned specific times for amateurs in the various inspection districts to call "test" and sign their calls. By rotating the periods daily no district sent the same time each night. Such an arrangement gave all the districts an equal chance in case some hours seemed more favorable than others. Canadian stations, due to their small number, entered as one district.

The second portion of the six-hour periods confined transmissions to the individual stations that qualified in the November preliminaries. Divided into fourteen periods of 15 minutes



The tent on the farm at Ardrossan, Scotland, in which Godley set up his receiving station. The Beverage-wire antenna ran from the tent down toward the beach. Courtesy of the Radio Club of America.

each, this half of the nightly tests extended from 9:30 pm until 1:00 am EST. Each station received sealed instructions from the ARRL assigning them secret ciphers to transmit and designating the time for each transmission. Sending times varied nightly like in the free-for-all half of the test. The selected stations represented all the United States districts plus eastern Canada.

To avoid accusations of unfairness, Godley possessed no more details of the test than the British amateurs. Both knew the free-for-all schedules. Later, Coursey gave the British amateurs and Godley the times of transmission and the special wavelengths of the selected stations. But only Coursey and the ARRL Traffic Manager knew the call letters and the ciphers. Like the British amateurs, Godley's instructions required him to send his daily logs to Coursey for verification with the master

Call	Location	Type	Wave	Cypher
1AFV	Salem, Mass.	C.W.	200	YLPMV
1TS	Bristol, Conn.	C.W.	200	AOTRB
1RU	W. Hartford, Ct.	C.W.	200	BPUSC
1DA	Manchester, Mass.	C.W.	200	CQVTD
1AW	Hartford, Conn.	Spk.	210	DRWUF
1BCG	Greenwich, Conn.	C.W.	230	GODLY
2BML	Riverhead, L. I.	C.W.	200	FSXVG
2FD	New York City	C.W.	200	GTYWH
2FP	Brooklyn	C.W.	200	HUZXJ
2OM	Ridgewood, N. J.	Spk.	200	JVAYK
2EL	Freeport, L. I.	C.W.	200	KWBZL
3DH	Princeton, N. J.	C.W.	210	LXCAM
4GL	Savannah, Ga.	C.W.	200	MYDBN
3BP	Newmarket, Ont.	Spk.	200	NZFCO
8DR	Pittsburgh, Pa.	C.W.	200	OAGDP
9KO	St. Louis, Mo.	Spk.	200	PBHFQ
9AW	Toronto, Ont.	C.W.	200	QCJGR
1ZE	Marion, Mass.	C.W.	375	RDKHS
2ZL	Valley Stream, L. I.	C.W.	325	TGMKU
3ZO	Parkesburg, Pa.	C.W.	360	UHNLV
5ZZ	Blackwell, Okla.	Spk.	375	VJOMW
6XH	Stanford U., Cal.	C.W.	375	WKPNX
7ZG	Bear Creek, Mont.	Spk.	375	XLQOY
8XK	Pittsburgh, Pa.	C.W.	375	YMRPZ
9ZY	Lacrosse, Wis.	C.W.	260	RZQMY
9ZN	Chicago, Ill.	Spk.	375	ZNSQA
9XI	Minneapolis	C.W.	300	SFLJT

These amateur stations qualified in the 1000 mile preliminary test, and operated as special stations in the second portion of the Trans-Atlantic Test transmitting code groups.

copy. To guarantee the authenticity of the logs, Coursey assigned a British observer to listen-in to all Godley's receptions and confirm the signals received.

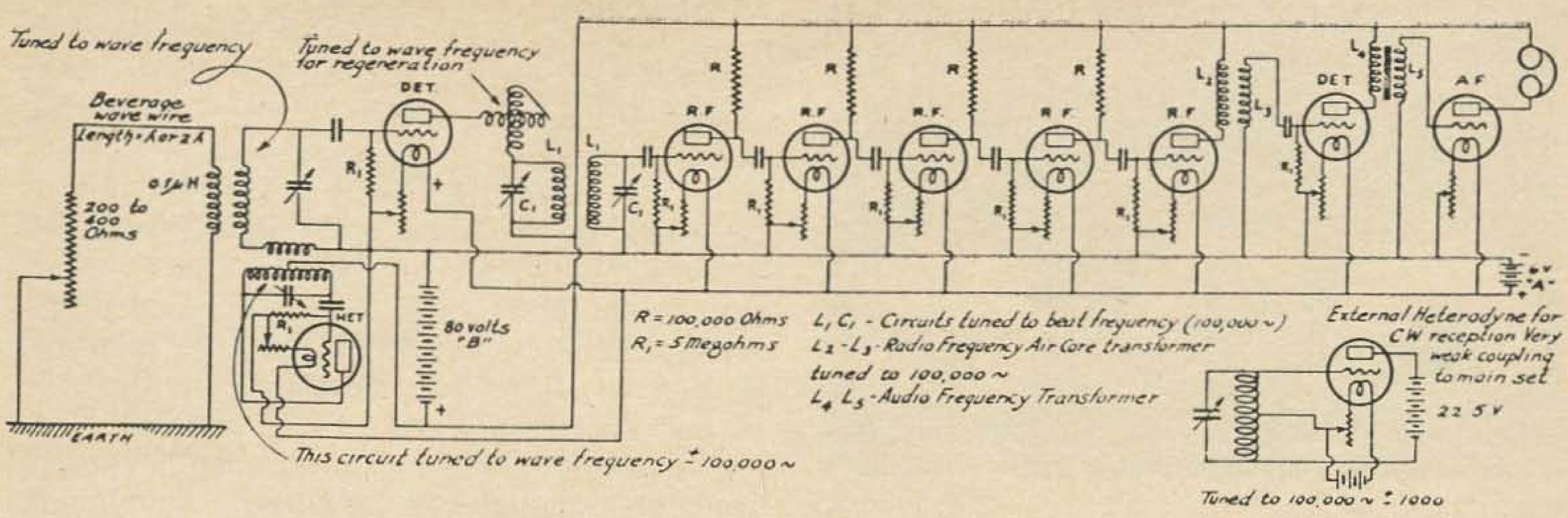
Though commercial interests didn't expect any startling results from the amateurs' Trans-Atlantic attempt, two of them offered free services during the test. MUU, the British Marconi wireless station at Carnarvon, Wales, arranged to transmit the daily results slowly by hand key at 2 am EST each night. Some American hams built long wave receivers to pick up the 14,000-meter signals direct. But for the majority of amateurs unable to receive long waves, WII, the RCA station at New Brunswick, New Jersey, agreed to repeat MUU's report on short waves immediately after its reception.

Godley sails for England

Firmly resolved to "hear signals or bust," Godley sailed for England November 15th aboard the Aquitania. Behind him, with reddened eyes from long watches on the relay routes, American and Canadian hams touched up their rigs for the big assault just three weeks away. Among Godley's luggage nestled two receivers: a regenerative set and a superheterodyne. Both receivers tuned from 150 to 500 meters. Especially built by him for the big job ahead, the superheterodyne—the latest word in advanced receivers—consisted of a 100 kc *if* and detector unit plus an outboard tuner. The tuner, though, worked with either receiver. When placed between the antenna and the regenerative set, it sharpened the performance of that favorite circuit of the American hams. These two receivers represented America's best. Armed with this combination, Godley pitted his ability against the performance of the British hams and their multi-stages of radio frequency amplification.

Shooed from the ship as she made ready to sail, Godley's well-wishers gathered near an opening in the enclosed pier and continued to talk to him via hand-signals in Continental code. Suddenly someone spotted Beverage, the Radio Corporation of America's receiver engineer, standing by the rail on the top deck just a short distance away from Godley. Besides his professional status, Beverage also qualified as a "boiled owl" under the call 2BML. Quickly the gang hand-radioed the news aloft. Godley found Beverage smiling as he walked over and shook hands for Beverage too read the code signals coming up from the pier.

By the time the tugs straightened the Aqui-



The circuit of the superheterodyne receiver used by Godley to receive the short wave signals from America.

tania in mid-stream and her powerful quad screws started her down the Hudson, 2ZE and Beverage sat deeply engrossed in receiver talk and the coming Trans-Atlantic Test. Soon the conversation settled on the "Beverage Wire"—2BML's famed antenna for reducing static on long waves. The technology behind this long-wire antenna appealed to Godley very much, though at the time, he didn't see a need for its merits in the task lying ahead. Fortunately for amateur radio, however, he listened well.

Two days after arriving in England, Godley set up his equipment at Commander Frank Phillips' station in London where he planned to listen for the signals from America. Coursey took care of the operating permit. Like Godley, Phillips too looked back on a long career of radio receiver designing. His Burndept designs compared with the Paragon series fathered by Godley in the United States. The latest, a Burndept III, sat on the operating table waiting to challenge those Godley now unpacked. Godley hooked up the regenerative set first. Before many hours passed, he proved to Phillips the superiority of the regenerative design. Later, when the superheterodyne performed, his English host stared in disbelief. He couldn't believe the little 3-inch coils containing only 10 turns of wire could capture the distant stations pouring from the earphones.

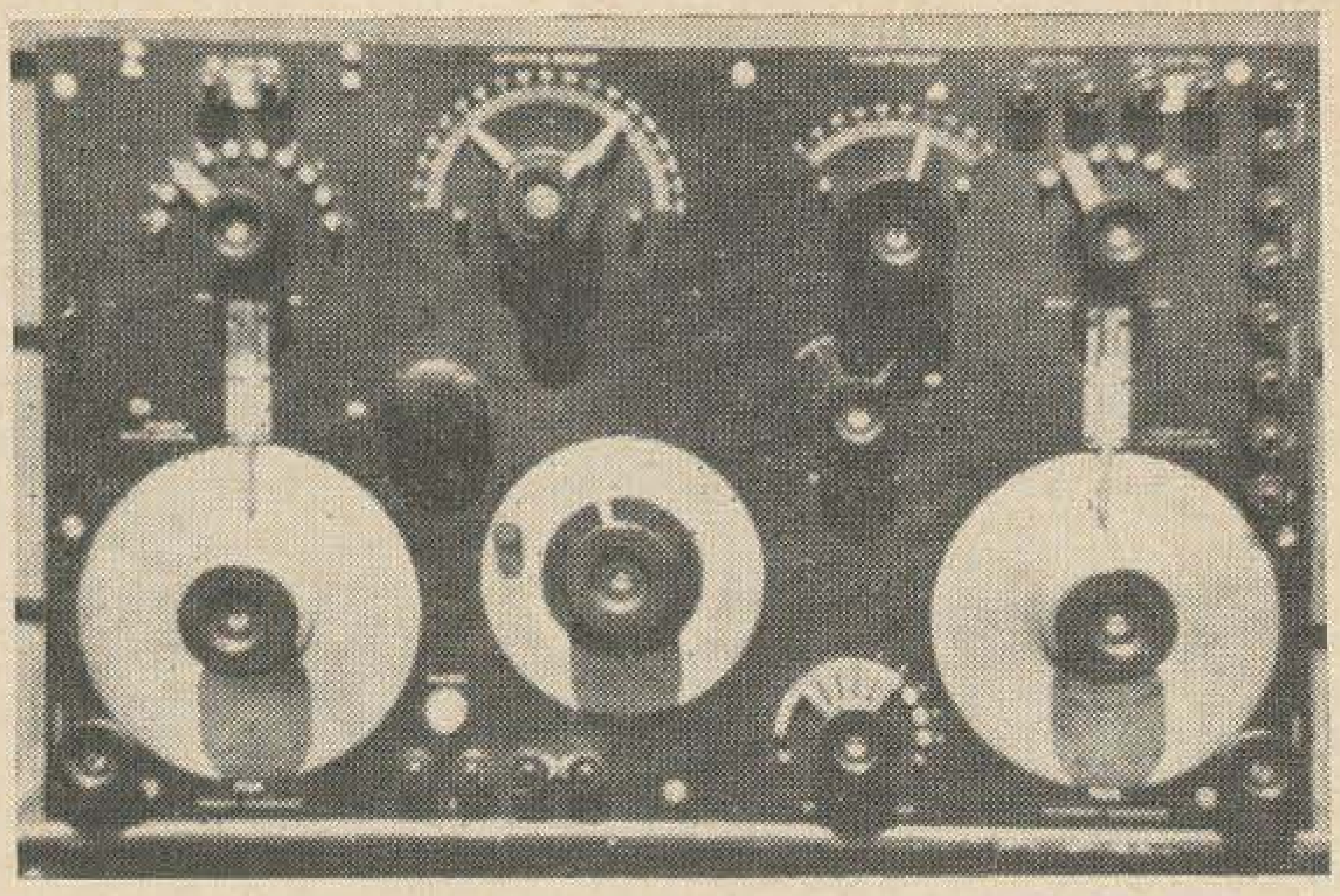
While the contest showed the superiority of the American receivers, it also brought to light the unsuitability of the Wembly Park location. Vast numbers of harmonics filled the ether. The unwanted din emanated from amateur single-circuit tube transmitters in the area and the high-power, Poulson commercial arcs. Also, peculiar atmospherics existed. In America during winter months, atmospherics mostly disappeared around 200 meters. Not so in England. In that land of high tides and lengthy winter nights, Godley noticed the QRN suddenly increase during short periods, then abruptly decrease only to soon reappear in another quarter in a different form. Now he understood the handicaps that plagued British amateurs during the first Trans-Atlantic Test. As a result, Godley decided to leave London and the pea-soup fog, and use a Beverage Wire in place of the planned vertical. He picked Ardrossan for the new receiver site—a small fishing village near Glasgow on Scotland's west coast.

Trans-Atlantic Test No. 2

Breathing heavily with anticipation, Godley huddled over his superheterodyne straining to hear the 200-meter signals from America. He no longer remembered the chilling fog that welcomed him to Glasgow nor the wind-driven rain that greeted his arrival in Ardrossan. Buried too lay the memory of his hectic scurry a week before test-time when only his own initiative plus a little luck persuaded the Assistant Secretary of the Post Office to change the receiving permit from London to Ardrossan. He even forgot for the moment his keen disappointment when an inspection showed the preferred beach sites picked from a map completely covered by water at high tide.

Harmonics from European sparks and powerful CW stations flocked to the Beverage Wire like chickens to a roost. From 1 until 1:30 am GMT, Godley heard nothing else. Apparently he missed no amateur signals by rechecking the received installation again and joining the contest one hour late. But the directional characteristics of the 1300 foot aerial prevailed. Except for a strong signal out of Ireland, he found the spurious signals much weaker at Ardrossan than in London.

Godley slowly tuned across the band hunting for those distinctive tones that set amateur signals apart from all others. Outside, rain still driven by gusty wind beat against the tent. At 1:33 his heart skipped a beat. A 60 cycle synchronous spark on 270 meters finished chewing the rag and signed off with a CUL. A burst of



Navy model SE-95A long wave receiver. This set, made at the Washington Navy Yard in 1917, operated from 1000 to 10,000 meters. Loading coils extended the range to 20,000 meters. The American Radio Relay League used it to copy Paul Godley's messages direct from MUU during the ARRL Trans-Atlantic Test of 1921. Courtesy of W2ZI Historical Museum.

QRN hid the call. But Godley knew he heard an amateur. The thrill made him forget his heavy chest cold and wet clothes, and the miserable weather so aptly predicted by his London friends. He suggested hot coffee and Pearson volunteered to brew it. Midway in the preparation, Godley's sudden shout caught Pearson with both hands full. The spark signal now at double strength boomed through the static as the amateur called an eighth district station and signed 1AAW clearly at 1:42 am. Pearson jumped to his earphones to verify the reception. He got them on in time to hear the "AW". *Not enough to count the call!*

Teased by so near a success during the first half-hour they listened, Godley and Pearson camped on the 270-meter wavelength and waited. The roar of static mingled with harmonics pounded their ears. Suddenly they heard 1AAW again! They recognized the murmuring tone deep down in the atmospherics. Would he break through once more and win his rightful place as the first amateur signal to cross the Atlantic on schedule? Eagerly they held to the faint note and waited. Finally, disappointment crept across their faces: the signal gradually ebbed and disappeared. Spanning 3000 miles once more represented too great a task for the "spark" to repeat. During the remainder of the Trans-Atlantic Test, 1AAW never again became readable copy.

The next night Godley heard nothing. Apparently typical American DX-weather meant nothing in Scotland. The all night vigil beneath a half moon and starry skies got him nothing but a cold deeper down in his chest. Rather depressed, he entered the third night of the test. Outside, boisterous wet weather set in again. Godley wondered if the gusty wind would send the tent flying through the air like it did the first day right after they raised it. But at 12:50 am he forgot all his ills: a switch to CW brought in 1BCG. Bending over the operating table of boards supported by trestles, he no longer felt the hard box beneath him or the unpliable apparatus chest at his back. The feeble light shed by the lone lantern now lost itself upon his concentration. And cold drafts swirled about unnoticed as the little oil stove by his knees fought its losing battle to heat the 12 x 18 foot tent.

The strength of the Yankee signal amazed Pearson. It sounded so commercial he couldn't believe no more than a kilowatt backed the wallop. While Godley utilized the resonance of the telephones to peak the signal, Pearson sloshed to the far end of the Beverage Wire and adjusted the resistor connected between the antenna and the buried ground plates four and a half feet deep. Background static dropped and readability improved. Back in the tent, the two men's enthusiasm knew no bounds as they listened to the loud, steady tone of the first confirmed ham signal to get across. Jubilantly Godley wired Coursey the good news, and sent a cable to E. H. Armstrong at 1BCG requesting him to send a message. No other amateurs got through that joyous night.

Stimulated by the success of the previous night, Godley came on duty the fourth night eagerly anticipating a message from America. At 1 am GMT, 1BCG broke through strong and clear sending "Mges" over and over. Godley waited but no message ever came. Because the British operator used the English abbreviation for the word "message" instead of the American Msgs, Godley's cable arrived at 1BCG reading, "SEND MGES." So, they did. They repeated the letters M-G-E-S over and over all night long.

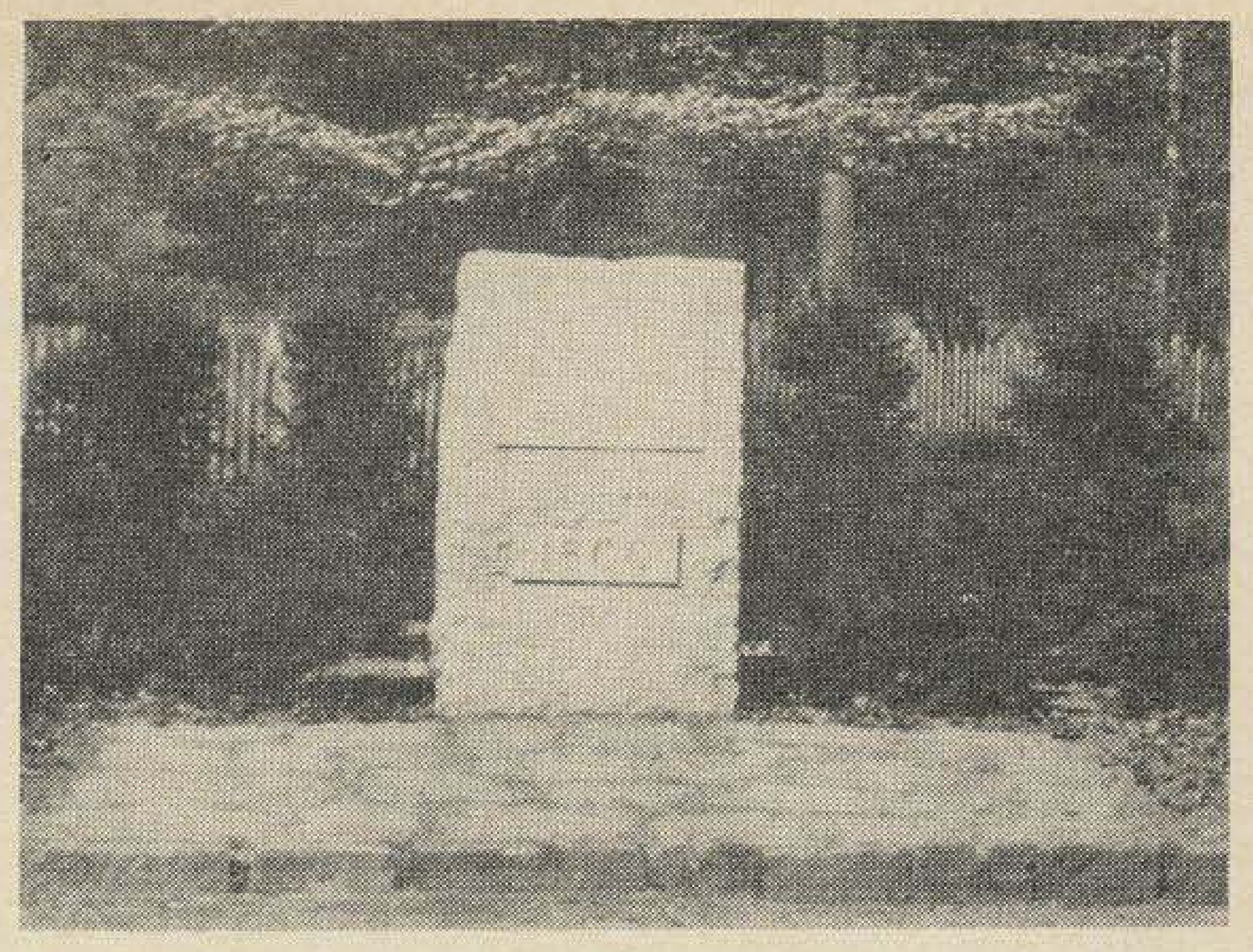
Godley's disappointment, however, didn't last long. An atmospheric change at 4 am lowered the invisible barrier between America and Scotland letting ham signals pour across the Atlantic the remainder of that night and half of the next. As fast as Pearson verified one call, Godley logged another. One moment they copied a spark buzz; the next, a CW shriek. Power mattered little. Thanks to the excellent characteristics of the Beverage Wire, even two 35-watt stations got through.

Back in the "States" tension and excitement reigned too. Each night in the Traffic Manager's room at ARRL headquarters, a small group of officials blinked through a haze of tobacco smoke and marveled at the clockwork precision of the hams. One moment 2's filled the air; the next, 3's. Then with an enthusiastic, "Go ahead 4's. Give her the juice," the last 3 passed the free-for-all on to the next district. At the conclusion of the second segment of the test, during which time the special stations sent their assigned code groups on slightly longer wavelenths, the officials shifted to long waves and waited for MUU to send Godley's message. If the word check read 17, they learned to expect only weather conditions. But the night the message started "CK 94," they trembled with expectation. Slowly by hand key came the news they wanted: "Heard 1RU BPUSC, 2FP HUZXJ, 2BML FSXVG, also spark 1ARY, LBDT, 2BK, 2DN, 3BP; undamped, 1ARY, 1BCG, 1BDT, 1BGF, 1BKA, 1RZ, 1YK, 1XM, 2ARY, 2AJW, 2FD, 2EH, 3FB, 8ACF, 8XV . . ."

Back at Ardrossan, Scotland, the fifth night began where the fourth left off. In the midst of the scramble to copy as many signals as possible, Godley heard 1BCG break through. He listened a few moments then his pencil fairly flew across the paper. Watching, Pearson saw him write, "Nr 1 de 1BCG." Then came the rest of the *first amateur message to cross the Atlantic:* ". . . words 12, New York. Date December 11, 1921, to Paul Godley, Ardrossan, Scotland. Hearty congratulations. (signed) Burghard, Inman, Grinan, Armstrong, Amy, Cronkite." The message just did get across. It started at 2:52 and ended at 3 am GMT. Ten minutes later, all readable amateur signals ended too. And not another ham call reached Godley during the remainder of the Trans-Atlantic Test.

Call	Location	Type
3BP	Newmarket, Ontario	Spark
1ARY	Burlington, Vermont	„
1BDT	Atlantic, Massachusetts	„
2BK	Yonkers, New York	„
2DN	Yonkers, New York	„
3FB	Atlantic City, New Jersey	„
9ZJ	Indianapolis, Indiana	„
8BU	Cleveland, Ohio	„
1RU	West Hartford, Connecticut	CW
1RZ	Ridgefield, Connecticut	„
1ARY	Burlington, Vermont	„
1BCG	Greenwich, Connecticut	„
1BDT	Atlantic, Massachusetts	„
1BGF	Hartford, Connecticut	„
1BKA	Glenbrook, Connecticut	„
1XM	Cambridge, Massachusetts	„
1YK	Worcester, Massachusetts	„
2EL	Freeport, New York	(?)
2EH	Riverhead, Long Island, New York	CW
2FD	New York City, New York	„
2FP	Brooklyn, New York	„
2ARY	Brooklyn, New York	„
2AJW	Babylon, Long Island, New York	„
2BML	Riverhead, Long Island, New York	„
3DH	Princeton, New Jersey	„
8ACF	Washington, Pennsylvania	„
8XV	Pittsburgh, Pennsylvania	„

The amateur stations heard by Paul F. Godley and confirmed by D. E. Pearson the official observer during the December 1921 Trans-Atlantic Test.



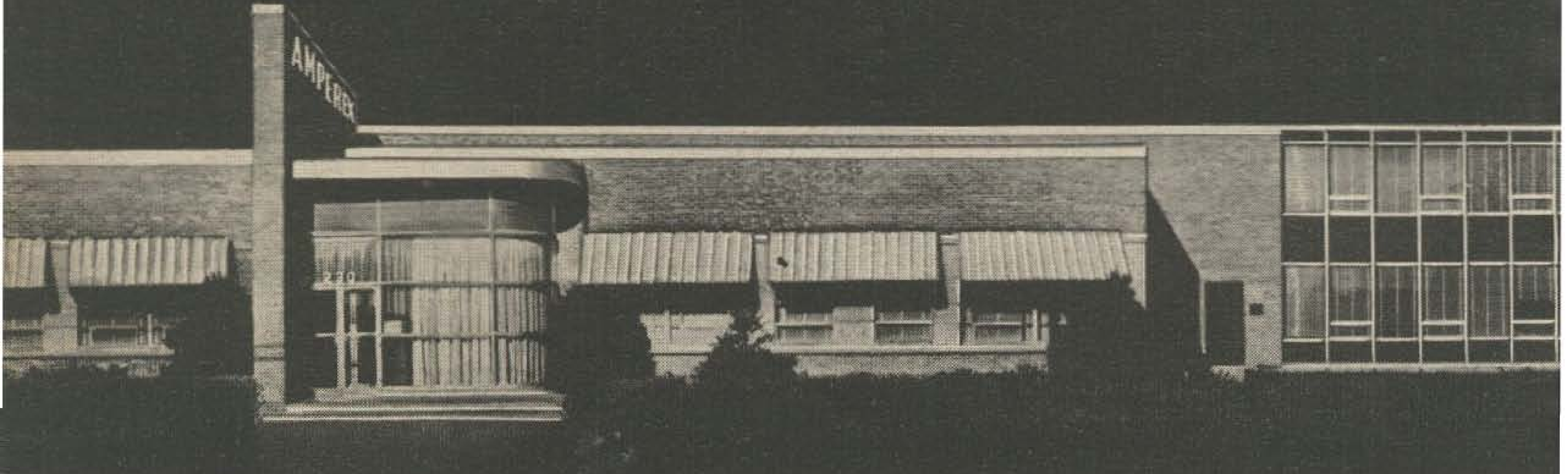
The 1BCG memorial located 200 feet east of the original station site at Greenwich, Conn. It reads: "Near this spot on December 11, 1921, radio station IBCG sent to Ardrossan, Scotland, the first message ever to span the Atlantic on short waves. 1BCG, an amateur station, was built and operated by members of the Radio Club of America." Courtesy of the Radio Club of A.

To make connections with the Olympic sailing on December 21st, Godley left Ardrossan Friday afternoon for London foregoing the final night of the test. How lucky for him! That night a hurricane whirling across the Atlantic during the Trans-Atlantic Test struck Scotland. Winds greater than Godley experienced at any time backed up the waters of the English Channel until they stood two feet deep in the streets of Hull. Earlier, the Olympic tangled with the hurricane in mid-Atlantic. When she finally reached the safety of her Southampton berth, she displayed battle damage amounting to thousands of dollars and reported two men dead.

After a hero's welcome for Godley in New York City, the ARRL brought him up-to-date with highlights of the test at home. The most interesting one concerned 1AAW. Upon learning that Godley heard 1AAW the first night, the ARRL set out to break the good news to the operator. They found him in nearby Roxbury. Also, they found a transmitter that last saw action six months before. What did it mean? Did Godley hear wrong? After all, Pearson failed to get the earphones on quickly enough to verify the signal. No. Godley heard correctly. Numerous amateurs around Boston confirmed the activity of the call and placed it somewhere in their vicinity. However, no amount of effort could flush the operator out. He preferred *not* to claim the distinction for sending the first Trans-Atlantic Test signal "across" rather than go to jail. A just "reward" for an unjust deed. *The operator who signed 1-A-A-W that night bootlegged the call!*

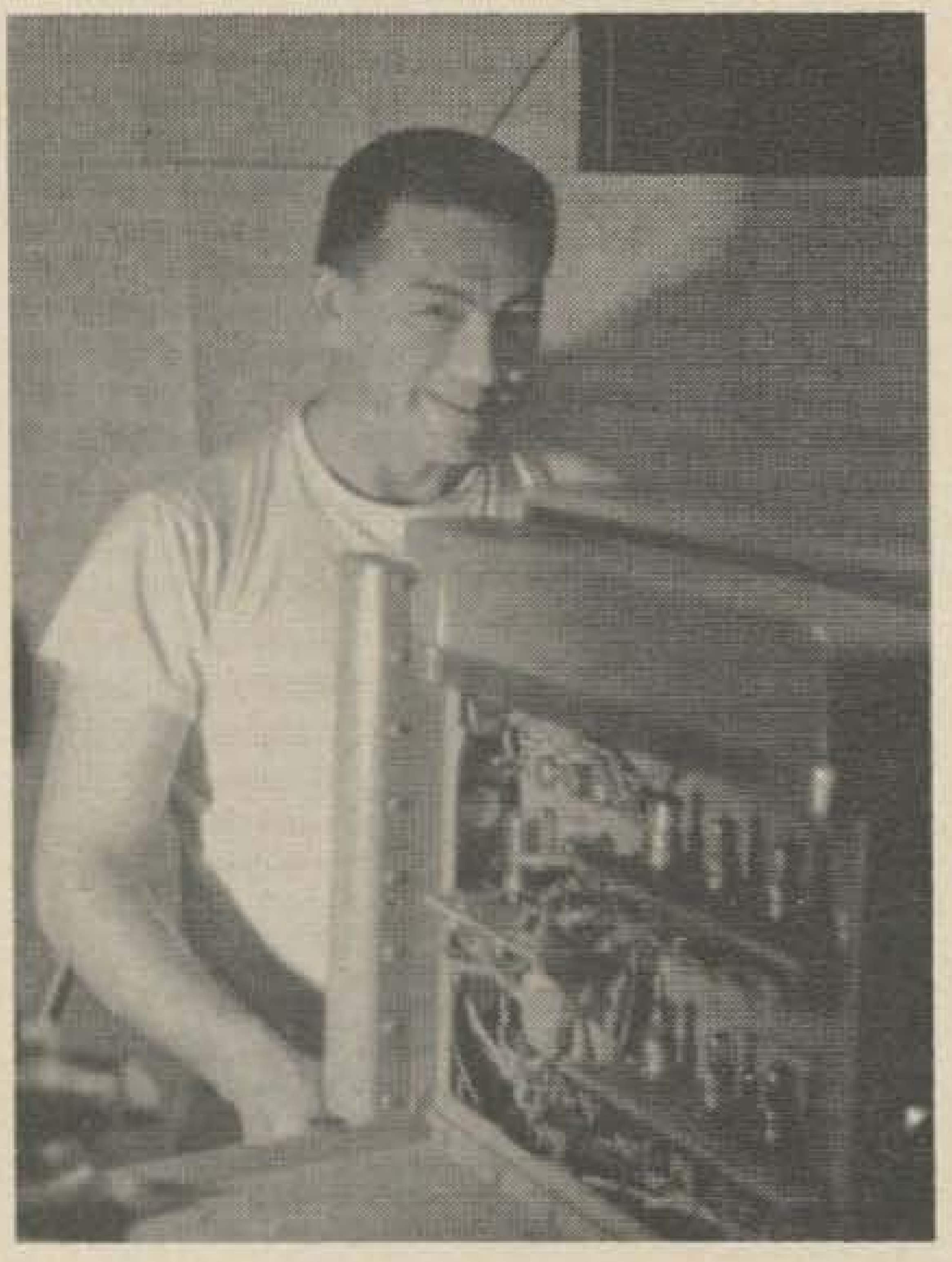
. . . W2AAA

SSB problems solved here



Amperex status as the source of more tube types for Single Sideband Suppressed Carrier Service than any other producer, didn't just happen. Leadership has been achieved as the result of a deliberate and continuing program of engineering research and intensive laboratory testing from which has emerged a distinctive and clearly superior comprehension of SSB technology and SSB applications for any power level from 5 watts to 5 kilowatts PEP.

From internal tube geometry to overall envelope design, AMPEREX SSB Tubes are *Performance Tested, Performance Rated* and *Performance Guaranteed* for optimum linearity and minimum intermodulation distortion at *full Single Sideband power ratings.*



Robert Walker W8VCO
1849 Meadowlark
Toledo, Ohio

An Audio-TV Transmitter

There's been a lot of controversy over television transmitting and receiving equipment. The problem of transmitting both audio and video has been a sticker. Many methods have been used: a separate transmitter for each, which is rather expensive; a subcarrier 4.5 mc away from the audio, difficult to adjust and design for satisfactory results; etc. I looked around a bit and decided to try the method shown in this article. It works very well, though you may want to modify it some for your own use.

Fig. 1, the block diagram, illustrates the system. Basically it is an FM audio transmitter with the final modulated for video AM. The video modulator was described in the August 1963 issue of 73. It is connected directly to the control grid of the final amplifier. The two meter FM exciter is fairly conventional. The screen of the crystal oscillator is modulated, which produces enough change in frequency for FM. You could use a surplus FM transmitter for this portion. The tripler to 432 mc uses a surplus assembly from the ARC-12. You might also use a surplus 450 mc FM exciter to replace two meter exciter and tripler. The final amplifier is a 4X150A in a coaxial cavity. You may find that this is the most interesting part of the transmitter if you're not in ATV.

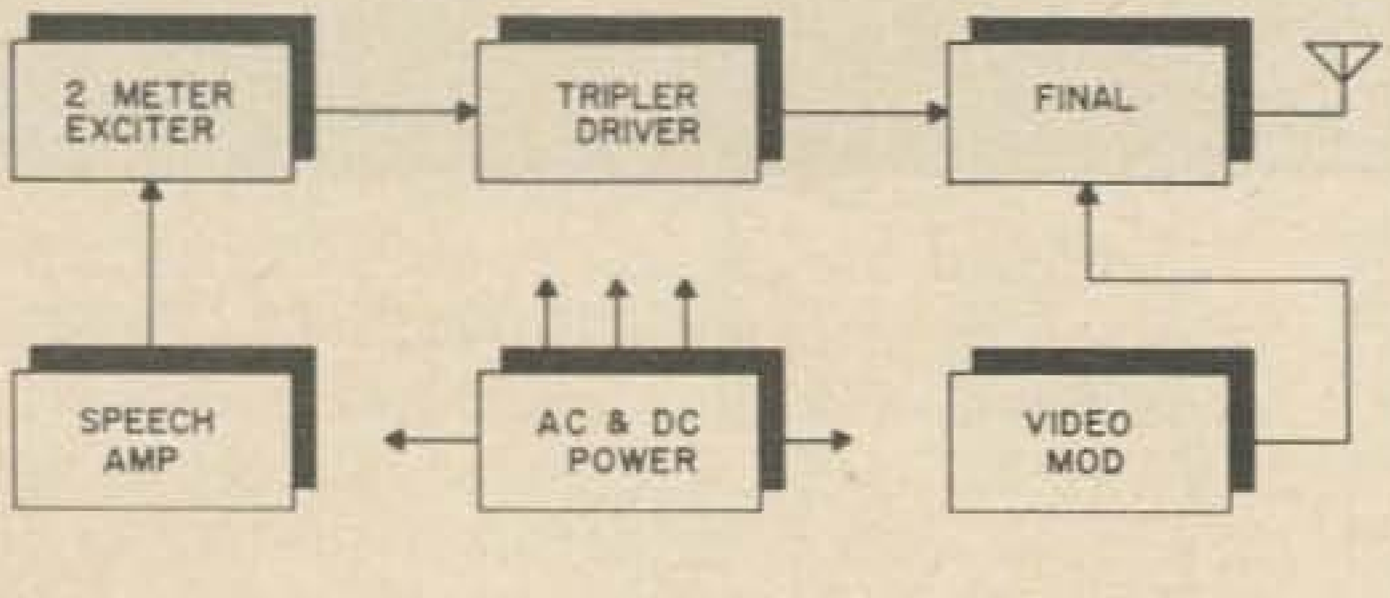


Fig. 1. Block diagram of the ATV-audio transmitter.

Exciter

Fig. 2 is the circuit of the two meter exciter. It has an output of 6 watts. Any transmitter that can deliver 5 to 10 watts of two meter FM can be used. The oscillator is a 6BA6 colpitts. The screen is bypassed for RF, but not for audio. C4 and R15 is the de-emphasis network. Adjusting R15 will affect the bandwidth. Note that C4 and R15 are shown in both **Figs. 2** and **5** as you can put them in either chassis. Initial adjustment was with a grid dip meter. Final tune-up used a power output meter.

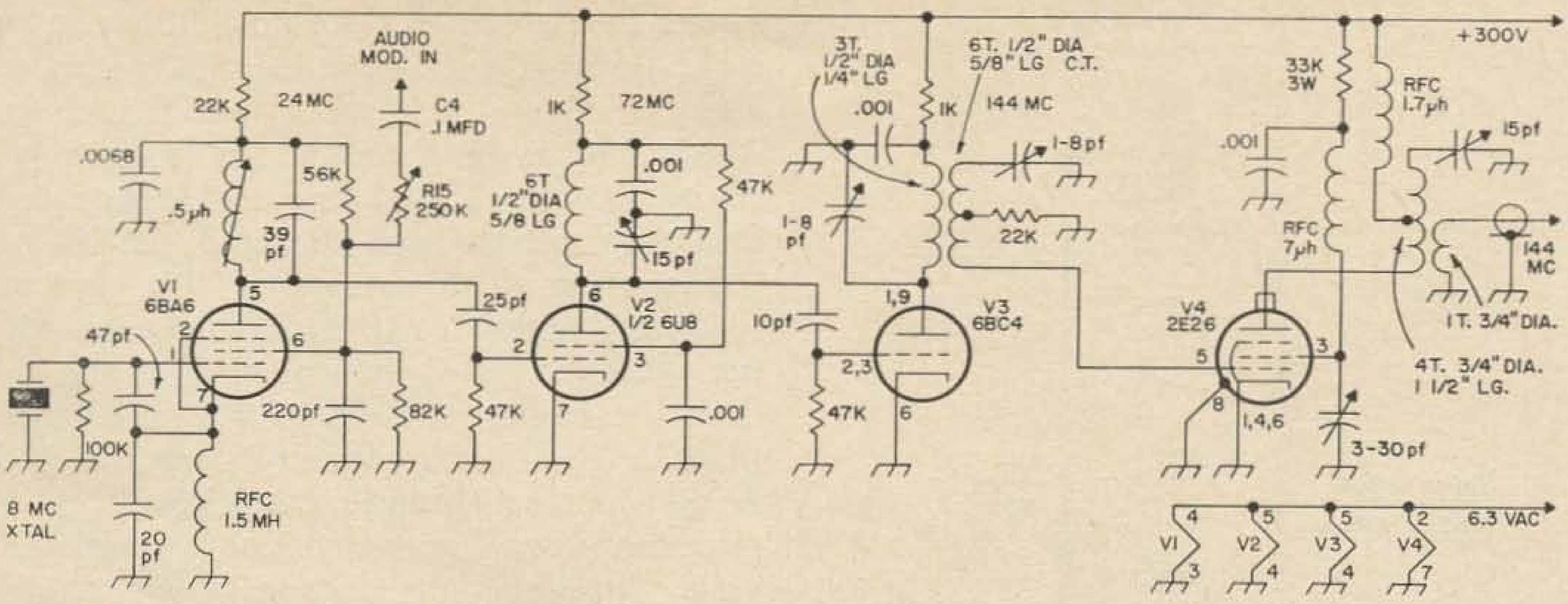


Fig. 2. Two meter FM exciter.

Tripler-Driver

The grounded grid tripler to 432 mc and the grounded grid driver shown in **Fig. 3** use surplus cavities from the ARC-12. These cavities, which use 2C39's, originally operated from 200 to 390 mc, but can operate on 432 with little work. The cavities are about 2½ in. square by 5 in. long. Drive is to the cathodes. Output is from coupling loops in the plate circuits.

First thing to do in modifying these units is to remove the variable capacitors which were mounted externally. Also remove the brackets and hardware for these capacitors and shaft mounts. In the middle of the grid cavities are capacitors which should be removed. The first cavity input circuit is tuned to 144 mc with a three turn half finch coil of thin copper tubing. Adjust C3 for minimum SWR. The second cathode is fed through a short length of coax. On both of the coils the tubing ends at the 2C39 cathodes and heater contacts. Use separate filament transformers for each 2C39. At the center of each cavity, add a disc capacitor. These capacitors are 1/16 inch brass 1 inch in diameter. 10/32 screws 2 inches long are attached to the capacitors and 10/32 nuts are soldered to the cavity walls. The 2C39's are held in place with finger stock on the plate end of the mounting brackets. Mylar discs insulate the plate mounting brackets from the cavities. Forced air cooling of the 2C39's is necessary.

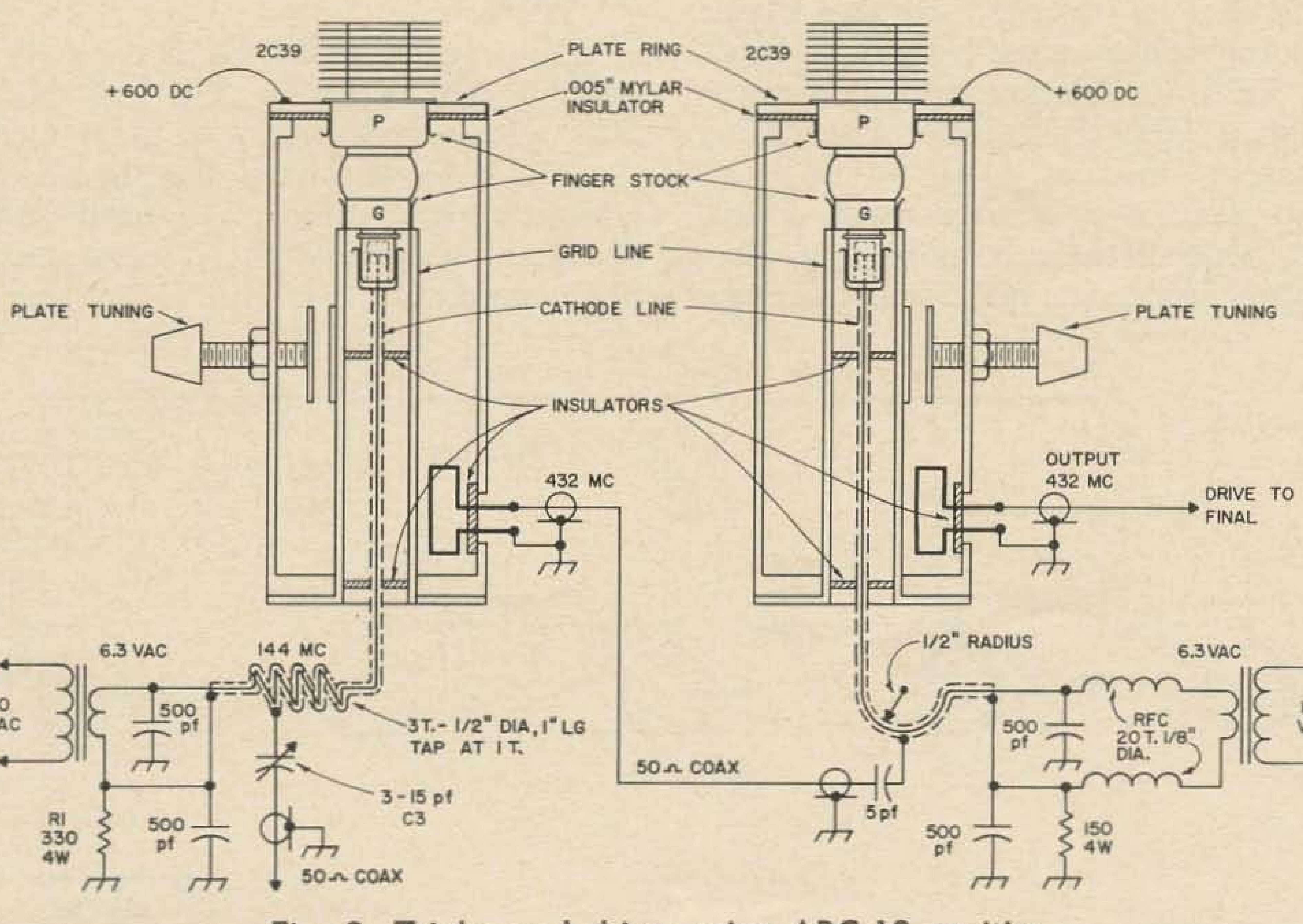


Fig. 3. Tripler and driver using ARC-12 cavities.

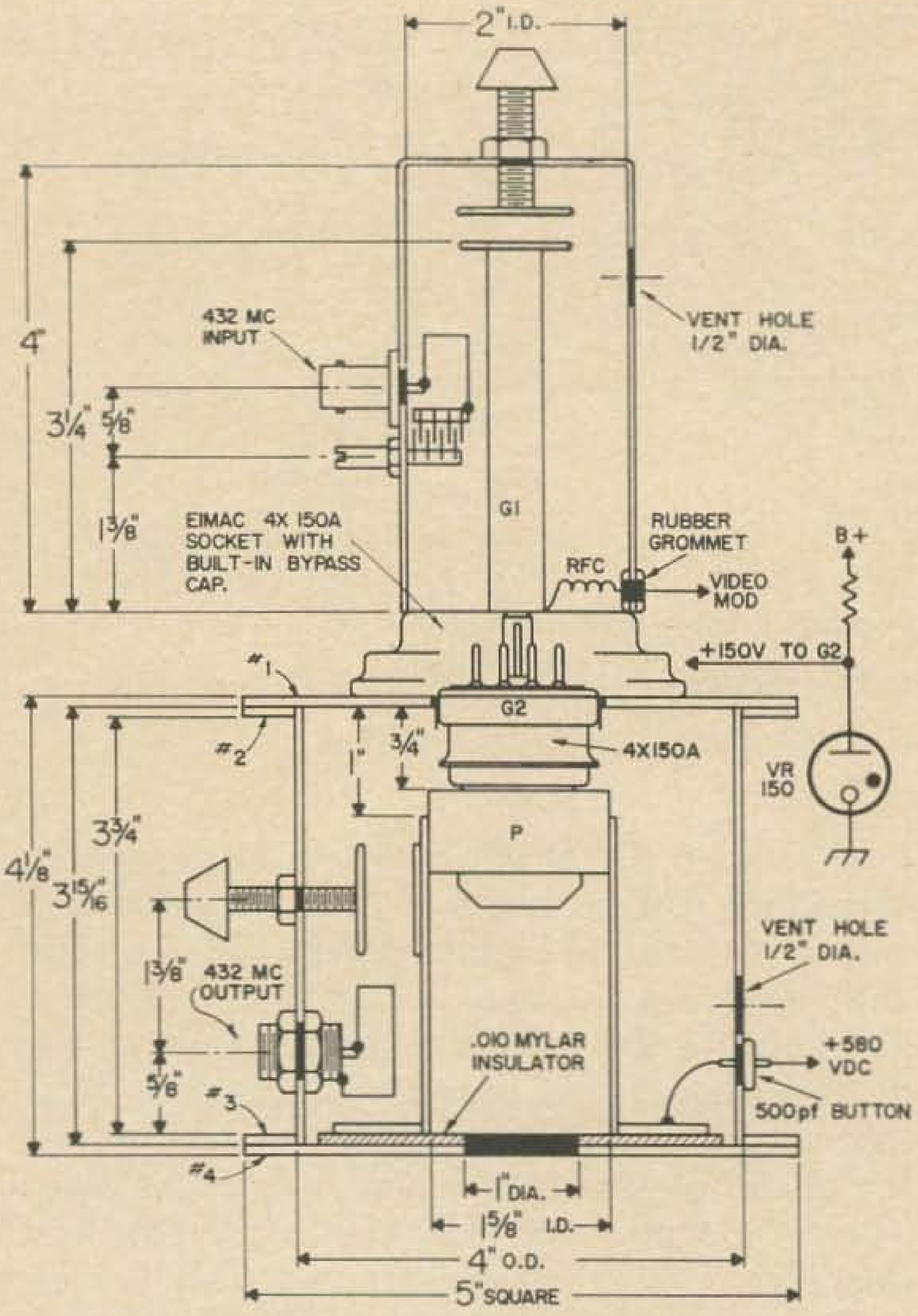


Fig. 4. 4X150A 432 mc final amplifier.

4X150A Final

The 4X150A final is shown in **Fig. 4.** RF input is to the half wave grid cavity through a loop with a series matching capacitor. The ⅜ inch grid line is fastened to the Eimac 4X150A socket grid terminal by a 6/32 headless screw. Video modulation is applied to the grid through a UHF RF choke. The tuning capacitors are 1¼ in discs.

The plate tank is a quarter wave coaxial cavity. The plate of the tube is held in place by the slotted undersize plate line. A mylar spacer insulates the plate post from the cavity wall. Both grid and plate cavities are ventilated for forced air cooling which is essential. Air is blown in through the bottom (plate) cavity, passes through the socket and cooling fins, then out through the grid vent holes.

Mounting plate number 1 is secured to mounting plate 2 with 6/32 hardware. Mounting plates 2 and 3 are soldered to the 4 inch diameter cavity wall. Plate 4 is also bolted to plate 3. The tuning capacitors are 1 inch discs. A 500 pf feedthrough capacitor is mounted near the ground end of the cavity and the 580 volts variable plate voltage is fed through it to the plate line. The output link is adjustable and may be rotated for optimum loading and matching.

The screen voltage is 150 volts regulated. The socket has a built-in screen bypass. The cathode pins of the tube are grounded by the socket.

Speech amplifier

The schematic of the speech amplifier is given in **Fig. 5.** It is a fairly ordinary amplifier with clipping and filtering for best results. Extensive shielding was necessary. The output transformer is 2:1 and is loaded with a damping resistor. R4 is the clipping level control and R12 the amplitude (hence deviation) control. The deviation control is adjusted on the air by feeding in audio until sound bars are noticed, then backing off a bit.

Results

Much credit for the 4X150A cavity goes to W8RQI and W8JLQ. We had been using 2C39's for a long time with great success, but the 4X150A's improved the signals very significantly. Incidentally, we used surplus reflectometers for output measurements and SWR checks.

. . . W8VCO

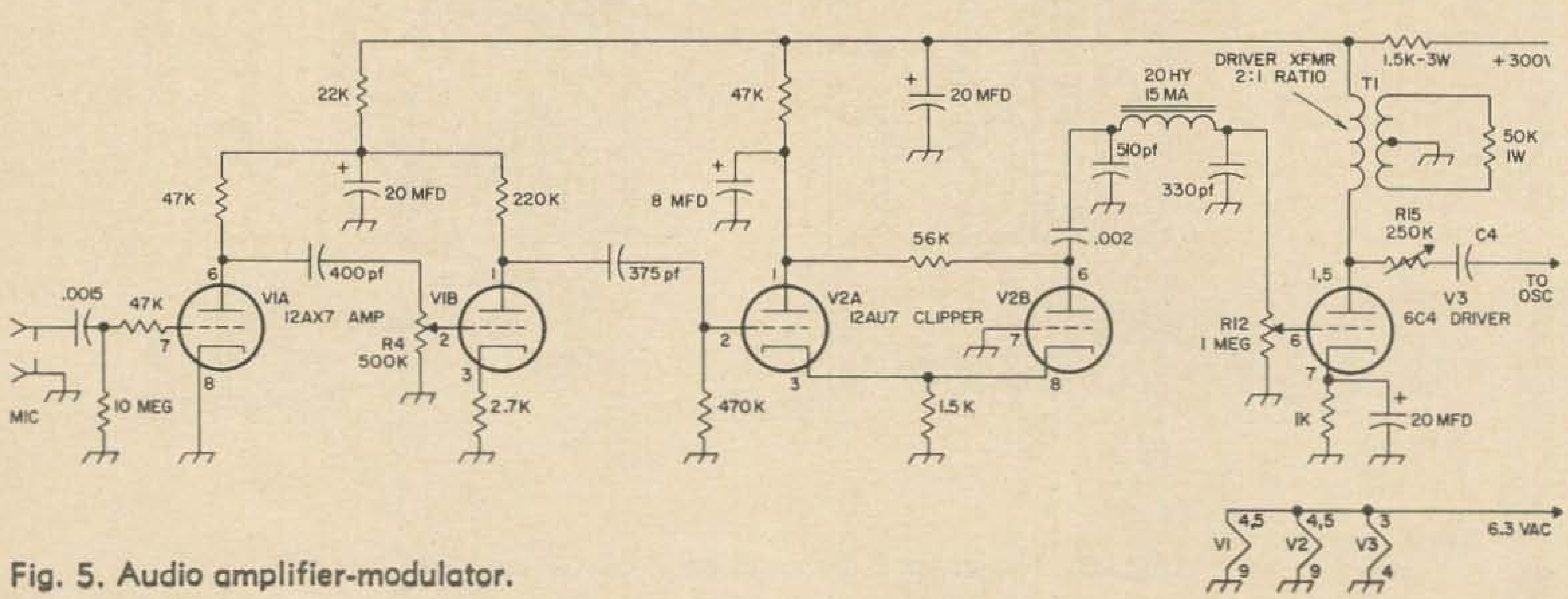


Fig. 5. Audio amplifier-modulator.

Katashi Nose KH6IJ
Physics Department
University of Hawaii
Honolulu, Hawaii

An Inexpensive Hybrid Phone Patch

Commercially built amateur hybrid phone patches cost from $25 to $50. A compromise homemade one can be built from junk-box components, and even if parts are bought new, should not cost over $7.00.

By using a hybrid phone patch there is no need for switching from send to receive position, and when used in conjunction with VOX, makes possible a telephone style conversation. It can be used in the conventional manner with manual switching.

Fig. 1 shows a typical bridge connection. When the bridge is balanced:

$$\frac{Z_1}{Z_2} = \frac{Z_c}{Z_t}$$

Where:

Z_1, Z_2 = any impedance
Z_c = compensating impedance
Z_t = telephone line impedance

Voltages appearing across similarly numbered impedances are:

$$\frac{V_1}{V_2} = \frac{V_c}{V_t}$$

Any voltage V_{in} (receiver output) impressed across Z_1, Z_2 does not appear at T_1 (mike input) since it is connected across points of equal potential. However, part of V_{in} appears across Z_t (telephone line) since it is one leg of the bridge. This condition fulfills feeding receiver output into telephone line and at the same time keeping the signal out of the mike input.

When voltage V_t is developed across Z_t (telephone talks up), part of this voltage appears across T_1 (mike input) and V_{in} (receiver output). The condition is fulfilled for feeding telephone signal into microphone input. Voltage appearing across the receiver output is immaterial because the receiver is inoperative when the microphone is energized.

Z_c is used to approximate the impedance of a telephone line (nominally 500 ohms) and

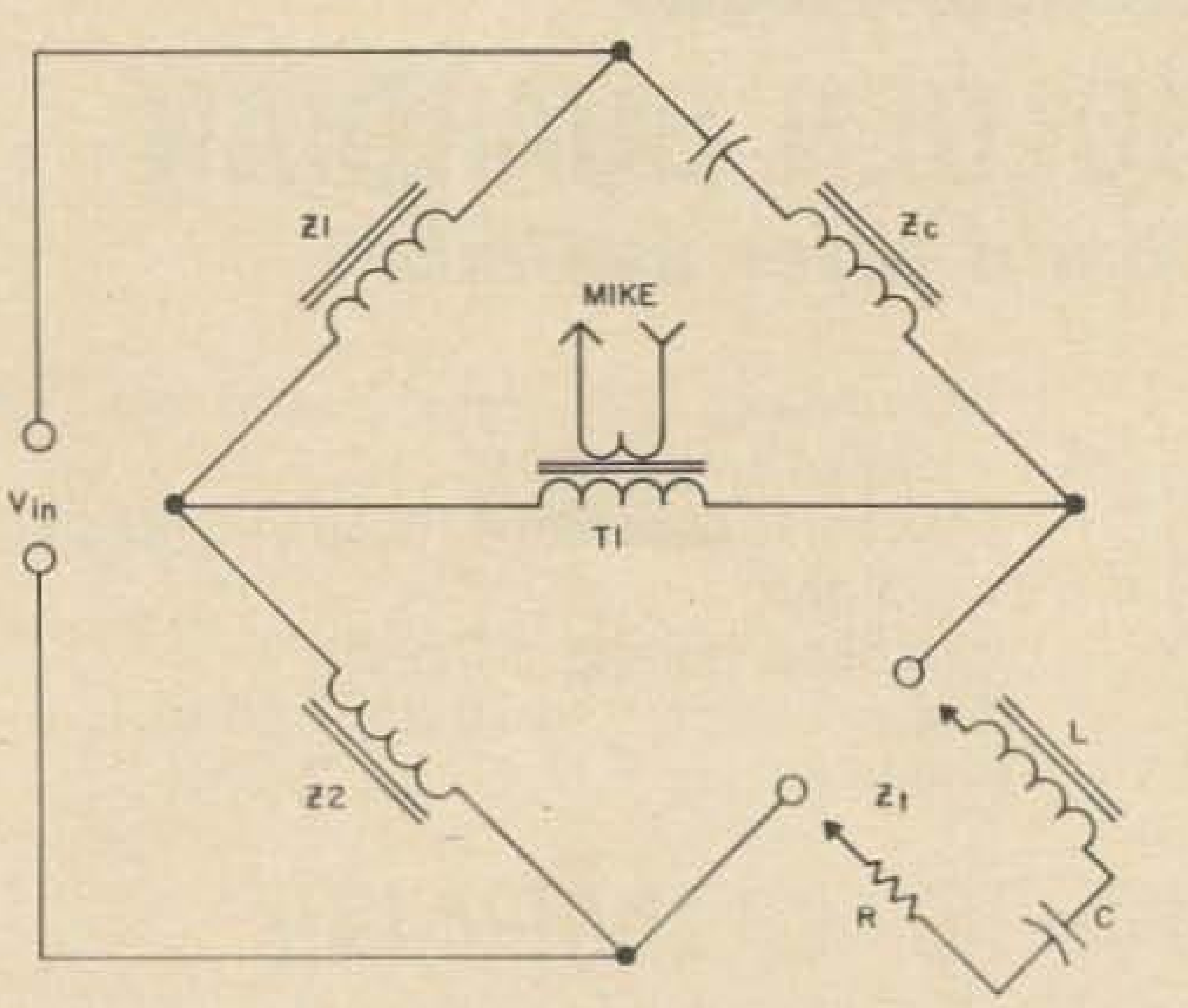


Fig. 1. Typical bridge connection.

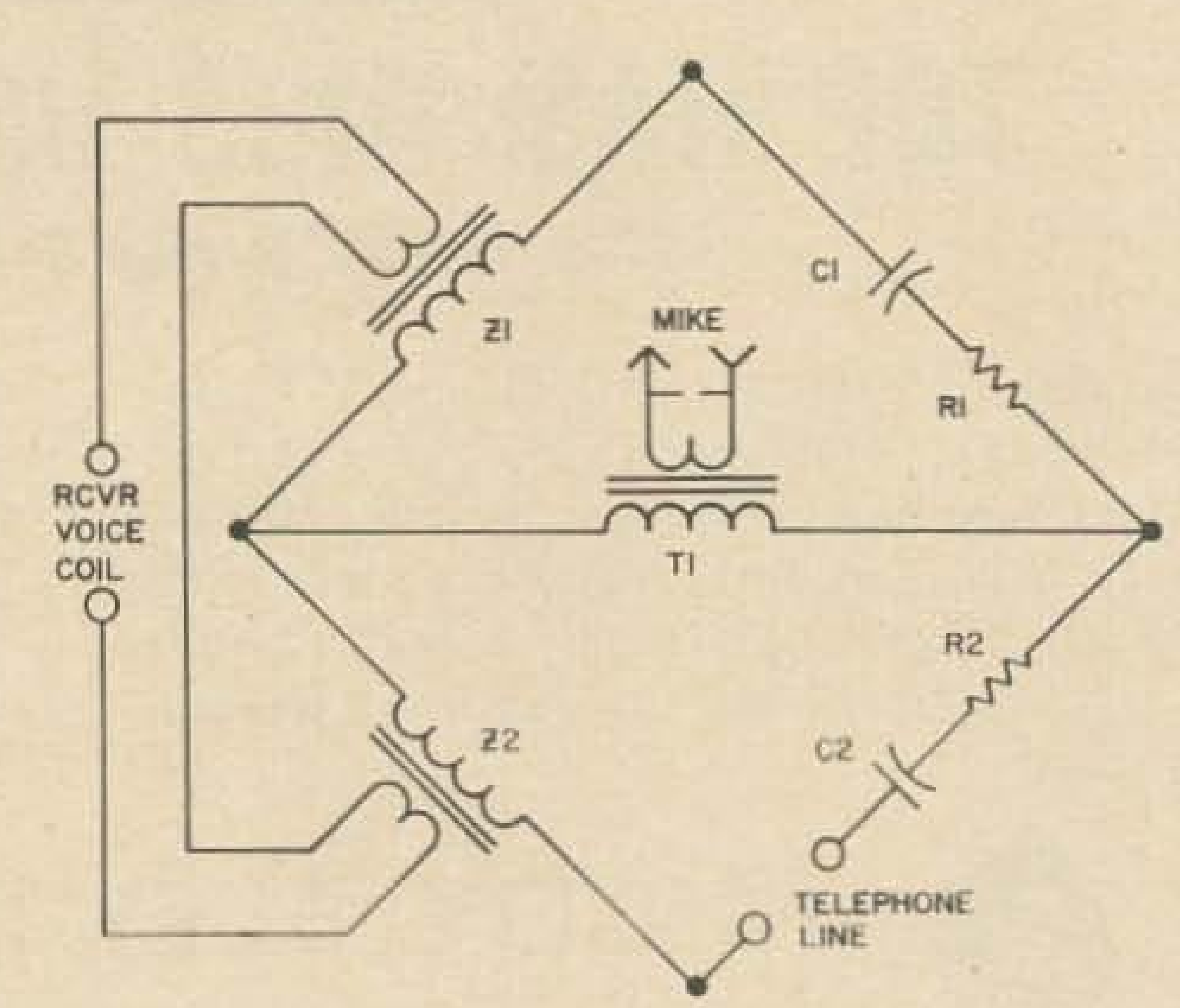


Fig. 2. Evolutionary bridge circuit.

in theory should be compensated for by adjustment of a LCR network.

So far so good, but there are difficulties. For one thing, Z is frequency conscious, and furthermore we are dealing with a complex voice waveform, not a single tone. Resonances occur, line levels vary, telephone line impedances change, resulting in all sorts of voltage and impedance excursions, all of which plays hob with the desired isolation of V_{in} from mike input.

However, a practical circuit embodying the above principles works out surprisingly well and is simple to adjust, requiring only your receiver and a pair of headphones.

An evolutionary diagram is shown in **Fig. 2** and **Fig. 3** shows practical circuitry. Load compensator Z_c degenerates into a variable resistor R_2 which is split into two sections and serves as a simple isolation and matching pad. Considerable loss in audio gain occurs by this arrangement, but we have gain to burn.

Condenser C_2 is to prevent a short across the telephone line to prevent interference with ringing and dialing. Coupling condenser C_2 and compensating condenser C_1 are smaller than the usual value.

Increasing this capacity to get a lower cutoff is not worth the sacrifice in compactness. This small capacity, together with the interposition of R_2, makes for lighter loading of the telephone line, something your phone company will appreciate.

The photo shows components built into a minibox 2" x 3" x 3½", somewhat of a tight squeeze. Receiver output is fed to Z_1 and Z_2 through the voice coil winding of a cheap pushpull replacement output transformer (T_2) which is hooked in series with the station loudspeaker. If more volume in the loudspeaker is desired, the two units can be paralleled, but the series connection was found to be more satisfactory acoustically. It is assumed that the receiver has a built-in muting system, either mechanical or electrical.

The patch is plugged into the mike plug of the transmitter. Don't be alarmed at the idea of using a "low impedance" transformer as a microphone transformer. One hears so much about "proper" transformers to "match the input impedance of the tube." A high impedance transformer is usually used in this position. Transformers which can be used in this application are hard to come by and unless you are willing to pay the price of a "triple shielded Linear Standard" broadcast service unit, you might as well forget the idea.

This quest for gain and quality is what makes necessary, the usual rf chokes, by-pass condensers, shielding and other anti-feedback and hum bucking measures. By using an output transformer or even a power transformer, your feedback and hum troubles are minimized. The gain is reduced and the frequency range is restricted, but we have gain to burn ("O" db line to −55 db mike input), and moreover who ever heard of a high fidelity telephone.

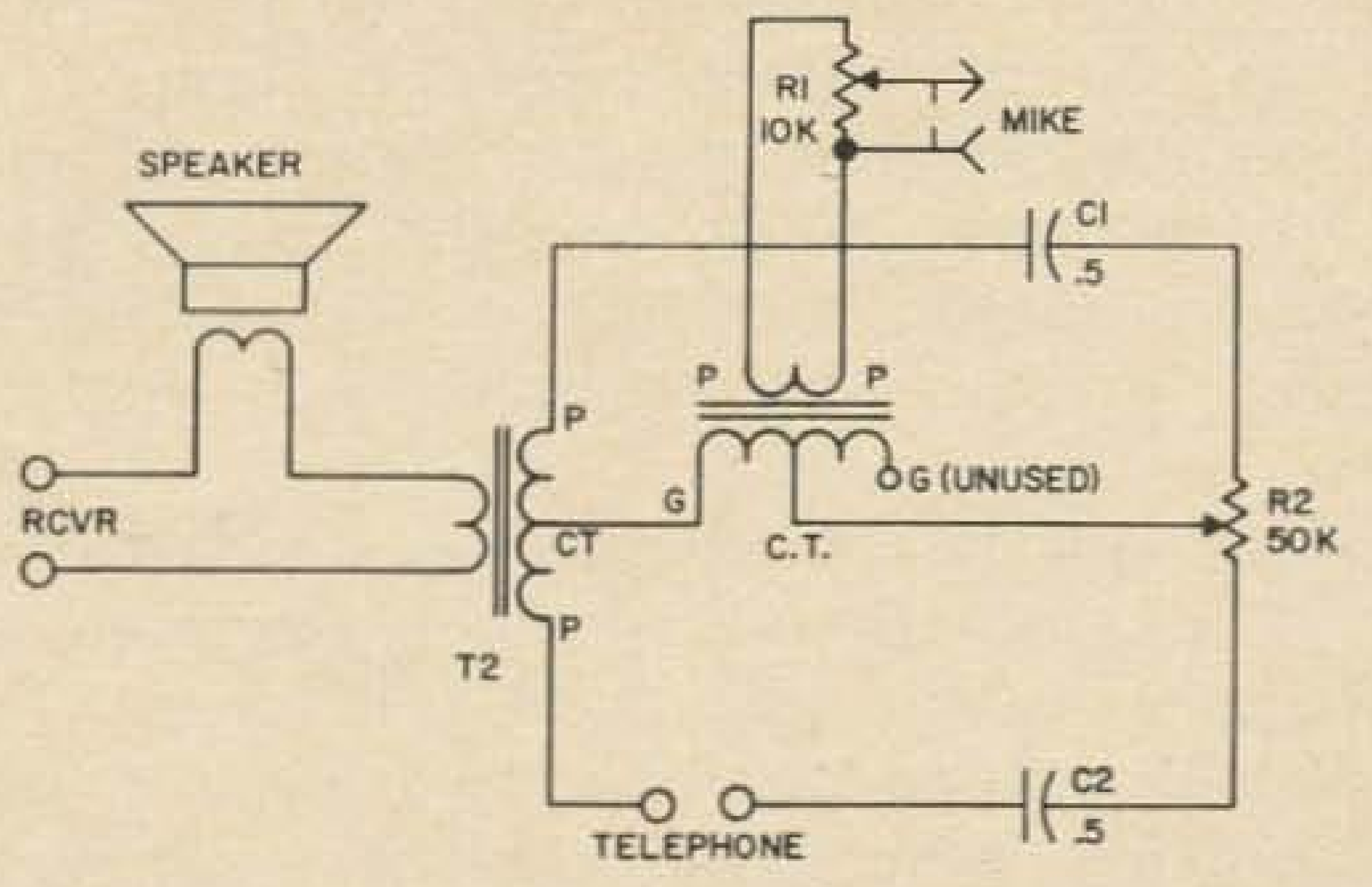


Fig. 3. Circuit of phone patch. T1 is a 1:2 ratio interstage transformer such as Stancor A52C. T2 is an PP plates to VC output transformer such as Stancor A3856.

Connection to the telephone line is made by means of two alligator clips in nicks made on the telephone line at two widely separated points (**Fig. 4**). You can even give a quick yank if you want to disconnect the patch in a hurry.

Don't expect a hybrid patch to work like a manual patch wherein you can feed as much audio as you want coming and going. By the way, you will be hearing from the telephone company if you pump too much audio into the line.

As with other hybrid phone patches, this one works best on clean lines with a minimum of hum and a reasonably good signal to noise ratio. Overall voice level is governed by the person on the other end of the line. If he

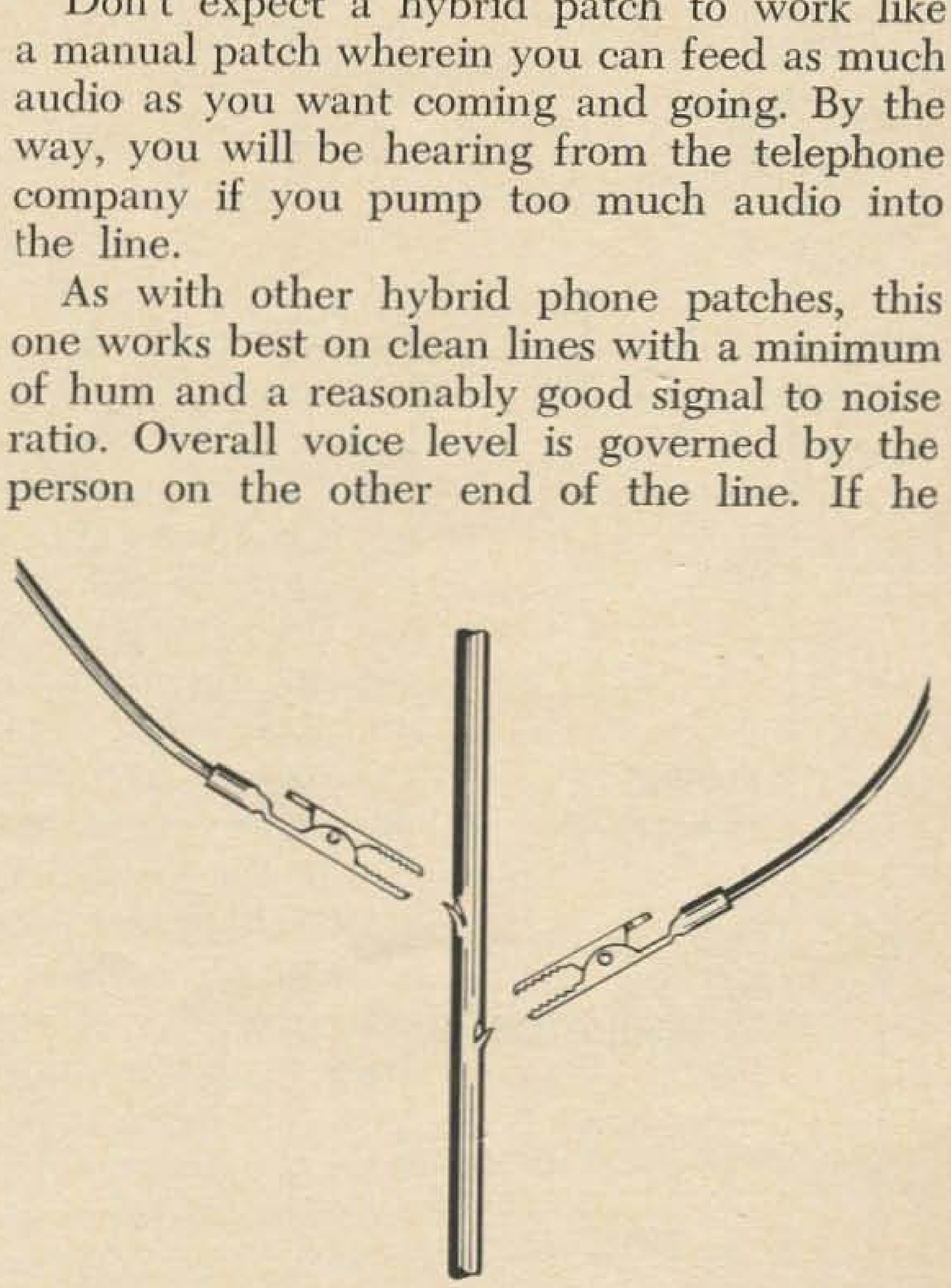


Fig. 4. A method of tapping the phone line without cutting the wires.

talks up loud, you can in turn feedback more receiver output to him and vice versa.

Isolation between receiver output and mike input averages 35 db at 1000 cycles to a maximum of 45 db at 3000 cycles and can be peaked anywhere between 500 and 4000 cycles.

Hook on the telephone line, feed a 1000 cycle tone into T_2 and adjust R_2 for minimum voltage across the mike input as determined by a pair of headphones. If a 1000 cycle tone is unavailable, tune in on a mess of 20 meter AM heterodynes or WWV and adjust for minimum headphone output. Peaking at 1000 cycles is a compromise. Better isolation is had at 2500 cycle peaking but then isolation below 1000 cycles suffers.

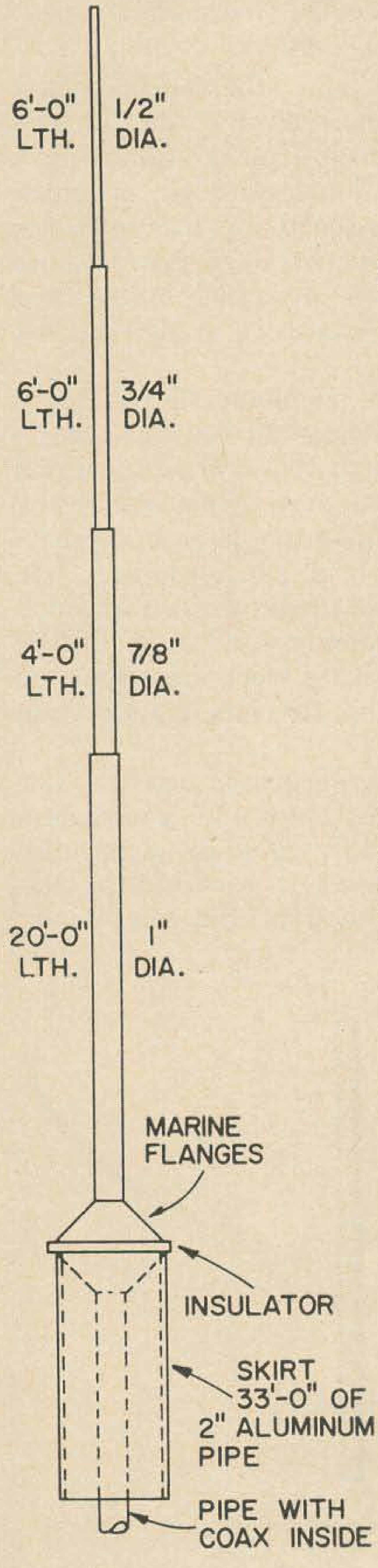
Nulling of R_2 is fairly critical but is done only once and holds for a long time unless adjustments are accidentally thrown off. Adjust mike input pot R_1 so that the VOX works when modulating normally. Too much mike gain actuates the VOX continuously and prevents feeding of high level audio from the receiver back into the telephone line.

. . . KH6IJ

Angel Fernandez W2NQS
2017 Homecrest Avenue
Brooklyn, New York

The Landlord's Delight:

A Coaxial Antenna for Twenty



Some time ago I was forced to QRT because my landlord wouldn't let me install a beam or a half wave dipole on the roof. In desperation I came across the coaxial, or hypodermic, antenna. Many hams aren't too well acquainted with it, but it is basically nothing more than a vertical dipole. It is an excellent antenna for DX because it has a very low angle of radiation and also radiates equally well in all directions.

I immediately decided to figure out the dimensions for a coaxial antenna for twenty meters. I presented these figures to my landlord and I explained to him that this antenna would not take up more than one-half of a cubic foot of space on the roof. To my surprise, he agreed to let me install the antenna. I know that many of you who live in apartment houses are troubled by similar situations.

Matching the antenna is no problem at all for the impedance is close to 50Ω. Close proximity to other objects has little effect on the characteristics of the antenna. Neither has height. The only drawback to this coaxial antenna is that it is a one-band affair. However, you can build two or more for different bands using the formula, total length = 470/frequency, where the length is in feet and the frequency is in megacycles.

With this antenna, you can achieve an excellent match and work out well. So why not try the coaxial?

. . . W2NQS

THINK SMALL...

PERFORM BIG!

GO GONSET *Sidewinder 2 Mtr.*

Here's coverage of the entire 2 meter band in four, one megacycle segments, operation on SSB, AM, or CW, and all packaged in a sharp little chassis only 9" wide, 5" high and 7$\frac{3}{16}$" deep.

The Gonset Sidewinder 2 meter transceiver is so compact that it's ideal for mobile as well as fixed station application. Separate 117 VAC and 12 V DC solid state power supplies snap on to the rear of chassis, or may be remotely positioned to simplify installation.

And look at some of the features Gonset builds in to provide top performance: complete push-to-talk operation, full 20 watts P.E.P. input, crystal lattic filtering, vernier tuning, transistors at primary stages, stabilized VFO and high-sensitivity reception.

SPECIFICATIONS*

Frequency Range	143.975 to 148.025 MC
Modes of Operation	AM, SSB, CW
Carrier Suppression	50 db
Sensitivity	$0.5\mu v$ for 10 db $\frac{S+N}{N}$
Selectivity	3.1 KC crystal bandpass filter
Output impedance	50 ohms
Audio Output	2.5 watts into 3.2 ohms
Antenna Input Impedance	50 ohms unbalanced

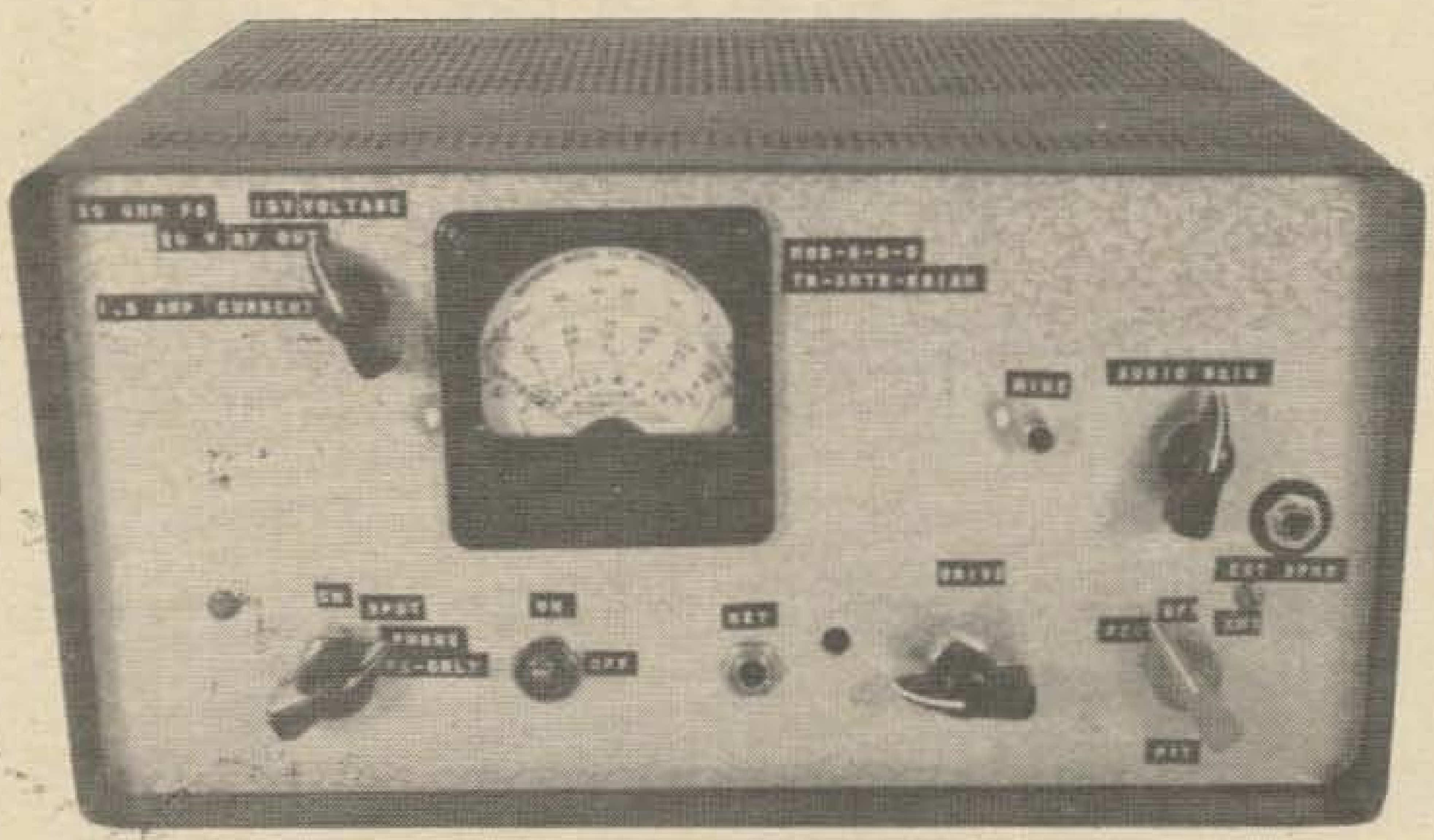
NEW* – from GONSET

- Two new power amplifiers—model 903A for 2-meter, model 913A for 6-meter
- The GSB-201 Linear Amplifier—provides 2000 watts PEP(SSB) for 10 to 80 meter operation
- Gonset Sidewinder 6-meter SSB-AM-CW Transceiver with all the features of the 2-meter.

* Complete descriptions and specifications on all Gonset equipment is yours for the asking. Write to Dept. 73-7.

GONSET, INC.
A Subsidiary of LTV Ling Altec, Inc.
1515 South Manchester Avenue, Anaheim, California

William Tyrrell K9IAH
5845 South Mobile
Chicago, Illinois



6 Solid Watts on 160

If you would like to be one of the first hams in your area to go on the air with a home-brew transistor transmitter, this rig should appeal to you. It operates on the increasingly popular 160 meter band where TVI is no problem, and the average builder will have no troubles with feedback or neutralization. This rig is economical (a full set of RF transistors and audio transformers costs less than seventeen dollars), easy to build, and features conservative cool running design.

Other advantages of the rig are zero standby current, instant warmup, portability, 30% or more overall efficiency, no need for a high voltage supply, and the added bonus of having a 5 watt portable public address system available.

The signal is only 1½ to 2½ S units down compared to a 50 watt tube type rig on the other fellow's receiver. Good ground-wave coverage is obtained here in the city on phone, and more than once I could sense an upraised eyebrow when I reported the station power as two watts. On CW, Canada and nearby states have been worked with ease.

Circuit description

Four basic units comprise the transmitter. One is the chassis/panel assembly containing switching and metering, and serving as a mount for the three sub-assemblies. One of the subassemblies is the complete audio section, and the other two are RF sections. One of the RF sections is the final RF transistor and its heat sink; the other consists of a Pierce crystal oscillator, the grounded base buffer/driver, and RF final tank circuit components.

The audio section has two amplifiers, a driver, and a push-pull class B final, used either as the modulator, or, in the public address mode, as an audio output stage.

The RF sections all have slug-tuned, fixed frequency coils, since operation is at the one crystal frequency. Over 95% modulation is obtained by modulating the buffer/driver along with the final, rather than the usual method of modulating the final stage only, with its resultant 80 to 85% usual modulation limit. Link coupling is used throughout.

PTT (push to talk) is accomplished by SW2 serving as an on/off, antenna transfer, and receiver muting switch. Mode of operation is determined by SW3 for CW, Phone, Spot, or Public Address operation. Meter versatility is provided by SW1, to measure DC input voltage (0-20v), DC input current (0-1 amp), or RF rms output voltage (0-20v).

The power supply can be any well filtered DC source of 11 to 14 volts at 1 ampere. The author uses surplus four amp/hr Ni-Cad batteries, eleven in series, to provide about 13 volts for up to ten hours of operation before requiring recharging.

The silicon diodes connected back to back across the meter make it almost burnout proof, without appreciably affecting its accuracy.

Construction

Complete the chassis/panel, switching and metering assembly first. It then facilitates construction of the three sub-assemblies as each is built and tested.

The complete audio section is built on a 4" by 8" flat tin plate, and mounted flat on the top of the chassis on the far right, as viewed from the front. Q4 and Q5 are mounted on the same large heat sink, but insulated from it by mica insulators. Q1, Q2 and Q3 do not need heat sinks. All audio components are mounted on this plate except the mike input jack, gain control R8, and the external speaker jack.

The RF final transistor, Q8, is mounted directly on its heat sink without any insulation, and the heat sink itself is insulated from the chassis. This section is mounted vertically in the center on top of the chassis, to the rear. Q8's base, emitter, and collector connections are brought over to the other RF section containing all other RF components.

Next assemble the other RF section on a 4" by 8" plate, and mount vertically along the far left top side of the chassis. Use in line construction, with the oscillator at the front, buffer/driver in the middle, and final tank circuit and decoupling components to the rear. The key jack and RF drive control mount on the front panel. Q6 and Q7 have fin type, press-on heat sinks.

Mounted on the rear of the chassis are the antenna input, output to receiver, output to receiver muting (grounding type), and power supply input jacks.

The photo indicates an on/off switch under the meter, and a center off position on the PTT switch. These were eliminated, as the schematic shows, because with the instant warmup inherent in transistor equipment, the PTT switch receive position becomes the off position. Also, the photo indicates different full

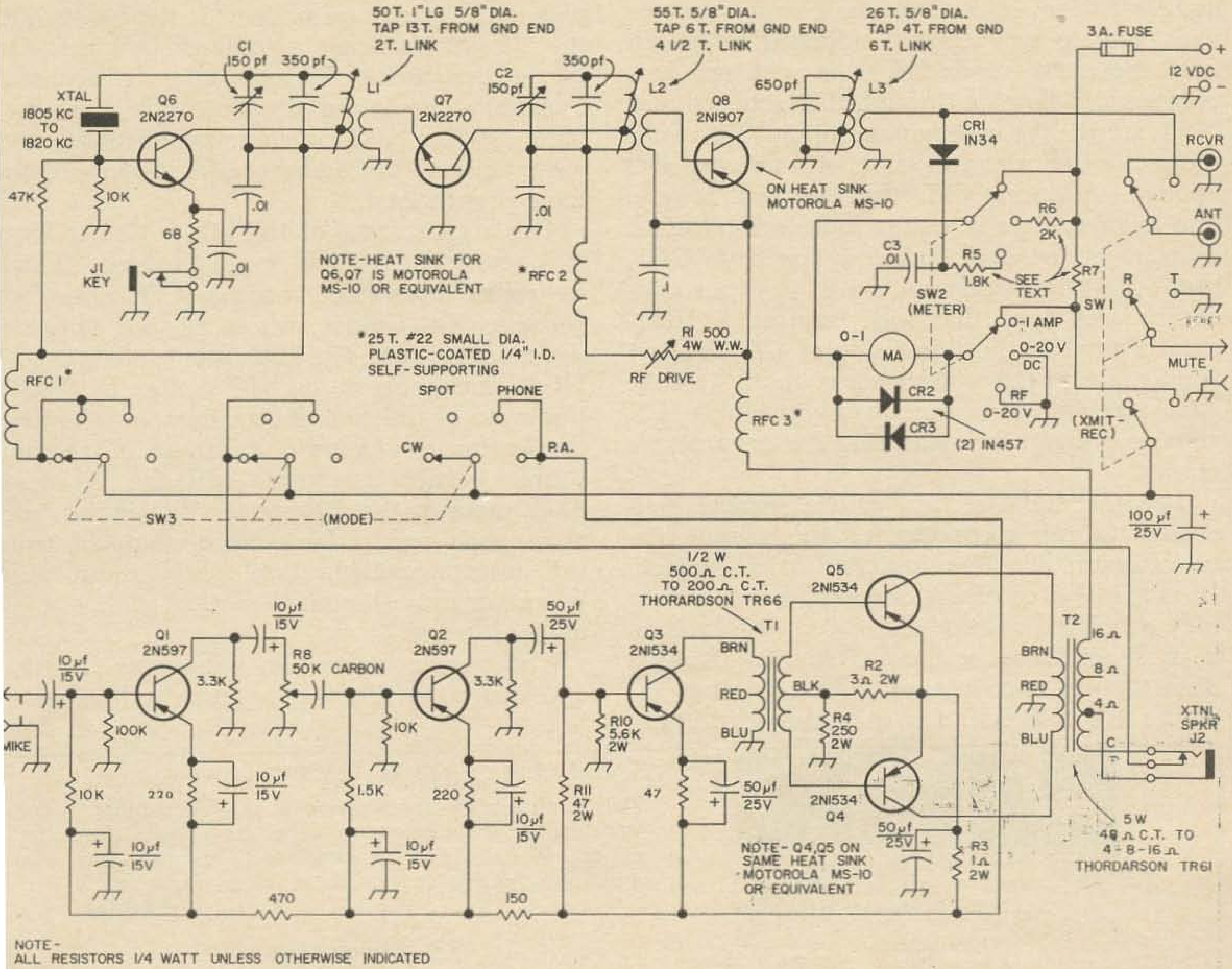
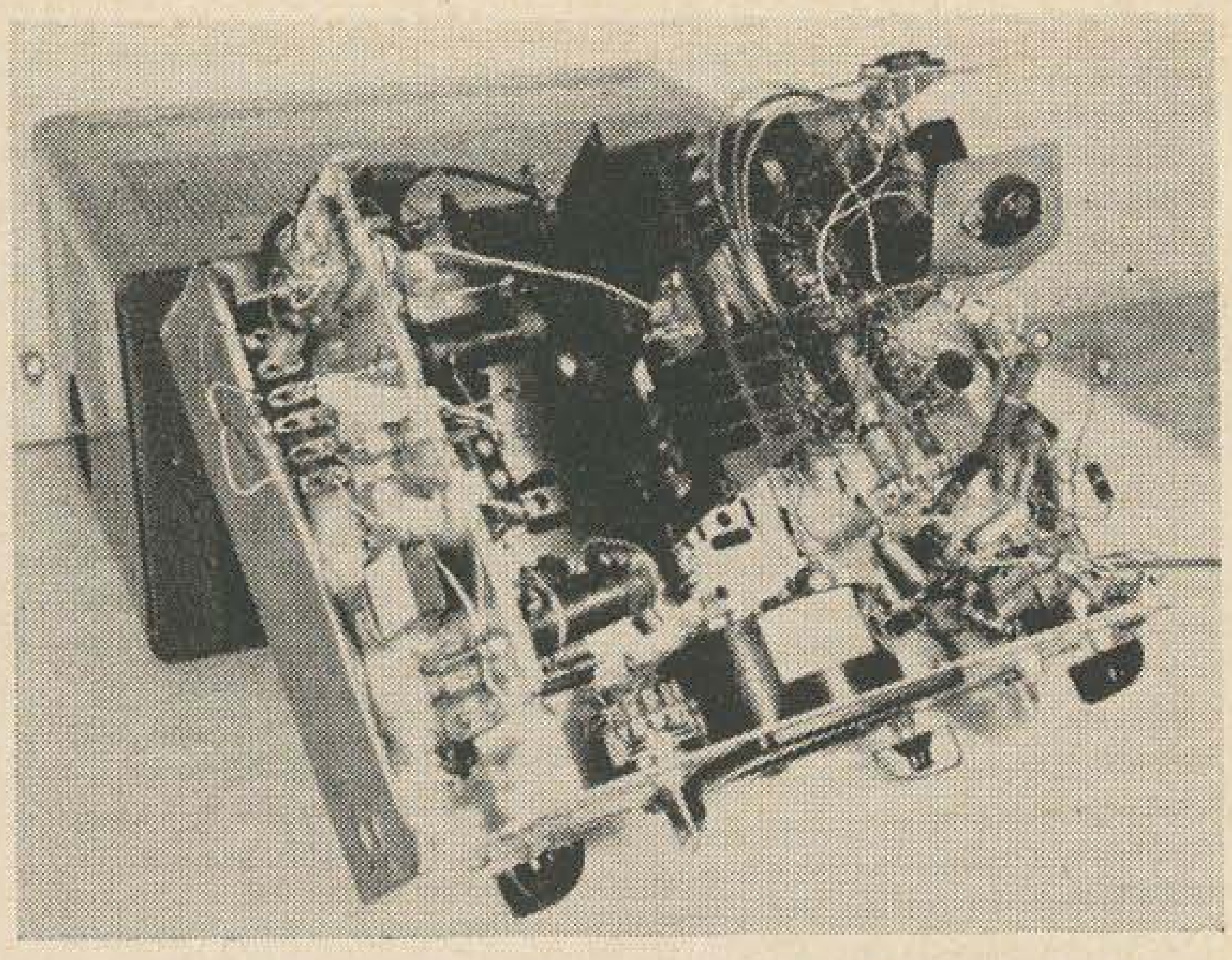


Fig. 1. 6 solid watts on 160 meters.



Neat interior construction is not all-important on 160 meters.

scale meter values, due to the scale markings already on the meter used by the author.

Use sockets for all the transistors, as it helps greatly in testing, substitution, and enables short lead surplus transistors to be used.

Testing and alignment

The meter current shunt R7 is approximately 10 feet of #28 plastic covered copper wire, jumble wound, and adjusted in length until the meter reads full scale with one ampere current flowing through the meter circuit. Next adjust the voltage multiplier R6, until the meter indicates full scale with 20 volts DC applied. Adjusting R5, the RF rms voltage multiplier resistor is a little more complicated. Disconnect the final tank coil link from CR1, shunt C3 temporarily with a 1 μf paper condensor, and apply 6.3 volts from an AC filament source to the input side of CR1. Adjust R5 to give a 6.3 volt reading on the meter. This method gives reasonably accurate RF voltage readings for measuring the transmitter's output.

Test the audio section with a speaker connected to the secondary of the modulation transformer T2. The insulated speaker jack, J2, shoud be carefully checked to be sure it isn't grounded to the chassis; it would then be a direct short for the DC supply. If audio distortion is encountered, adjust biasing resistors R4 and R10 for minimum distortion, with a total idling current of about 75 ma for the entire audio section.

Substitutions may be made to keep down the cost of building, and in fact are recommended for all parts but the three RF transistors and two audio transformers.

Next, get the RF oscillator working. The buffer and RF final will draw no current until driven by the oscillator, as they are biased beyond cutoff without signal input. All three RF coils may be grid-dipped to approximate operating frequency, while wired in, transistors in sockets, and power off. The oscillator coil must be capable of being tuned slightly below crystal frequency, so as to provide the proper inductive reactance necessary for oscillation.

After the oscillator and buffer/driver are operating properly, connect the RF final transistor to its tank circuit and peak all circuits while operating into a dummy load (a 50 ohm 2 watt carbon resistor). Keep the RF output below 4 watts (14 RF rms volts on a 50 ohm line) when on CW, and at 2 watts (10 volts) on phone. If you go above these limits, you risk exceeding the peak collector current ratings of the RF final and early transistor failure, plus non-linearity on phone. At two watts out, the RF stages draw a total of 500 ma. On phone, this rises to 750 ma on audio peaks.

Always check and double check polarities, base, emitter and collector connections, and never operate the audio or RF stages without their proper load.

One requirement of this rig is that it must look into the proper antenna load, which should be a resonant antenna of 50 ohms impedance. The author, whose city lot can't accommodate a full size 160 meter antenna, uses his 40 meter dipole on 160 meters by letting the braid of the coax feeder float, and feeding the center conductor only, from an antenna coupler, which is adjusted with the aid of an SWR meter to the proper 50 ohm impedance. Very good results have been obtained from this antenna configuration, which is probably operating as a shortened vertical with top capacity loading!

The author hopes you will enjoy building and operating this rig as much as he has.

. . . K9IAH

Another Heathkit® First...

Fully Automatic Electronic Keyer

...all solid-state switching ... built-in sidetone ... integral paddle

NO RELAYS TO CHATTER & PUNCH HOLES IN CHARACTERS ... the solid-state switching circuitry of the Heathkit HD-10 Electronic Keyer articulates crisp, clean CW characters. Speed, dot space ratio, and sidetone volume are adjustable. Each dash is three dot spaces in duration, each character of a series is separated by equal dot spaces. The built-in sidetone lets you practice off the air, lets you hear your keying as you transmit on the air. The HD-10 helps you develop a near-perfect fist.

COMBINATION CIRCUIT BOARD AND POINT-TO-POINT WIRING MAKES THE HD-10 A REAL PLEASURE TO BUILD ... its sturdy, hefty construction keeps it well planted on your operating table, even during the hottest contest hours. Plus, engineering with a practical goal in mind provided the HD-10 with full operating versatility: Use it with an external bug or straight key, with headphones for matrixed receiver audio plus sidetone, as a semi-automatic keyer, or "as is" for full automatic Electronic Keyer operation. Based on a "QST" circuit by W3OPO, the Heathkit HD-10 Electronic Keyer is "Ham Radio" through and through.

Kit HD-10, 7 lbs. **$39.95**
Provision for 230 v. 50/60 cps operation.

HD-10 SPECIFICATIONS — Keying: Keying Output: Keyed line to chassis ground. **Voltage polarity:** Negative to ground only. **Maximum open circuit or spike voltage:** 105 volts. **Key-closed voltage:** 0.2 volts, max. **Key-closed current:** 35 milliamperes, max. **GENERAL: Audio:** Internal speaker or high impedance headphone jack. **Transistor complement:** (7) 2N407 PNP; (3) 2N2712 NPN; (1) 2N398A PNP. **Controls:** Off-Operate-Hold switch; Speed control; Dot-To-Space ratio control. **Rear panel connections:** Keyed line; receiver audio; battery +45 volts; battery +22½ volts. External key options: hand key, dash arm, dash, dot. **Power requirements:** AC operation, 105-125 V. AC, 50-60 cps. Battery operation, 45 volts with 22½ V. tap; 14 milliamperes. **Dimensions:** 3¾" W x 4¼" H x 10½" D.

HEATHKIT®

FREE 1966 HEATHKIT CATALOG

See the wide array of Heathkit Amateur Radio Equipment available at tremendous do-it-yourself savings! Everything you need in "mobile" or "fixed" station gear with full descriptions and specifications . . . Send for Free copy!

HEATH COMPANY, Dept. 11-11, Benton Harbor, Michigan 49023

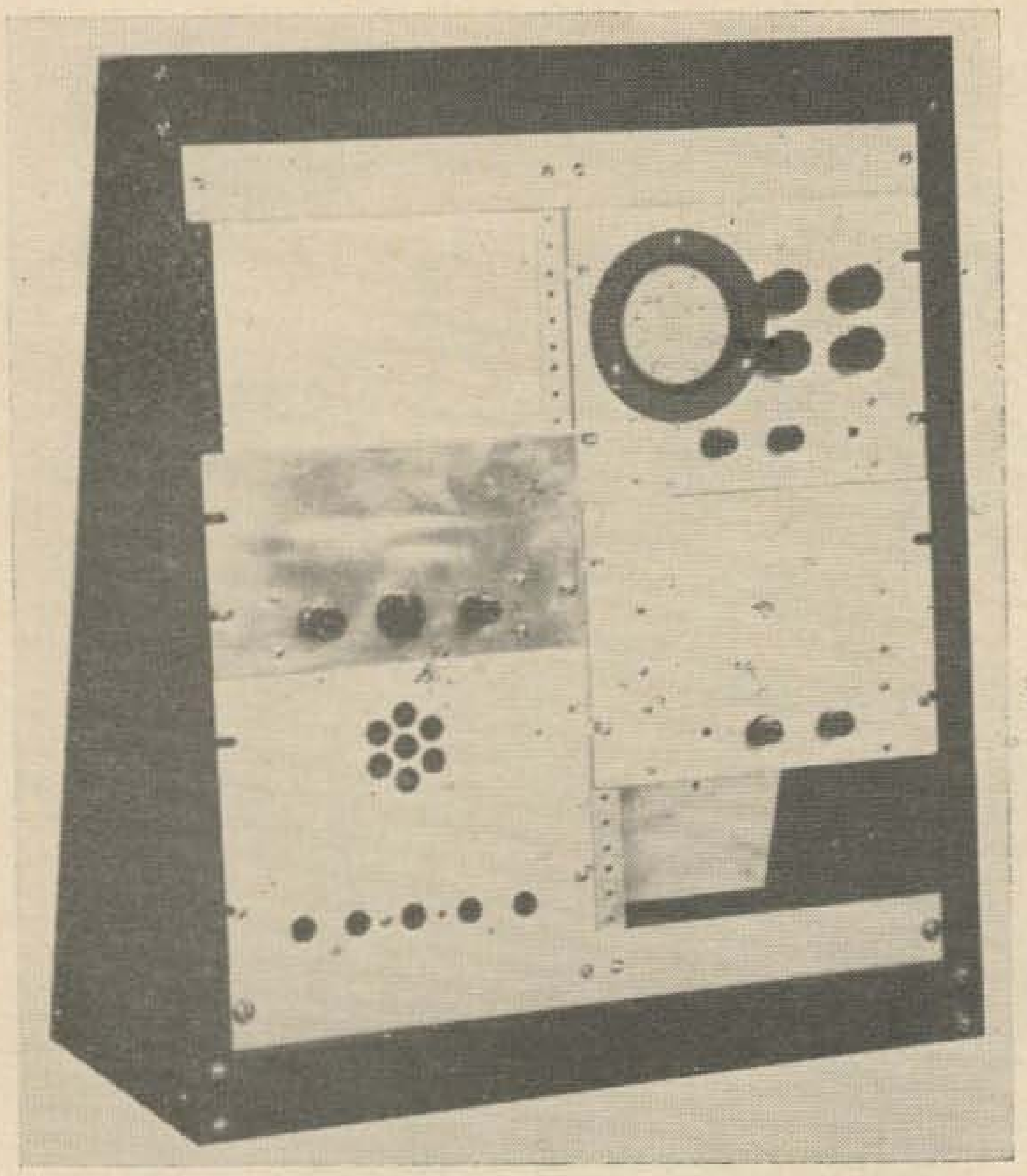
☐ Enclosed is $__________, plus shipping.
Please send model (s)__________
☐ Please send free Heathkit Catalog.

Name__________
(Please Print)

Address__________

City__________ State__________ Zip__________

Prices & specifications subject to change without notice. AM-158

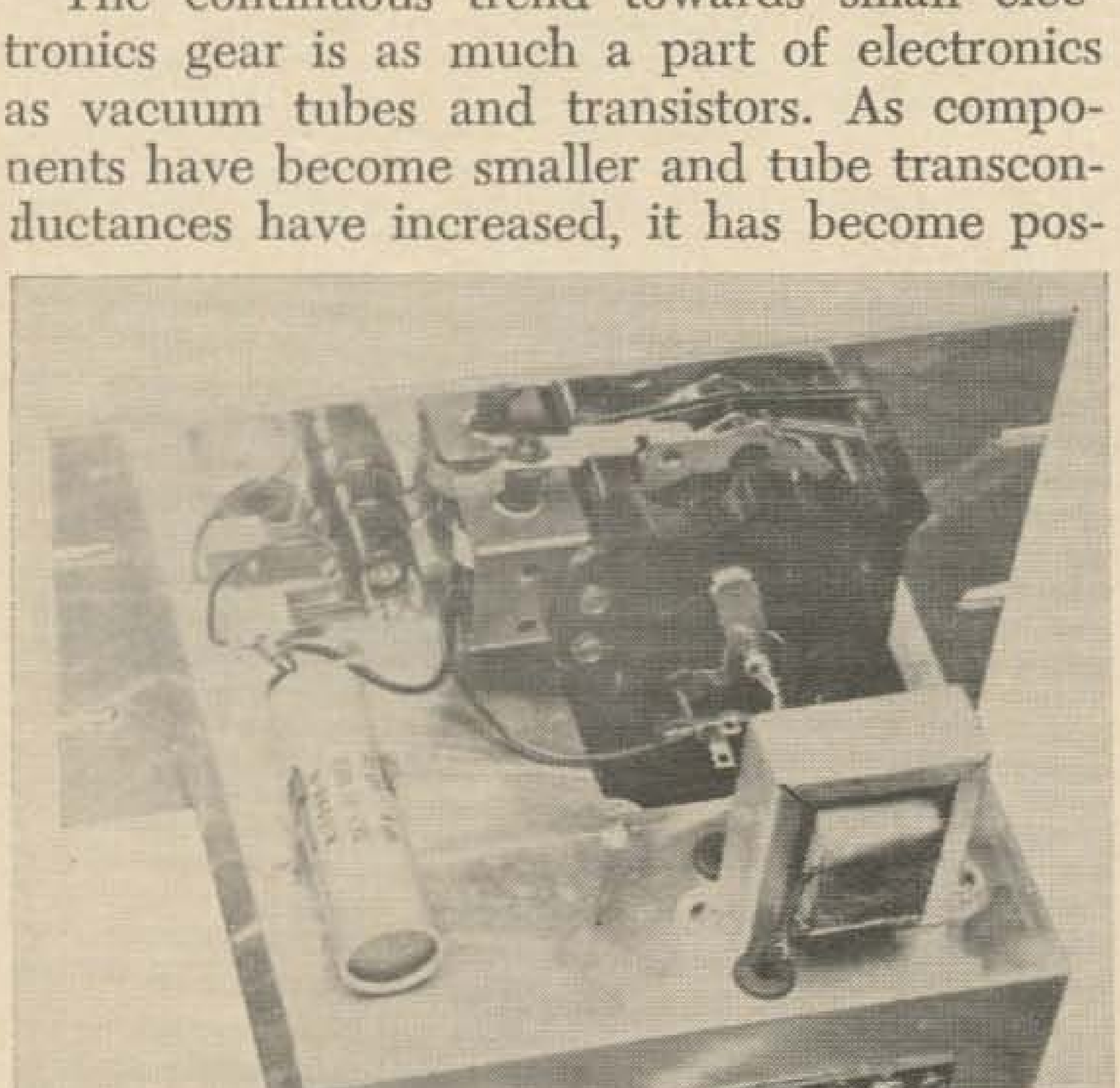


James Ashe W2DXH
Freeville, N.Y.

Half Rack Panels

Old-fashioned radio gear, back in the days of the 24A vacuum tube and the great big Majestic receivers, was large and heavy. The standard 19 inch panels, made of heavy steel with generous bracing, were often none too large to carry the load placed on them. There were—and there still are—24 inch panels to be used if the ordinary 19 inch panels cramped the builder's style.

The continuous trend towards small electronics gear is as much a part of electronics as vacuum tubes and transistors. As components have become smaller and tube transconductances have increased, it has become possible to put very impressive amounts of performance in small packages. Since the cabinet manufacturers are extremely conservative, the builder may have real difficulty in finding a suitable small mounting for his circuits.



An Alliance rotator control, remounted for incorporation into a rack.

Also, there are some very considerable advantages to reducing circuits to building-block sections and constructing these blocks to operate relatively independently. Some of these, along with examples of construction are described in Howard Burgess' article in the Feb. 1963 issue of **73.**

But the ambitious builder may find that this approach has certain mechanical and electrical limitations. Among these are 1) the small chassis do not hold enough circuitry, 2) there is no easy way to set up large arrays.

The simple solution to this is to use the relay rack system of construction, but with half-width rack panels. It is not widely known that this is a commercial standard construction. Quarter width is also standard but seems a little narrow for most purposes.

The first photo is a collection of circuits used for a lightning direction locator similar to that just described in **73** and earlier in Scientific American. The various chassis were built over a period of about two years, only one of them being built for this particular project. The scope tube chassis was derived from a radar set, the loudspeaker is one of several on hand, and a Lafayette transistor amplifier with batteries is assembled in back of one of the 1¾ inch panels. A spare panel finishes off the unused space.

The rack is a standard relay rack with no additional holes. Some aluminum angle stock was cut and drilled to adapt the rack to this style of construction. A 19 inch strip of 1¾ high angle goes across top and bottom, and a pair of ¾ x 1 verticals provides the center support.

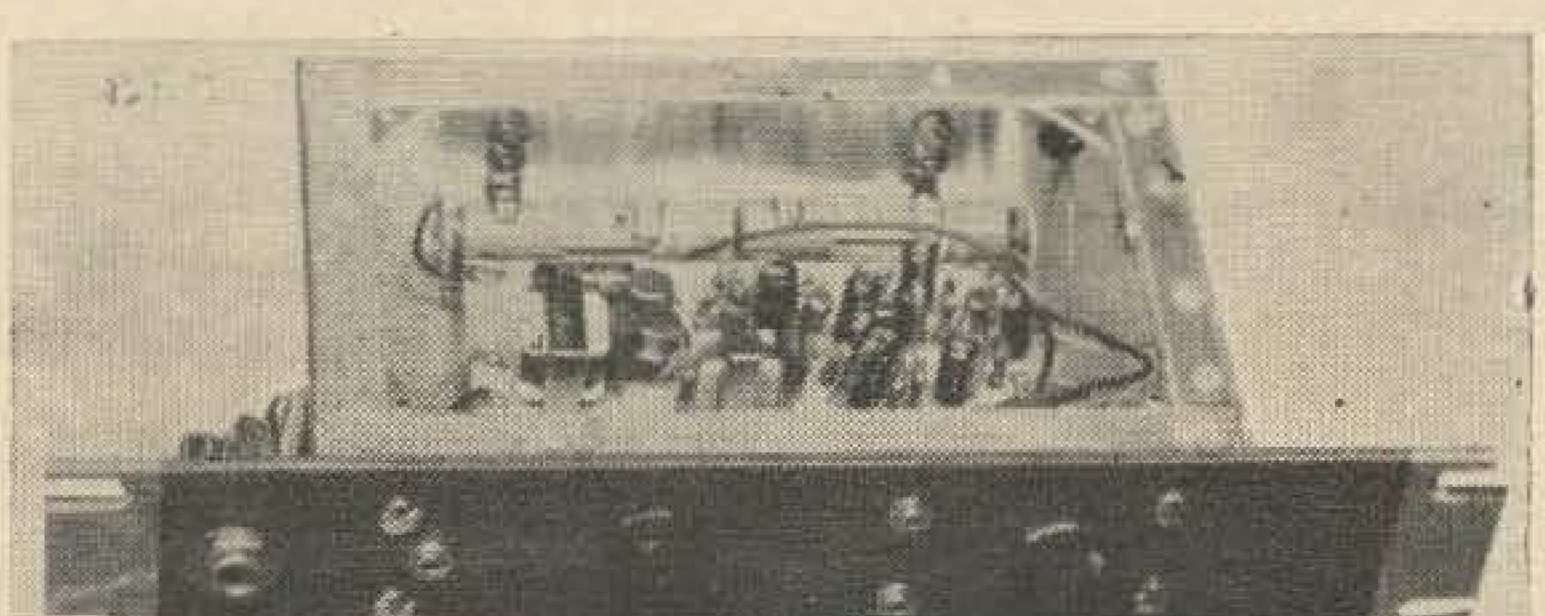
All holes are arranged according to the usual rack mounting scheme. This is an irregular spacing, ⅝, ⅝, ½ and repeat. The best way to get this in phase with the holes already in the rack is to transfer a few directly from the rack and then fit in the rest from a steel tape measure. Don't try to do it with dividers, the cumulative error will spoil the work. I drill all the holes but tap only the ones I'm using. A little oil on the tap works wonders.

The commercially available half-rack panels are not economical. They cost only a few cents less than full rack panels. One supplier gets $2.46 for an aluminum 7" half-rack panel. This is practical commercially because of the time and tools required to cut down the rack panel, but the amateur builder comes out ahead if he does the job for himself. With care a very acceptable job can be done.

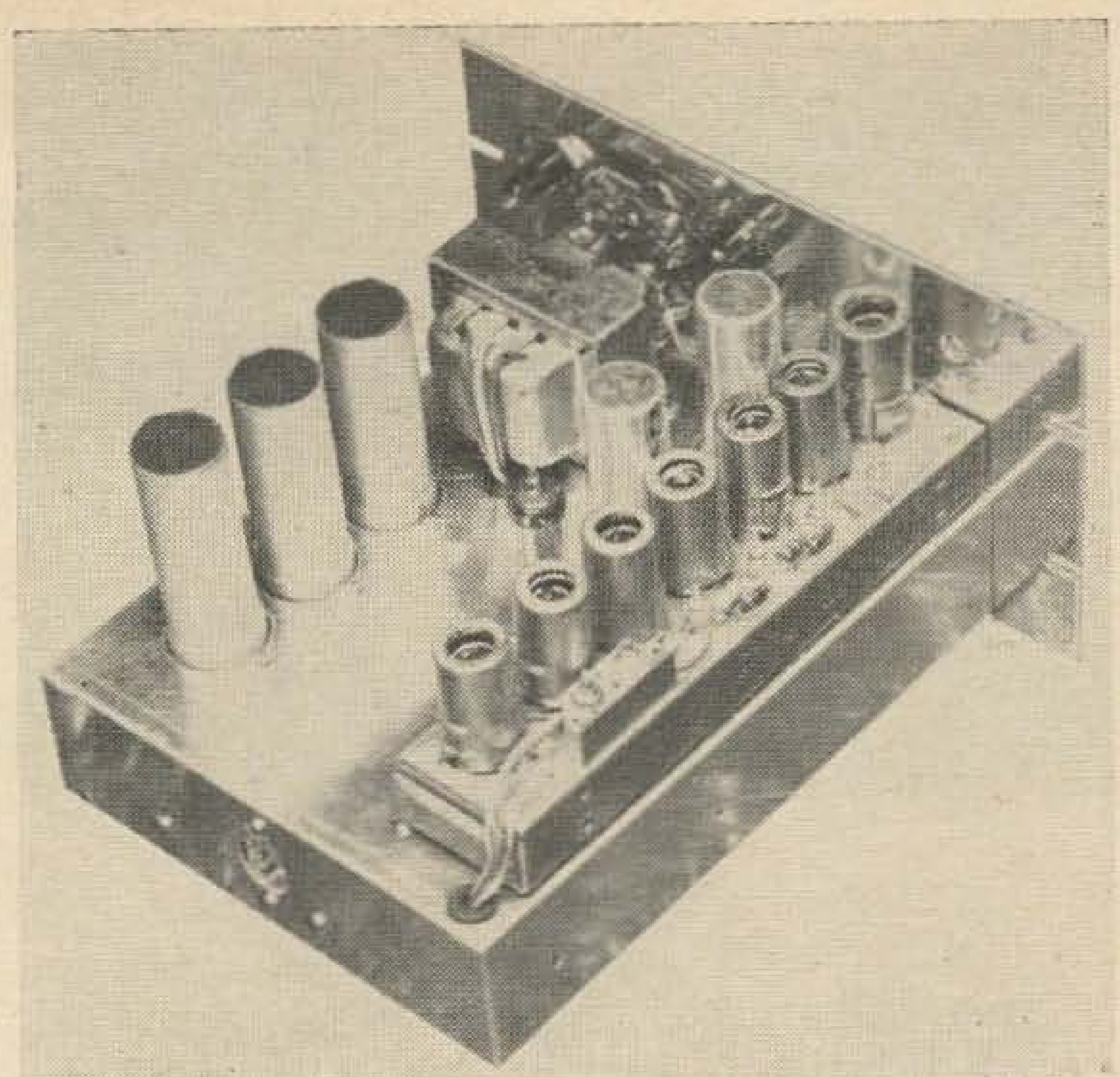
The following tools are required: straightedge, scale, ball point pen, fine tooth saw, center punch, drill with quarter inch bit, and a little oil. The preferred panel is the unpainted masked variety, having a sheet of adhesive paper applied to each side to prevent scratching.

Lay the panel flat on the bench and draw two parallel lines, almost touching, one each side of true center of the panel. The distance between the outside edges of the lines should be the width of the saw cut. Apply the line of oil along the cutting line and go at it. Don't hurry. The oil eases cutting and stops the almuinum from clogging the saw. Having two lines to cut between rather than one to follow, you can do a good job of cutting a straight line. The nice thing to use is a bandsaw, but I get acceptable results from a benchmounted saber saw.

After completing the cut, each notched end



A Lafayette PK 544 amplifier mounted with batteries, two inputs and two outputs.



A radar IF strip, remounted with its own power and bias supplies.

can be used as a template to mark out the new notches. Punch each notch, drill out to one quarter inch, and cut in from the edge to the hole. Touch up with a moderately fine file and you're done. Requires about five minutes.

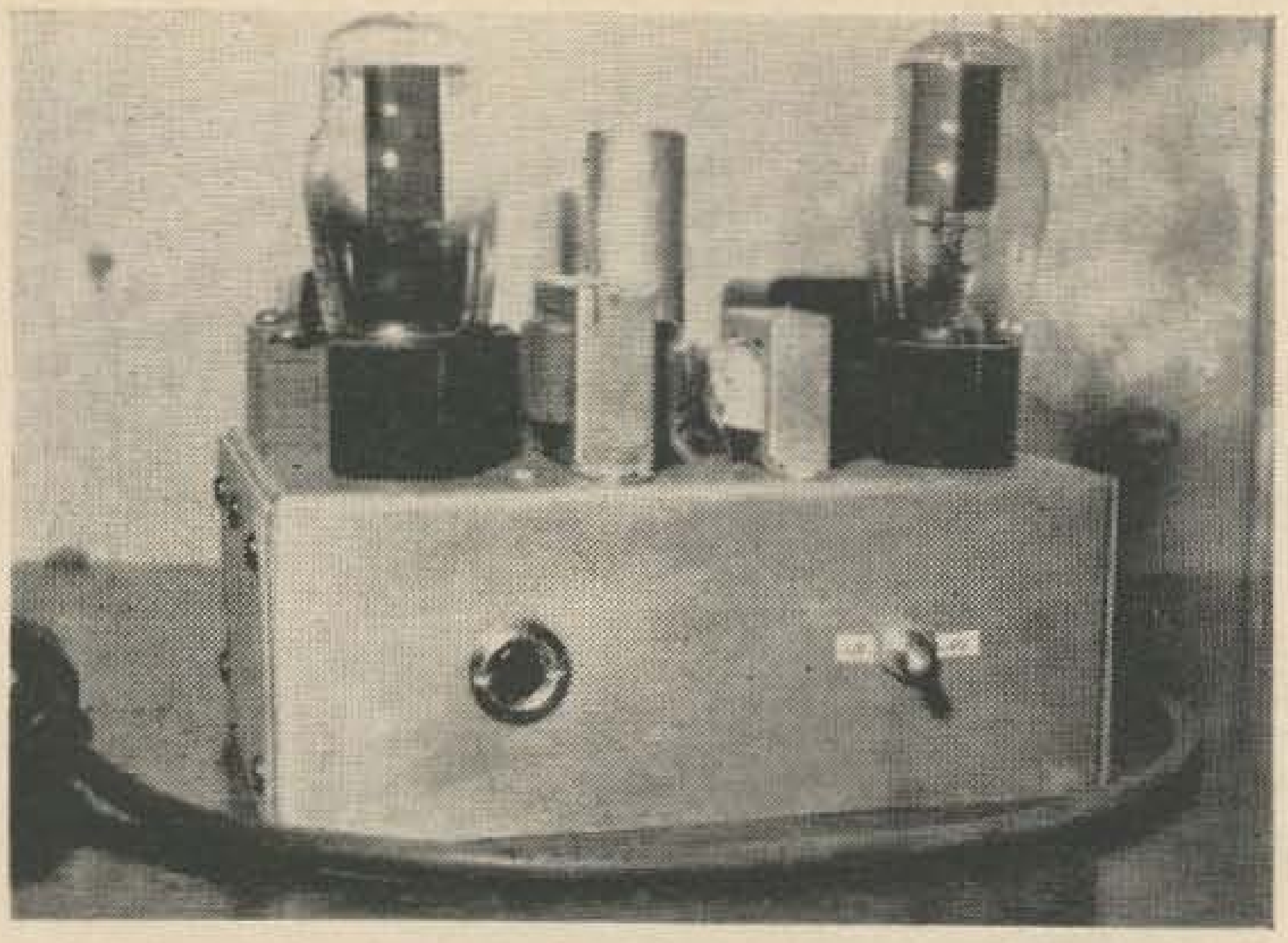
The half-rack panels have been used here in various ways. Mounted in a test bench they can serve as outlet and switch holders for heavy filament transformers and regulated power supplies placed out of the way below the bench. If a common supply for all is satisfactory, they are used with a separate large rack or self mounted power supply.

I find that the best way to use the half-rack construction is to build each circuit with its own supply if possible. When the circuit is to be used, there is no problem about matching supplies or connectors; and it is simply a matter of providing input, output, power, and control voltages. A second advantage is the decoupling obtained in this way. With a decoupling filter at the power line, decoupling in the heater and plate supplies, and another such obstacle course in the next piece of gear, a signal passing from one circuit to the next has a mighty rough time of it.

There are enough small instrument transformers available now so that the cost of building several small supplies need not be much of an obstacle—and you can always plan to use one or two large ones.

Most circuits are built on 5¼ inch panels. With a 2 inch chassis height there is just enough room above the chassis for the usual miniature tubes and small transformers. I usually use the 7 inch chassis widths in depths of 5, 7, 9, 11 and very rarely 13 inches.

. . .W2DXH



Junk Box Power Supply

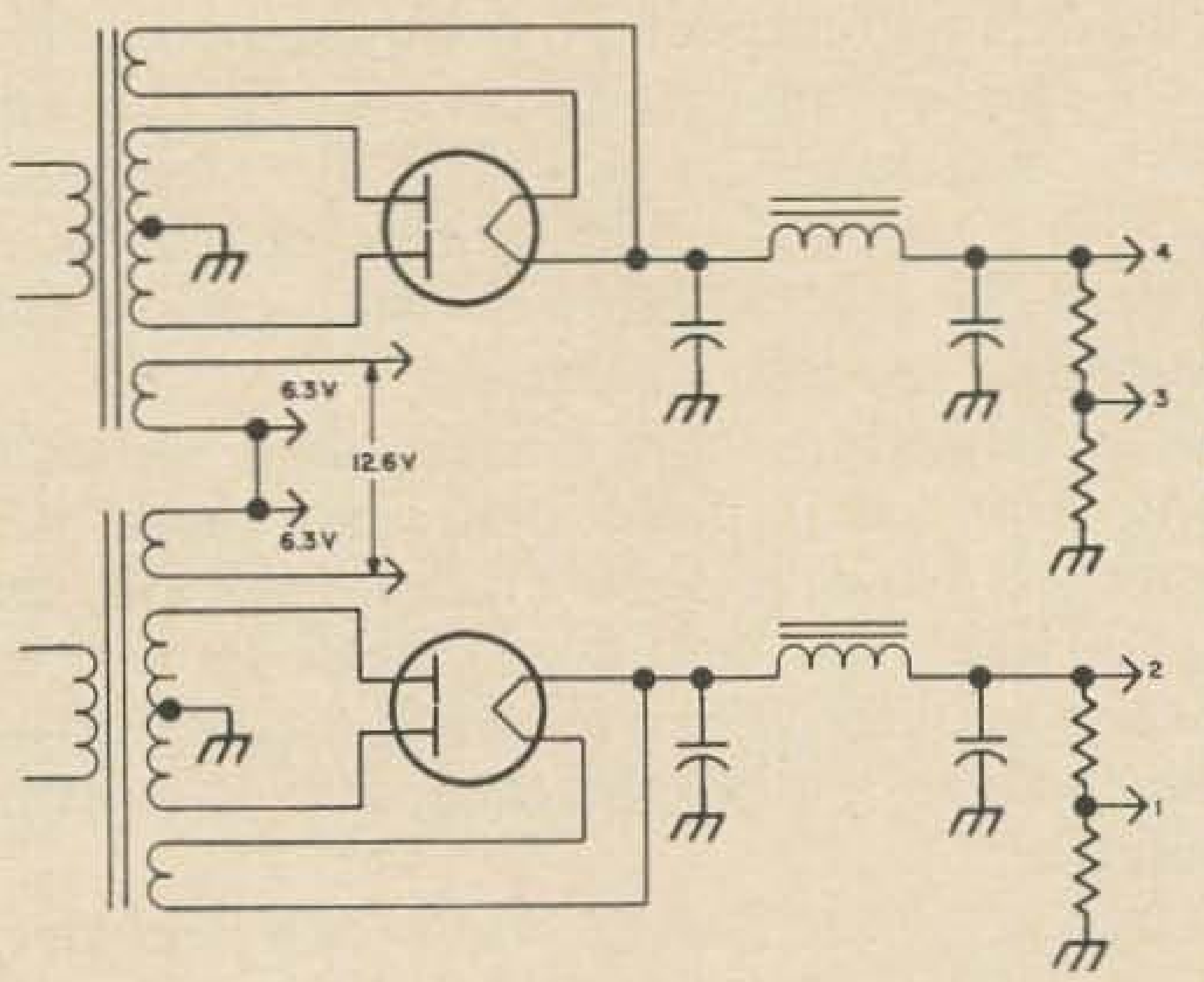
This extremely useful power supply has four dc high voltages and two filament voltages. It was constructed entirely from parts salvaged from two junk radios purchased for one dollar. The only extra part used was the chassis, which was bent up from an old cookie sheet.

The schematic is given as a guide, but the actual wiring and the output voltages obtained will depend on the parts used.

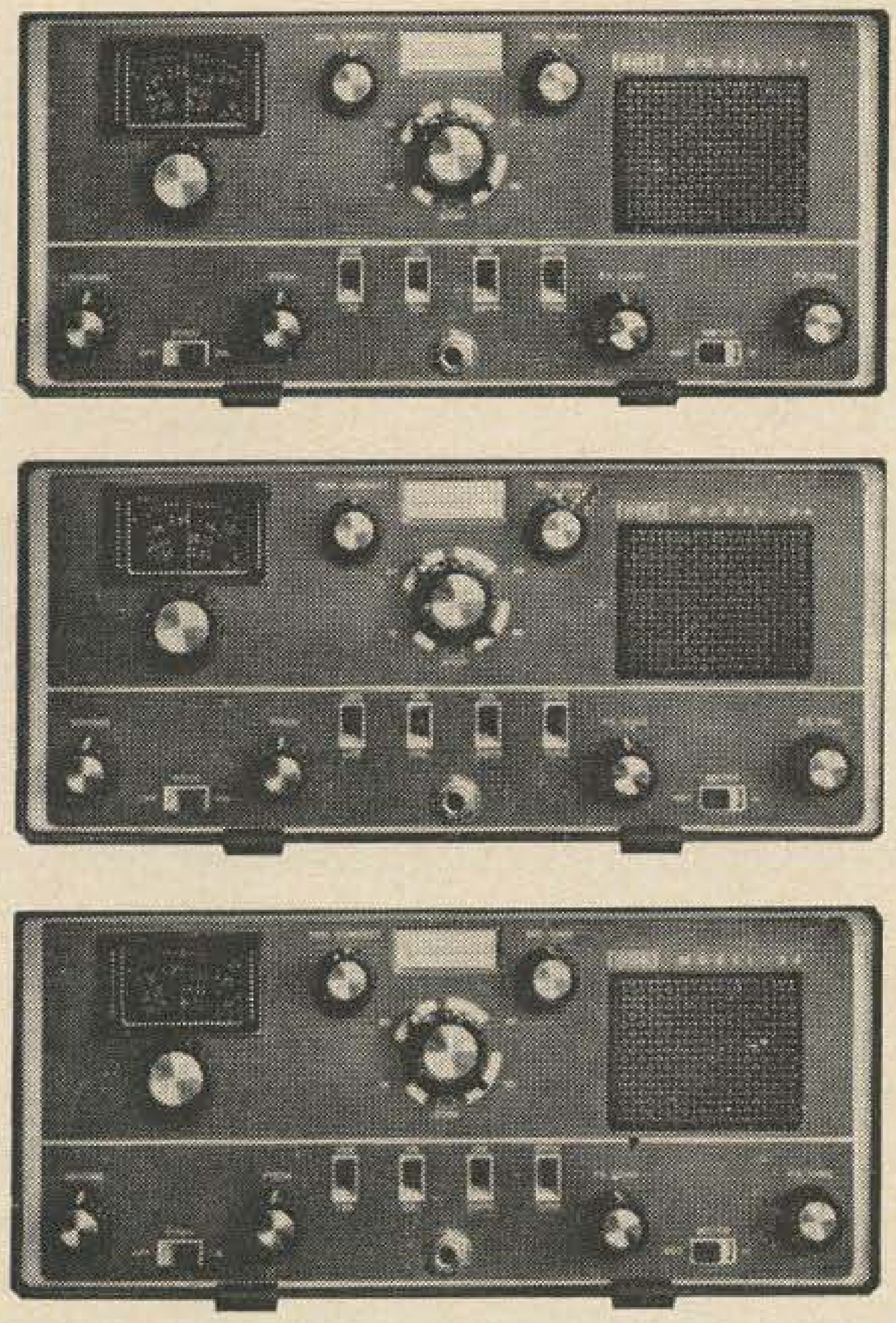
Output connections were made to an octal socket on the rear chassis and a plug was made from the base of a broken tube by soldering wires to the appropriate pins and filling the base with pitch. A spare pin was left available for an extra output voltage to be made up when required.

When picking up an old receiver for parts, of course, make sure it does have a power transformer. The ac-dc sets have a minimum of usable parts. Do not overlook the very old TRF sets, however. Although most of the parts will be unusable, some of the larger sets were rated as high as 130 watts, and have power supply components capable of powering a small transmitter.

. . . Pickles



SBE



SB-34 . . . your biggest dollar value!

The price of **395.00** includes built-in, solid-state, transformer type power supply that lets you operate on **12V DC** for mobile . . . on **117V AC** for fixed station service. The power change is simple too—just use AC or DC cable. (Both furnished). **SB-34**, the complete SSB station, is so small, lightweight and easily carried (has a handle for this purpose) that you can readily enjoy double use of this fine SSB four-band transceiver.

More power? Just add the big-value **SB2-LA KW Linear Amplifier.**

Mobile KW? Add the compact SB2-LA Linear and SB3-DCP Inverter.

CW? Merely plug in the new **CODAPTER** and key away.

HIGHLIGHTS:

• Expanded frequency coverage • Delta receiver tuning •
• Solid-state dial corrector • Panel switch selects USB or LSB •
• Solid-state switching---no relays • Collins mechanical filter •

Power input: 135 watts P.E.P. input (slightly lower on 15). **Freq. range:** 3775-4025 kc, 7050-7300 kc, 14.1-14.35 mc. 21.2-21.45 mc 23 transistors, 18 diodes, 1-zener , 1-varactor , 2-6GB5's PA, 1-12DQ7 driver. **Speaker built in.** Pre-wired receptacles on rear accept VOX and Calibrator — both units optionally available. **Size:** 5"H, 11¼"W, 10"D. 20 lbs. (approx.)

SB-34 Transceiver	395.00
SB2-LA Linear . . .	249.50
SB3-DCP Inverter	249.50
Codapter	39.95

SBE

SIDEBAND ENGINEERS
213 East Grand Ave.
So. San Francisco, Calif. 94080

Export sales: Raytheon International Sales & Services, Lexington 73, Mass. U.S.A.

RAYTHEON

Morris Goodman W2KAK
2621 Burns Place
Union, N.J.

A Novel ALC Circuit

As used in the NCX-3

This simple method of ALC is very easy to add to most transceivers. It increases talk power without introducing splatter, as Jim Kyle pointed out in the article in the January 73. I strongly recommend that you read this article if you want to understand what happens in a transmitter when you use ALC.

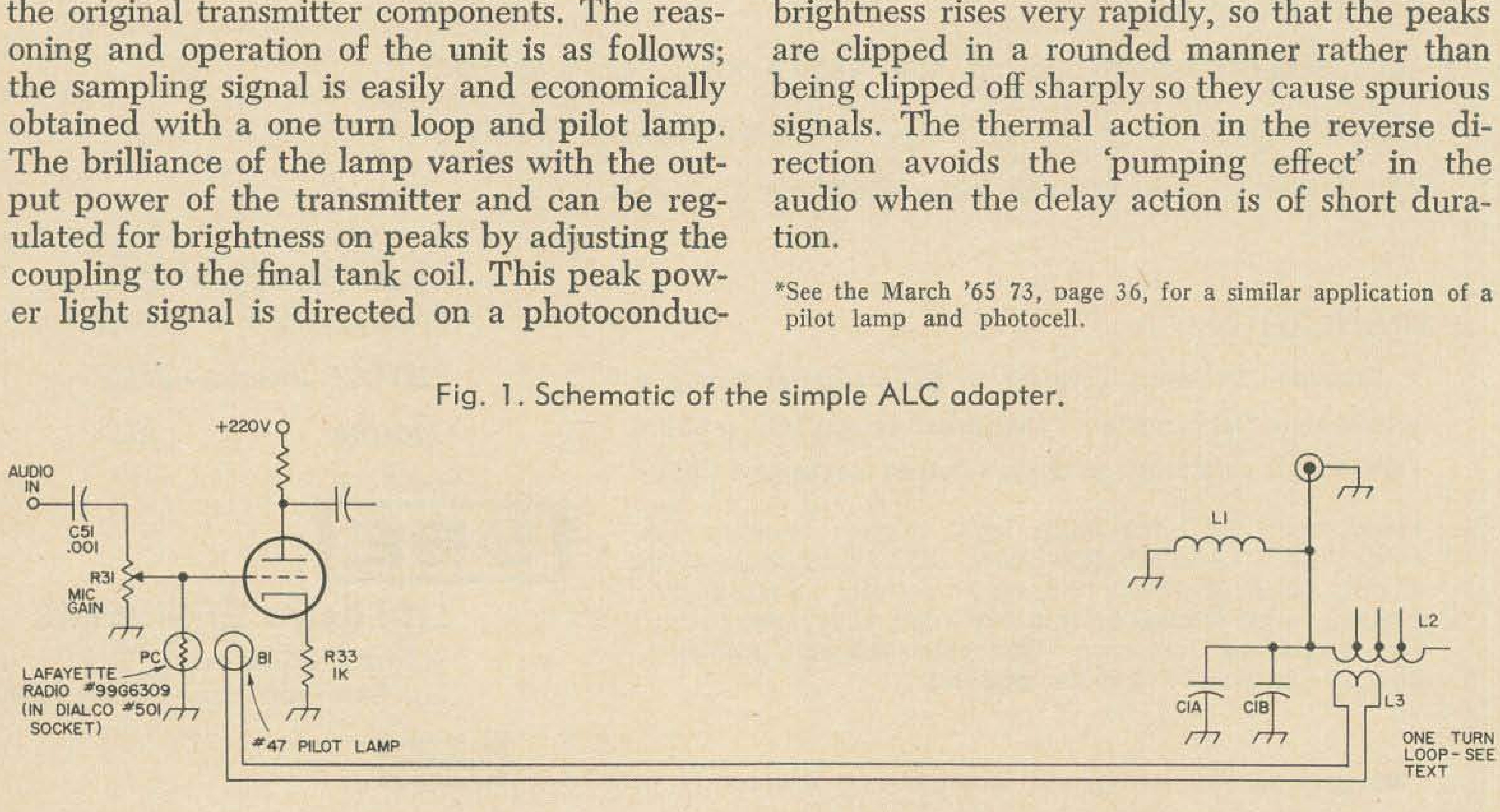
Basically what is needed is some means of obtaining sampling information that tells when the final amplifier is about to be overdriven into the non-linear region of power output where flat-topping, splatter, and distortion result. This information is applied as a correction control signal. Present methods use rectification of some of the rf output power, filtering it and applying it as a bias to control the driver stages, or using the grid current that the final tube draws when it is being overdriven, for this control bias. These systems require filtering, delay, and isolation.

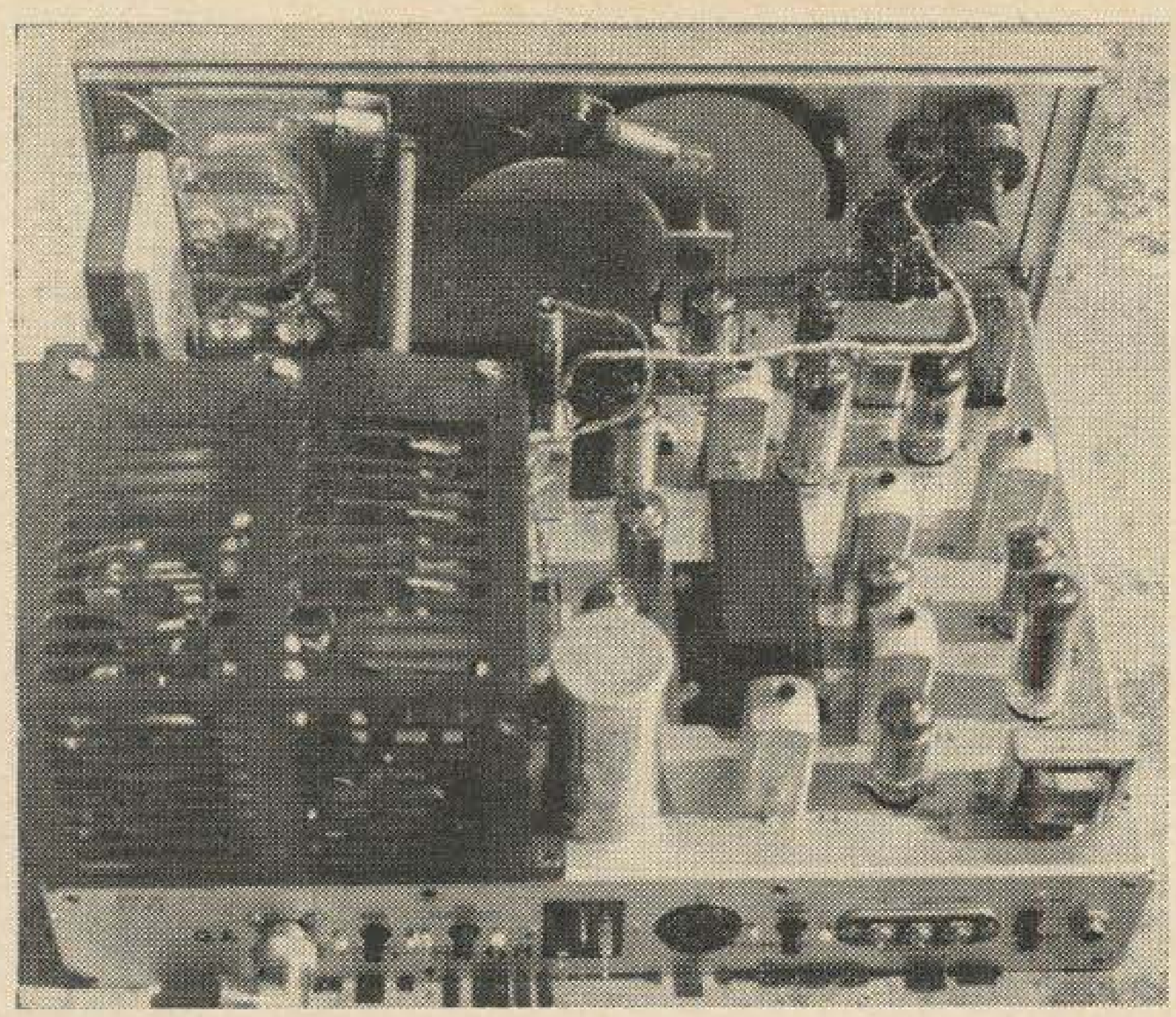
Like most hams who use purchased equipment and hate to mutilate the unit, the following system was developed and found to give very good results from all reports obtained on the air. It avoids rewiring or removal of any of the original transmitter components. The reasoning and operation of the unit is as follows; the sampling signal is easily and economically obtained with a one turn loop and pilot lamp. The brilliance of the lamp varies with the output power of the transmitter and can be regulated for brightness on peaks by adjusting the coupling to the final tank coil. This peak power light signal is directed on a photoconductive cell which in turn is connected to control the audio output going to the driver stage*. The resistance of the photocell varies inversely with the amount of light striking its surface—as the amount of light increases the resistance decreases. By connecting this photocell across the mike gain control, between the swinger and ground, the audio output will automatically be lowered as the transmitter power approaches its peak. In sideband transmitters, the driver output is proportional to the audio input so that control of the audio to the driver in effect controls the output power of the final tubes. In this way a negative feedback is imposed and the overdriving of the final amplifier eliminated.

There are several desirable features built into the lamp-photocell combination that lends itself perfectly to ALC operation. For one, the thermal inertia of the tungsten filament in combination with the 100 millisecond delayed action of the response of the photocell permits the transmitter to approach nearly full power before limiting action occurs. Secondly, as the power to the filament increases, the lamp brightness rises very rapidly, so that the peaks are clipped in a rounded manner rather than being clipped off sharply so they cause spurious signals. The thermal action in the reverse direction avoids the 'pumping effect' in the audio when the delay action is of short duration.

*See the March '65 73, page 36, for a similar application of a pilot lamp and photocell.

Fig. 1. Schematic of the simple ALC adapter.





The simple ALC circuit applied to the NCX-3

Construction

From the photo it can be seen that construction and installation of the ALC unit is extremely simple. The parts consist of a #47 pilot lamp, and four foot length of hook-up wire, an inexpensive photoconductive cell, and a clamp type support for the photocell.

Carefully remove the transmitter from its cabinet then remove the tank coil shield by taking out the self-tapping screws exposing the tank coil on its ceramic form. Fold a two foot length of hook-up wire in half and twist together. Snake the looped end of the wire through the small hole on the top of the ceramic form and open out the wire to form a one turn loop within the tank coil. Pass the twisted portion of the loop between the slits of the tank shield and replace the shield. Secure the balance of the wire along the shield can with lacing cord and tie in place.

Twist another two foot piece of hook-up wire together and solder the ends respectively to the mike gain control swinger and ground. Slip the clamp type photocell socket on the switch support plate and solder the other ends of the twisted wires to the lugs. Secure the pilot light to the photocell with a piece of plastic electrical tape so that the filament shines directly on the active cell surface. Screw the lamp-photocell combination into the socket and solder the twisted wires coming from the pick-up loop to the pilot lamp. The ALC control is now complete and ready for operation.

Tune-up

Rest the transmitter on an insulating surface such as a magazine and connect it up for operation. BE CAREFUL—LETHAL VOLTAGE. As a precaution to prevent burning out the lamp, turn the one turn loop with a thin insulating rod so that a minimum of coupling is in effect. Tune up the transmitter in the normal manner, then adjust the coupling of the loop using the insulated rod so that the lamp burns at about half brilliance. This is all the brightness you will need and represents the maximum power output from the final. Turn the selector to SSB and talk. Adjust the kick of the milliammeter to about an average level of 175 to 200 ma. Check with the boys of the air as to your quality and splatter, you will be agreeably surprised at the reports. There is one thing I haven't been able to work out satisfactorily yet, however, that is the change in the brilliance of the lamp in changing from band to band. If the lamp is too bright you will not be able to get enough audio output to drive the rig to full output.

This method is applicable to any rig that does not now have ALC. On the air reports and operation have proved that even though the ALC is a simple and inexpensive unit the results have been of great quality.

. . . W2KAK

Bob Heil K9EID
Holiday Inn East
4801 East Broad
Chicago, Illinois

The Nuvistatector

Many fine receivers can be found on the used shelves today in most of the radio distributors throughout the country. The biggest problem in these older receivers is the fact that nothing of a product detector can be found. When some of the older receivers were built, SSB was not even thought of!

Most of these older receivers are stable enough but lack that ability to tune the single sideband stations in without too much trouble. With this simple and easy to build product detector using three small Nuvistors, one can build it and tuck the entire package under the power transformer, or in a small space on top of the chassis.

The first problem that confronts the builder is the fact that you will have to chop a hole in the front panel of your 75A2 or your Super Duper Pro and there goes the resale value along with the looks of the equipment. This problem has been taken care of with ease by the use of the plate sensitive relay, K1, which is wired in series with the original bfo. By replacing the original plate resistor of the bfo with the 10,000 ohm relay and a series resistor, a perfect switch for switching the audio from the product detector to the original am detector has been achieved. When the bfo is turned on in the normal manner, the operator will be switching his am receiver over to a ssb receiver and the equipment has not taken on any odd switches hanging off in mid air or through the front panel.

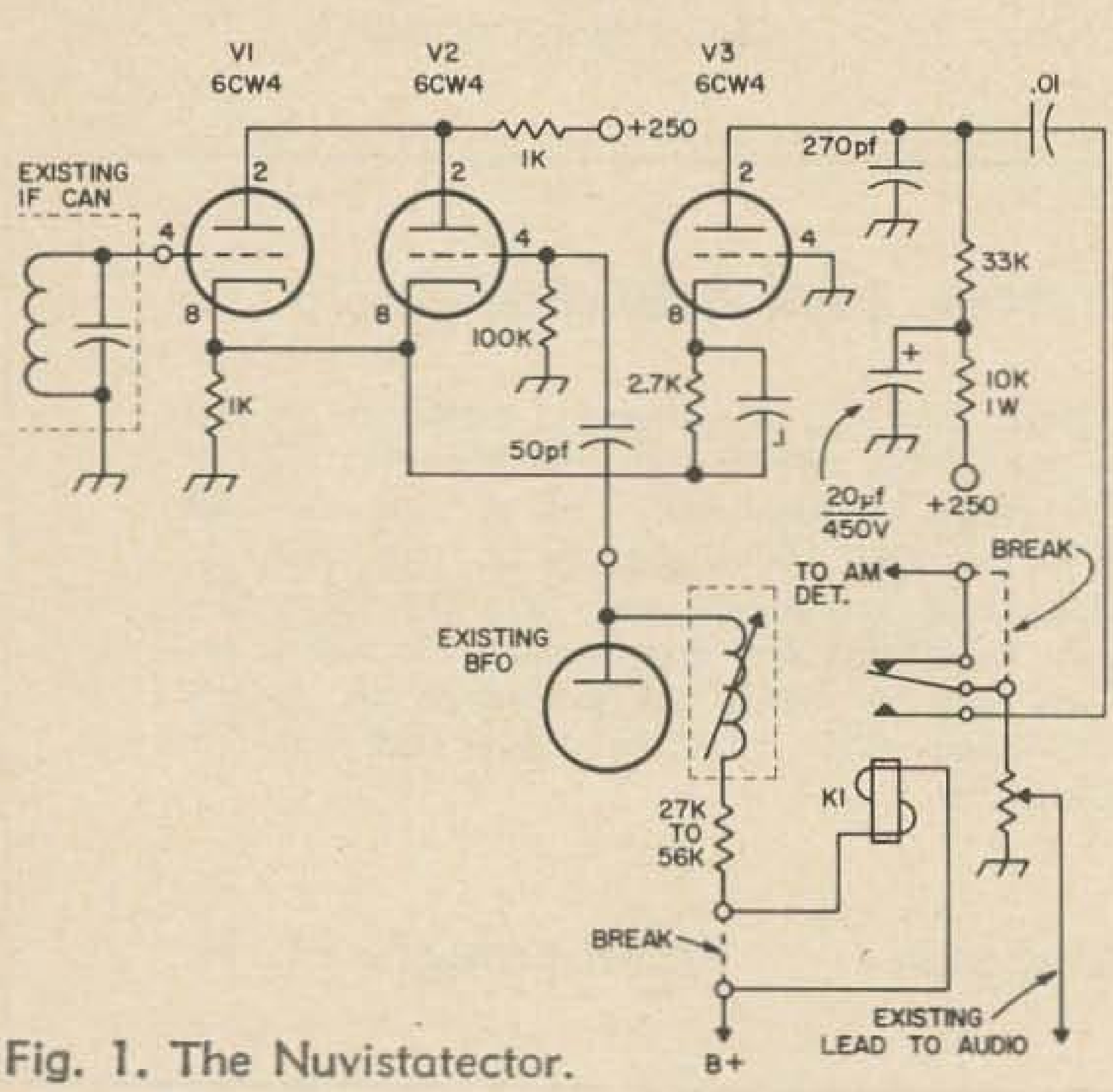


Fig. 1. The Nuvistatector.

The product detector is built on a piece of fiber glass epoxy board 6" x 1" and the sockets are spaced 1" center to center. The relay, K1, is mounted on the extreme end next to V3.

Connection to your receiver is very easy and simple. First, check to see if you have a tapped secondary on the last *if* can. If so, it will be noted that this feeds the grid of the am detector. This is the point where C2 connects through the relay, of course. Leave both the am and the product detector connected to the *if* can. This will not interact or cause any trouble.

Next check and see where the grid of the audio is connected. Most receivers will have a noise limiter preceding the af stage so the grid of the limiter will be the point where the relay should be connected. The arm of the relay is connected to the grid of the audio. When the bfo is on, energizing the relay, it will be connected on the bottom contact where C2 is attached. The top contact will be fed to the grid of the audio section, or the noise limiter, if you have one. It is best to use the grid of the limiter as this will allow you to be able to use it in the ssb mode.

None of the circuits are tuned so nothing has to be bothered with so when this project is finished being installed, it is ready to use. It should be noted that the detector is not only good for ssb reception, but it is excellent for cw and rtty, also. Since the usual diode detector has many distortion products and has to be used with the rf gain turned down, the audio turned up, signals don't actually have a chance to be heard in your regular receiver. With the addition of this product detector (so named since the output equals the product of the input signals and the bfo signal) the rf gain can be used at full position, therefore allowing the audio to operate correctly which allows you to have distortion-free reception with even the smallest of signal from the front end, as well as the fellow that lives down the street who runs a good gallon on the same frequency! . . . K9EID

Jim Fisk WA6BSO

Transistors for Hams

With more than 4,000 types of transistors on the market, it becomes a little difficult to choose those types suitable for amateur applications. This becomes evident when you consider the types of transistors that appear in amateur oriented construction articles. Many inexpensive, high performance semiconductors presently available are apparently not widely known. This is not to say that the ubiquitous 2N107, 2N274, 2N384 and the like are not good transistors; it is just that there are better types available at the same price. For instance, the 2N2953 may be used in many of the same circuits as the 2N107, but has higher voltage ratings, higher current gain, and a 10 mc cutoff at the same price. The 2N1226 is identical to the 2N274 except for higher voltage ratings. Many other familiar low-cost transistors have similar stories. For this reason, the following list of transistors was compiled as a guide.

This is by no means a complete list. Many manufacturers make transistors that have different type numbers, but are nearly identical electrically. Furthermore, in some cases identical transistors have different type numbers (and prices) because of the package. For instance, the 2N1526 and 2N1527 are electrically identical, but the former is in a JEDEC TO-1 can, the latter in a TO-40 package.

In looking through this list you will no doubt notice the absence of many familiar faces. There are several reasons for this. First, this list was prepared to familiarize you with some of the later transistor types and it is assumed that most amateurs are familiar with the older popular ones. The time has come when many of the older types are "not recommended for new design". For this reason this list is limited for the most part to those types registered since 1961.

The list is laid out in six main application categories: Audio and General Purpose, Audio Power, RF Amplifiers, RF Mixers, RF Oscillators, and RF Power. Within each category, types are arranged in order of increasing value of a key parameter. For the audio and general purpose types, the key parameter is current gain; audio power types, power dissipation and rf types, frequency.

Although the column heading should be self-explanatory for the most part, a few explanations are in order. The first column gives the transistor type number and the second column whether it is PNP or NPN. The third column lists the maximum voltage between collector and emitter (V_{ce}) or between collector and base (V_{cb}). V_{cb} is differentiated from V_{ce} by an asterisk. The fifth column gives the forward current gain of the device. A-C current gain (h_{fe}) is differentiated from D-C current gain (h_{FE}) by an asterisk. Where only one number appears in this column, it is a typical value. Two numbers indicate minimum and maximum limits. The collector currents in column six are those currents at which the current gains of column five were measured. The frequencies in the seventh column are designated in three ways. The gain-bandwidth products (f_T) is the most popular parameter and requires no further designation. The high-frequency cutoff in the common base configuration (f_{hfb} or f_a) is designated by an asterisk. The maximum frequency of oscillation (f_{max}) is indicated by a #. The manufacturer and current price are provided in colums eight and nine.

For the discriminating VHF and UHF enthusiast, a short list of low-noise types is also provided. Several of these types are not included in the main tabulation because of their cost.

One of the problems after selecting a particular transistor is in purchasing it! Most local electronics stores carry a limited inventory of semiconductors if any at all. However, only those manufacturers with large distribution facilities are included on this list. If your local distributor should not stock a particular type, any type on this list is available from either Allied or Newark Radio in Chicago. . . . WA6BSO

Type No.	Type	P_c (W)	V_{cb}° V_{ce}	h_{fe}° h_{FE}	I_c	f_{hfb}° f_T	Mfr	Price
Audio and General Purpose Types								
2N2430	NPN	.36	32	63°	20 ma	2.5	Amperex	$ .57
2N3414	NPN	.36	25	75-225	2 ma	120	GE	.77
2N2923	NPN	.2	25	115	2 ma	120	GE	.65
2N2614	PNP	.1	20°	160	.1 ma	10	RCA	.50
2N2953	PNP	.12	30	200°	10 ma	10	RCA	.50
2N2429	PNP	.5	32	220°	2 ma	2.3	Amperex	.57
2N3391	NPN	.2	25	250-500	2 ma	120	GE	.72
Audio Power Types								
2N2706	PNP	.5	32°	135°	20 ma	17°	Amperex	$ .57
2N3402	NPN	.9	25	75-225	2 ma	120	GE	.91
2N2431	PNP	1.0	32	90	300 ma	1.5	Amperex	.62
2N2148	PNP	12.5	40	100	1 A	3	RCA	1.25
2N2869	PNP	30.0	60°	50-165	1 A	.45	RCA	1.52
2N456A	PNP	150.0	40°	30-90	5 A	.20	TI	1.80
Small Signal VHF and RF Transistors								
2N1524	PNP	.12	24°	60	1 ma	33	RCA	$ .40
2N1632	PNP	.08	34°	80	1 ma	45	RCA	.50
2N2672	PNP	.1	32°	150	1 ma	75	Amperex	.67
2N2671	PNP	.1	32°	150°	1 ma	100°	Amperex	.84
2N1180	PNP	.08	30°	80°	1 ma	100	RCA	.68
2N2716	NPN	.2	18	75-225	2 ma	120	GE	1.01
2N1748	PNP	.06	25	50-150°	1 ma	132	Sprague	1.15
2N1177	PNP	.08	30°	100°	1 ma	140°	RCA	.83
2N2207	PNP	.26	70°	200°	1 ma	175°	Amperex	1.42
2N1747	PNP	.06	20	10	1 ma	200°	Sprague	1.05
2N2654	PNP	.1	32°	50	1 ma	250	Amperex	1.42
2N1745	PNP	.06	20	10	2 ma	600	Sprague	1.80
2N3399	PNP	.08	20°	20	1.5 ma	600	Amperex	2.55
2N3478	NPN	.2	15	9	2 ma	900	RCA	2.06
2N1742	PNP	.06	20	10	2 ma	1300#	Sprague	2.93
2N2360	PNP	.06	20°	10	2 ma	1600#	Sprague	2.40
2N2398	PNP	.06	20°	10	2 ma	1600#	Sprague	3.45
2N3294	NPN	.2	20	10	2 ma	2000#	Motorola	1.65
VHF and RF Oscillators								
2N1526	PNP	.08	24°	130°	1 ma	33	RCA	$ .43
2N1639	PNP	.12	34	75	1 ma	45	RCA	.53
2N1727	PNP	.06	20°	40	1 ma	100	Sprague	1.00
2N2362	PNP	.06	20°	33	2 ma	1600#	Sprague	2.10
2N3285	PNP	.1	20°	15	3 ma	2000#	Motorola	1.80
VHF and RF Mixer Transistors								
2N1743	PNP	.06	20°	33	2 ma	1300#	Sprague	$ 2.87
2N2361	PNP	.06	20°	33	2 ma	1600°	Sprague	2.25
2N2399	PNP	.06	20°	33	2 ma	1600#	Sprague	2.25
2N3292	NPN	.2	25°	10	2 ma	2000#	Motorola	2.10
2N3284	PNP	.1	25°	30	3 ma	2000#	Motorola	2.02
VHF and RF Power Transistors								
2N2270	NPN	5.0	60	50-200	150 ma	60	RCA	$ 1.49
2N697	NPN	2.0	40	40-120	150 ma	100	GE	.93
2N696	NPN	2.0	40	20-60	150 ma	100	GE	.93
2N3298	NPN	1.0	25	60-120	10 ma	150	Motorola	2.30
2N3118	NPN	4.0	60	50-275	25 ma	380	RCA	4.95
2N708	NPN	1.2	20	30-120	10 ma	480	GE	1.17
2N914	NPN	1.2	15	30-120	10 ma	480	GE	1.40
2N3866	NPN	5.0	55	—	—	800	RCA	4.95
Low Noise VHF Transistors								
2N2415				NF = 2.4 db at 200 mc			TI	$26.30
2N2865				NF = 3.5 db at 200 mc			TI	6.50
2N2398				NF = 3.6 db at 200 mc			Sprague	3.45
2N2857				NF = 4 db at 450 mc			RCA	24.75
2N3478				NF = 5 db at 470 mc			RCA	2.06

MAKE YOURS A REAL SIGNAL

. . . use a **CUSH CRAFT ANTENNA!**

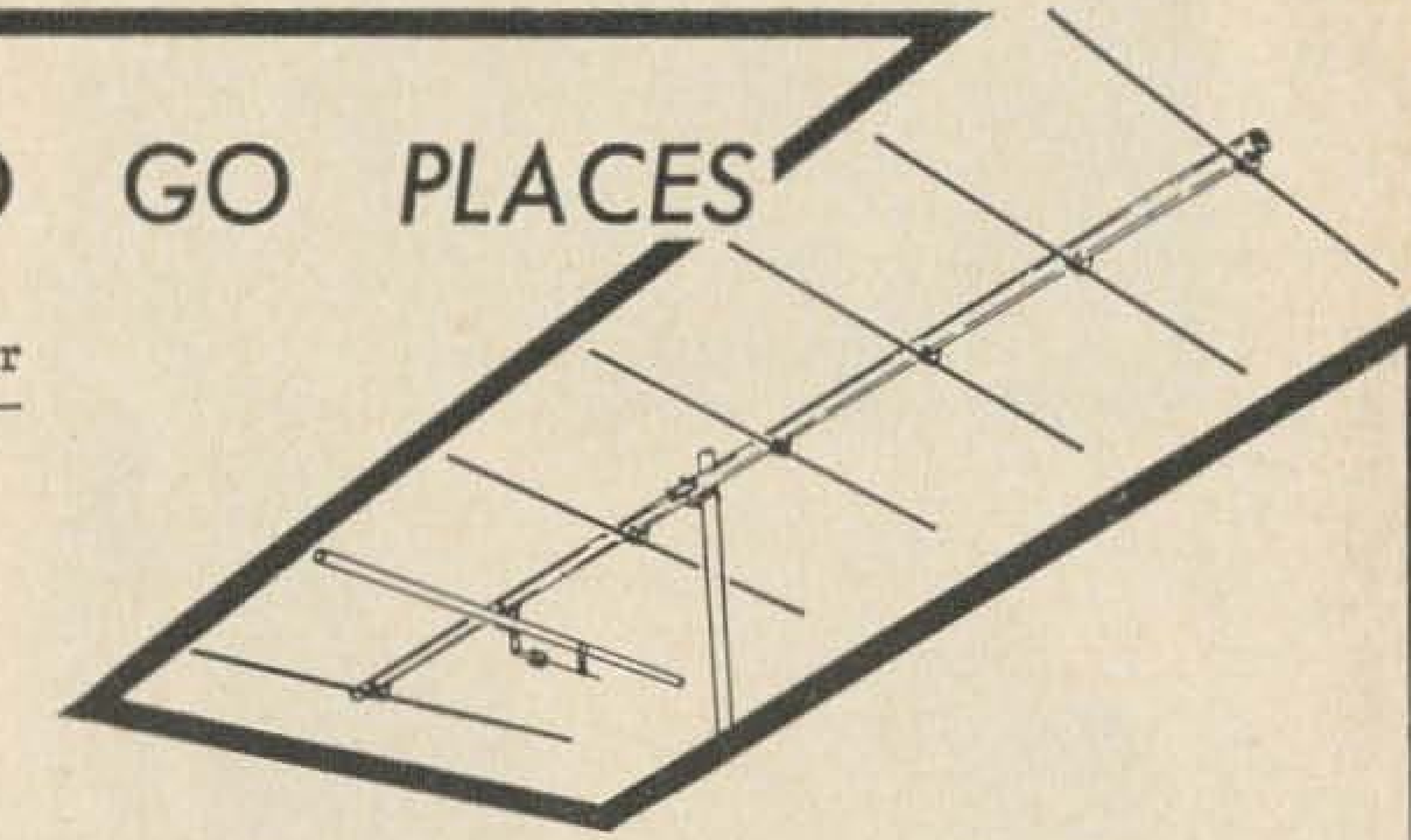
Whether you are . . .

- TRACKING SATELLITES
- MOON BOUNCING
- DX-ING
- RAG CHEWING
- WINNING CONTESTS

. . . you will do it better, more efficiently, and at a lower cost with a **CUSH CRAFT ANTENNA.**

YOU WILL HAVE A SIGNAL THAT **REALLY** RADIATES WHEN YOU BUY CUSH CRAFT . . . THE ANTENNAS WITH A "PATTERN OF FIRSTS" IN AMATEUR COMMUNICATIONS.

Cush Craft FOR THE HAM WHO WANTS TO GO PLACES



The standard of comparison in amateur VHF/UHF communications. Cush Craft beams combine all out performance with optimum size for ease of assembly and mounting at your site. These beams can be mounted vertically, horizontally, in pairs, quads, or virtually any combination — allowing you to design the antenna system that meets your exact requirements.

A144-11	2 meter	11 element	$13.95
A144-7	2 meter	7 element	10.95
A220-11	1¼ meter	11 element	11.95
A430-11	¾ meter	11 element	9.75
A144-20T	2 meter	Multi polarized	29.50
A50-ZP	6 meter	Portable	10.95
A26-ZP	6 & 2 meter	Portable	15.95
A50-3	6 meter	3 element	14.95
A50-5	6 meter	5 element	21.50
A50-6	6 meter	6 element	32.50
A50-10	6 meter	10 element	49.50
A26-9	6 & 2 meter	10 element	27.50

Cush Craft coaxial stacking kits are available for all of our beams listed. They are complete — ready to use. Amateur net price $4.95.

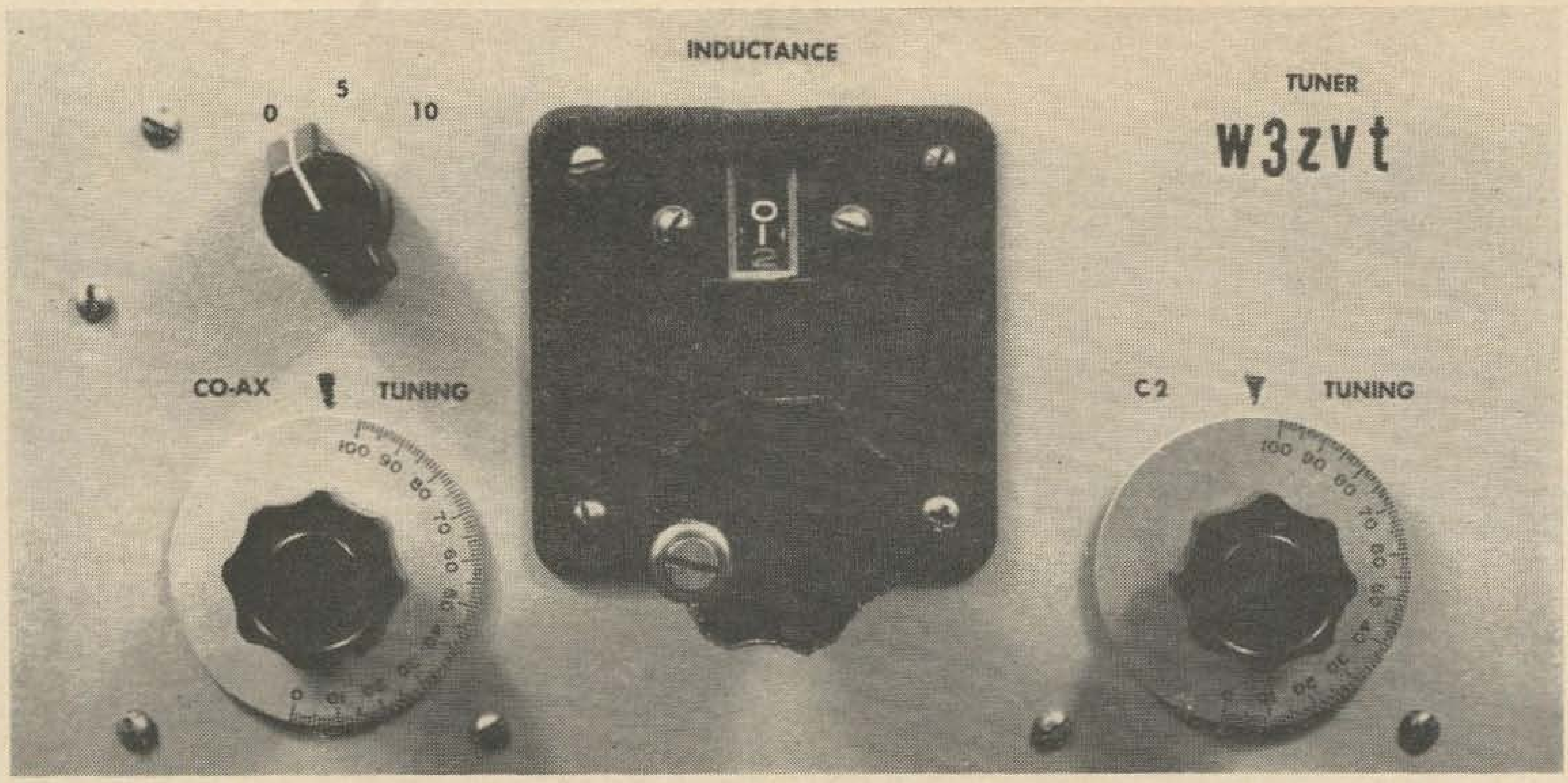
Cush Craft Quad arrays are complete package systems of four matched beams with stacking frames, hardware, and phasing lines for direct 52 ohm feed.

A144-11Q	2 meter	44 element	$84.50
A144-7Q	2 meter	28 element	72.50
A220-11Q	1¼ meter	44 element	64.50
A430-11Q	¾ meter	44 element	52.50

See your distributor or write for our free catalog of UHF beams, Colinear arrays, Squalos, Monobeams, Big Wheels, and the Blitz Bug Coaxial lightning arrester.

Cush Craft

621 HAYWARD ST. MANCHESTER, N. H.

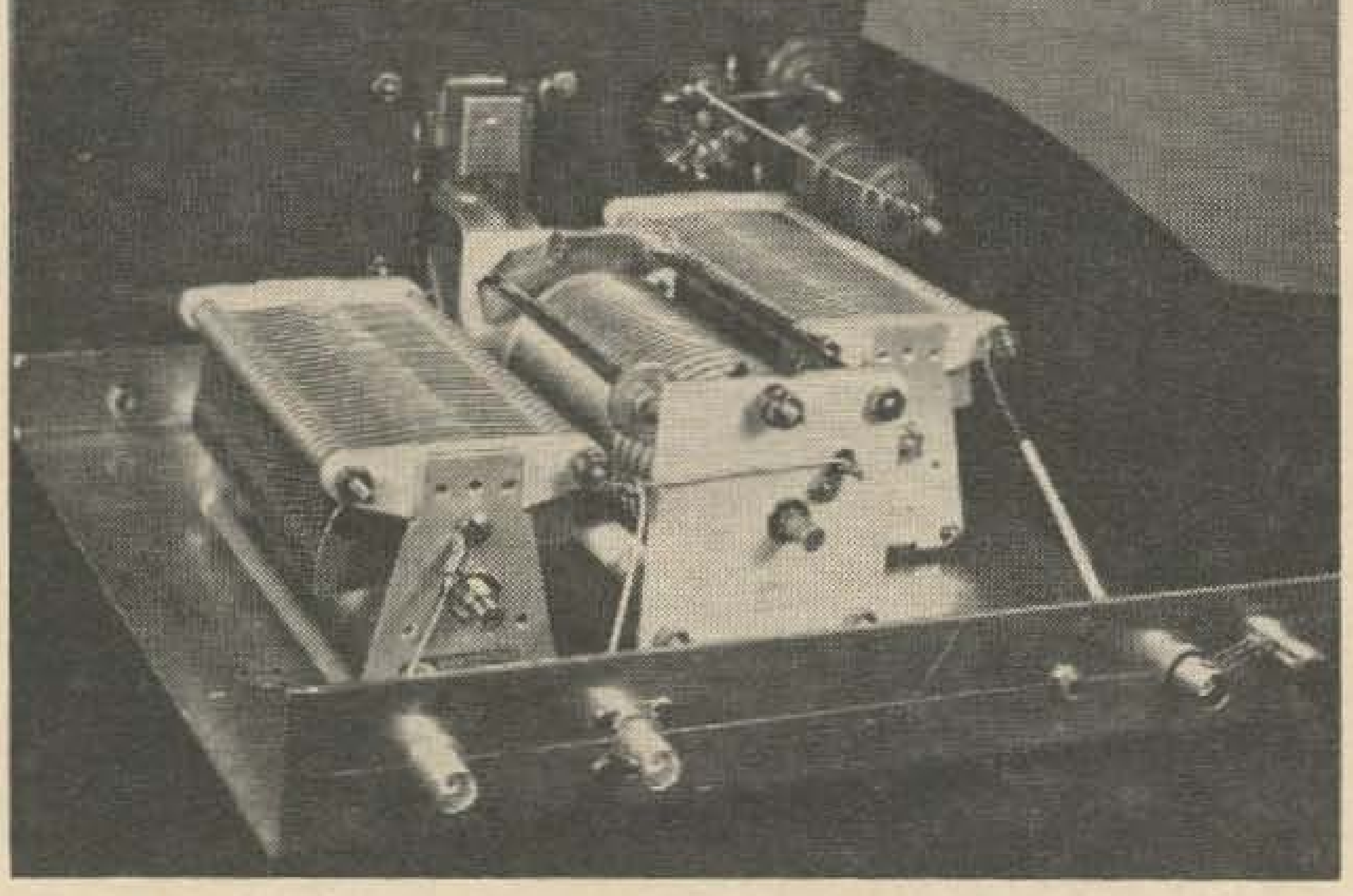


An all-band flexible antenna tuner.

The Flex-Match

Tim Soxman W3ZVT
50 Seventh Street
Uniontown, Pa.

Almost all of the transceivers and transmitters on the market today have fixed output loading in their pi-networks. The value of loading capacitance is calculated for a load of approximately 70 Ohms. This is a good idea, for some wide range pi-networks with variable loading can cause a loss of operating Q when the unit is loaded into an antenna that departs widely from the design center of the network. Fixed loading has its disadvantages though, one of them being the fact that with a high reactive component in the antenna circuitry the transmitter no longer looks into a resistive load. In such case a high SWR results and any



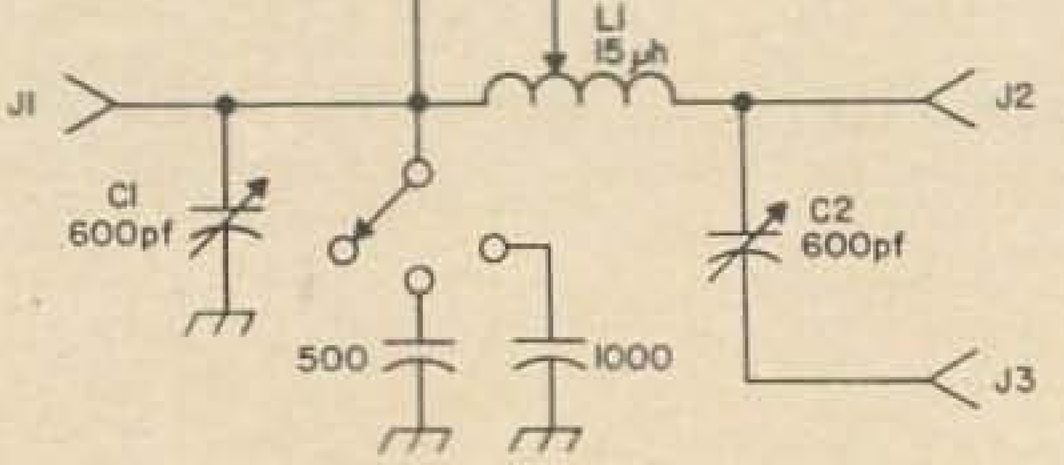


Fig. 1. Schematic of the Flex-Match

Left: Back view of the Flex-Match

impedance mismatch can degrade the linearity of the final; also there is one piece of gear I know of that has a habit of burning out plate chokes in cases of high SWR.

I got tired of fighting high SWR and decided to do something about it. All of my gear has fixed loading, so I decided the best approach was an antenna tuner. I wanted a tuner that would load into Aunt Gertie's girdle stays if need be, and still present a proper load to the transmitter for proper transfer of energy.

My requirements were:

1. A minimum of switched circuitry (lossy you know).
2. Wide flexibility and capability of loading a wide range of antennas.
3. Good resetability so that any band could be set up in a minimum of time.
4. Capable of operation in several configurations.

As can be seen from the schematic, this unit is capable of performing all of these functions with a minimum of switching and/or patching. The circuit consists of C1 and its associated switched capacitors, a variable inductor, and the output capacitor C2.

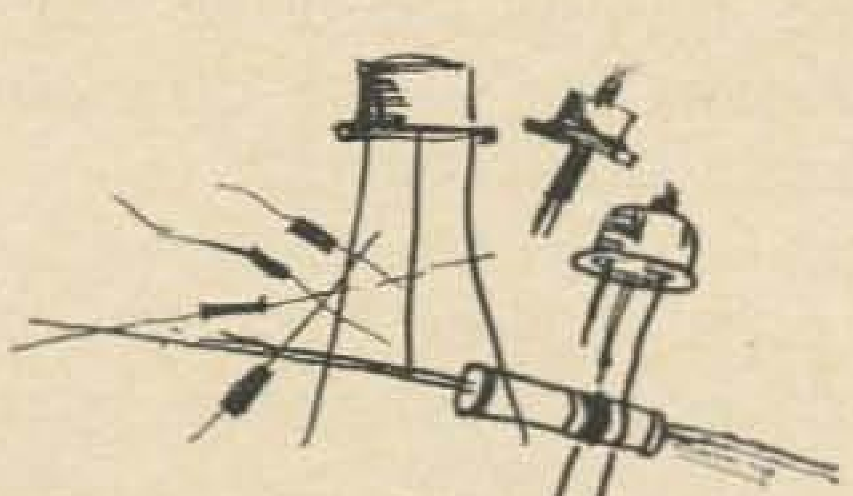
C1 and L1 comprise an L-network when the antenna is connected to J2, for series feed it is connected to J3. Finally, the whole thing can be used as a pi-network if a shorting plug is inserted in J3 and the antenna fed from J2.

The turns counter was scrounged from a BC-610 antenna tuner. In order to isolate C2 from ground, it was epoxied to a ¼ inch piece of plexiglass which in turn was epoxied to the chassis. In the photograph of the unit a pickup wire can be seen next to J1; this is for a scope probe or CW monitor.

Tune up is relatively simple and follows standard Handbook procedure. Just insert an SWR bridge between the transmitter and tuner and adjust C1 and L1 for minimum reflected power. In cases where two different settings of C1 both give unity SWR, use the one that has minimum capacitance.

One of the configurations, either L-net, Pi-net, or series feed, will give the unity SWR you've always wanted.

. . . W3ZVT



Jim Kyle K5JKX
Jim Speck W5PPE
1236 N.E. 44th St.
Oklahoma City, Okla.

Adding ALC to the Swan SW-240

For those Swan owners who would like to increase their average talkpower output a bit, as well as drastically improving their margin of safety against flattopping and other forms of distortion in the 6DQ5, this simple (half-day) modification may be of interest. No visible external changes are involved, although one additional tube is added inside.

The effect of the modification is to make it impossible to drive the 6DQ5 more than some 30 microamperes into the grid-current region, regardless of the position of the mike-gain control. Until grid-current is approached, of course, the higher settings of the mike gain control give louder output; old-time AM men will recognize the similarity to compression and speechclipping.

But while speech clipping is normally considered impractical for SSB use, ALC of the sort we're adding is a most practical thing. The big difference is that our ALC operates *only* when the final is being driven to grid current. The rest of the time, it's effectively not there. While a certain amount of peak clipping must naturally result, extensive and critical on-the-air tests have failed to reveal any trace of buckshot or splatter. These tests were conducted over a range of one mile—surely close enough to show up any garbage if it were present.

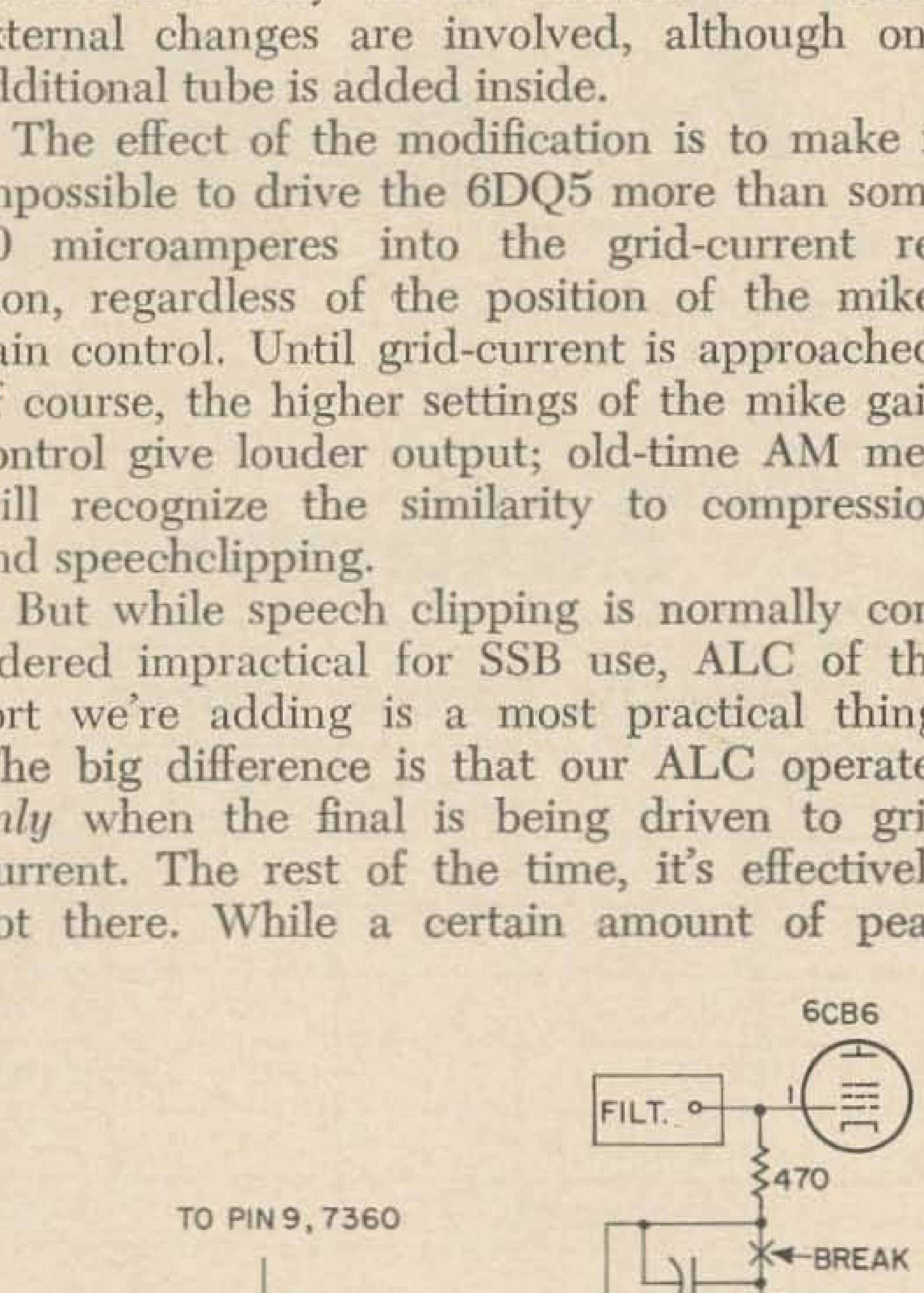


Fig. 1. Added circuitry.

Like any other ALC circuit (with very few exceptions) this one makes use of the fact that a control grid, when drawing grid current, is also a most effective diode detector. As a result, whenever grid current is drawn by signal peaks which recur at audio frequency (as is the case when a SSB linear is flattopping), an af component exists in the grid circuit.

We merely pick off this af component at the bias-adjust potentiometer, amplify it through a high-gain triode, and rectify it to obtain a negative dc control voltage. This control voltage then goes through a "hang" diode to a long-time-constant RC network, which charges up instantly when control voltage is applied but takes more than a second to discharge, once charged. The "hanging" control voltage is then applied to a low-level stage control grid, in this case the 6CB6 *if* amplifier, to reduce the gain of that stage.

The result is little short of fantastic to anyone who hasn't used such a circuit before. In the SW-240, the control is applied to the 6CB6 which is a sharp-cutoff tube. It takes only a few volts of control voltage to kill this tube completely, and when the tube is dead nothing gets through to drive the final. This in turn removes the source of control voltage, allowing the tube to recover.

In operation, the 6CB6 never cuts off. As the final drive passes into the grid-current region, the control voltage appears virtually instantly, reducing 6CB6 gain so that the drive never goes high enough to let the system shut down the rig. The rapid response is due

in no small part to the action of the added 12AV6 amplifier; this stage has a gain of 35, so that only 30 *millivolts* of af hash at the 6DQ5 grid will put a full volt of control bias on the 6CB6. ALC voltage seldom if ever rises above 2 volts; the 6CB6 needs around 8 volts to cut off completely.

We did run into a few fine points of design in putting the circuit to work, which we'll summarize here should you be tempted to make changes (changes may help—we stopped when we had operation which satisfied us completely and made no further attempts to optimize the circuit).

The original hookup applied 215 volts to the 12AV6 amplifier stage from the main power plug. With this, we had some residual control voltage on "receive" which cut down the receiving sensitivity. The next change was to move the 215-volt supply point over to the junction of R1308, a 6K 5-watt resistor, and the keying relay, which has B+ present on transmit only. This took care of the residual voltage, but we found we had big trouble when the function switch was turned to "tune".

In the "tune" position, a fair amount of grid current is deliberately developed in the 6DQ5. The hash present was amplified through the 12AV6, rectified, and applied to the 6CB6, cutting it off. This removed drive from the final until the ALC time-constant let the control line voltage drop below cutoff for the 6CB6, at which point the cycle repeated itself. Or, in other words, we had ourselves a nice relaxation oscillator going.

A search for other voltage sources for the amplifier which would be controlled by the "function" switch so that ALC would be killed while tuning turned up two possibilities. One was the 6DQ5 screen, which goes from +185 on "operate" to +90 on "tune". This didn't work; the oscillation, though weaker, was still present on "tune".

The other possible source, which we ended up using, was the cold-side deflection plate of the 7360, pin 9. This plate is at approximately +20 volts on "operate" and is grounded on "tune". At first we had some worries about using such a low plate voltage for our amplifier, as well as about the effects on the carrier-balancing networks of drawing an additional mil or so through them. Both sets of fears proved groundless. The amplifier still performs its function perfectly (though without quite so much gain as before) and the carrier can still be balanced out quite handily. In fact, we found carrier balance to be even better than before. This we cannot explain, but the left-over carrier at balance is now undetectable on an output meter which reads 100 milliwatts with ease. This is at least 30 db down, and undoubtedly far less than that.

Enough theory. By now you want to know how to do it for your own rig. Start by cutting and bending a small aluminum bracket as shown in Fig. 1. The two holes should be spaced to fit the two screws in the Swan which hold the final tank coil plastic support. Before drilling the tube-socket screw-holes, fit the bracket into approximate position on these screws beneath the chassis so that the tube will be horizontal, parallel to the back apron, and adjacent to the bias-adjust pot. Rotate the socket in its punched hole so that the blank space between pins 1 and 7 points to the back apron of the rig, and mark the position. Then drill the holes and mount the socket in place. Put a 3-terminal (two insulated plus ground) tie point on the socket-mounting bolt away from the rear panel. Wire in the tube connections and the F-6 silicon diode and time-constant network.

All these connections can be made before mounting the bracket in the transceiver. The diode and the R-C network mount on the 3-terminal tie strip. The diode should be specially selected for high back resistance, as read on an ordinary VTVM. Out of a dozen silicon diodes tested at random in this manner, most read about 5 megohm back resistance, a few showed as little as half a megohm, and one read more than 1000 megohms. The F-6 used in our installation measured 500 megohms on this check; this amount or more of back resistance we know will work. Smaller values may be usable but we haven't tried them. (While these readings actually bear no relationship at all to the normal reverse resistance of the diode, they do give a relative indication of the resistances of two or more diodes checked on similar meters. Therefore they are valid for the purpose mentioned here.)

With all connections to the tube socket soldered, and the plate resistor, grid capacitor, and filament leads hanging free, you can install the angle bracket in the rig. Run the filament leads direct to the power plug. Connect the free end of the grid capacitor to the arm of the bias-adjust potentiometer. Insulate the free end of the plate resistor, attach a length of hookup wire, and connect to pin 9 of the 7360, following existing cable runs to avoid introducing stray capacitance around the filter.

At this point, you can fire everything up, rebalance carrier, and check to see if you get proper ALC voltage. Use a dummy load at this stage, for the output of the rig will be pretty horrible until we close the ALC loop. With mike gain open wide and normal speech, you should be measuring at least 3 to 4 volts across the 0.47 ALC capcitor (negative to ground). Turn things off and make sure the power supply isn't holding some voltage. Then dig in at the 6CB6 and locate the 470-ohm resistor from pin 1 to ground. Lift the grounded end of this resistor and insert a .05-mf bypass capacitor to complete the ac ground path. Then run a lead from the resulting junction to the ALC capacitor.

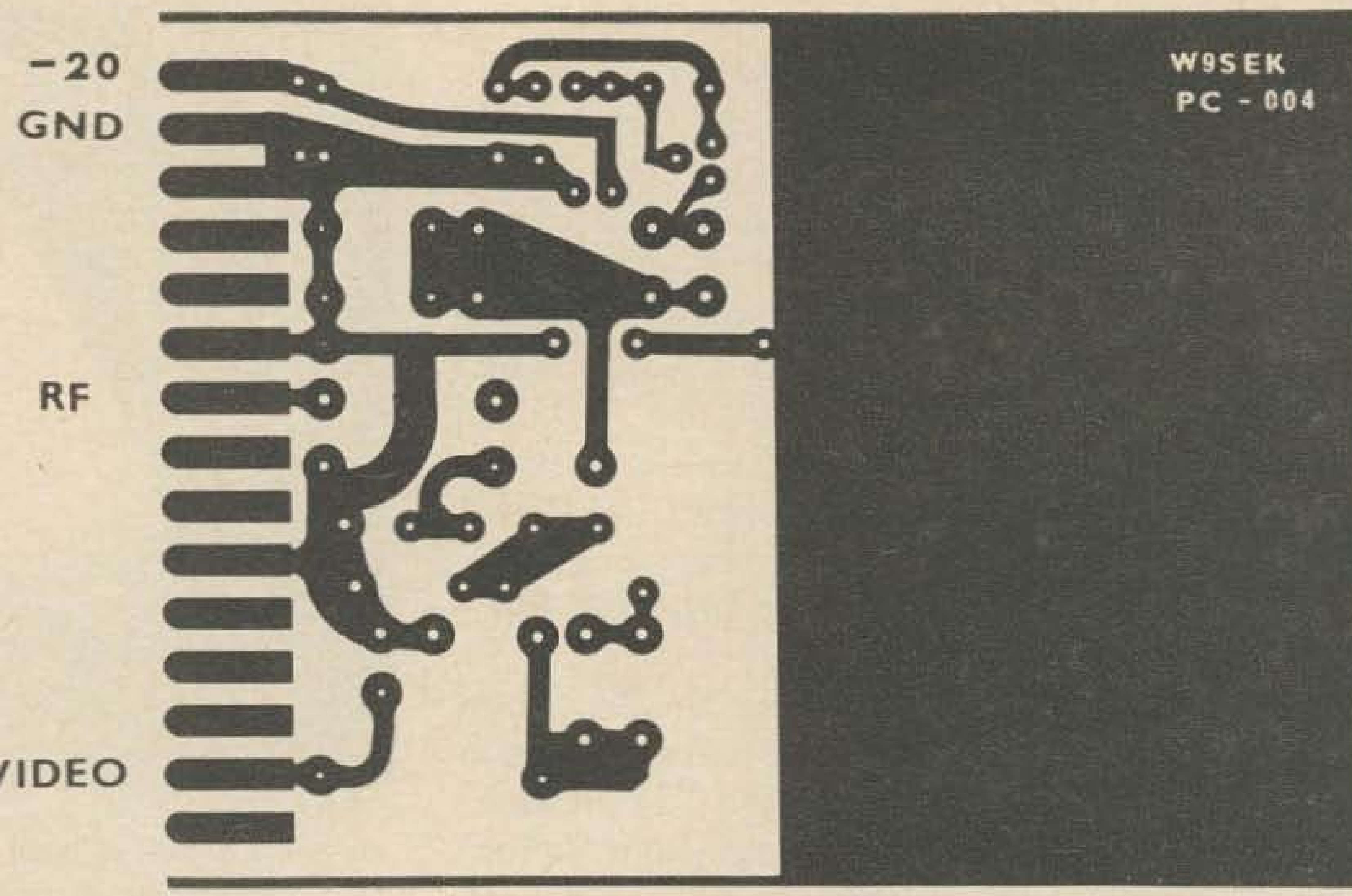
Connection of that lead closes the loop and completes the modification. The mike gain knob is now your ALC control. In the "12 o'clock" position, the one normally used here before ALC, action is the same as before except that the meter will never flicker above 150 MA on the loudest peaks. Twisting the gain wide-open raises the average meter reading, but it still doesn't flicker above 150—and at the other end of the line the other operator reports "It sounds much louder now, but it's just as clean as before." The new normal position is at about 3 o'clock, giving some ALC action at all times but leaving a healthy reserve for those bad situations.

At the same time all this was done, we did some general readjustment which also helped the performance. Major item was increasing the resting current from the recommended 25 MA to 60 MA, which represents maximum rated plate dissipation of the 'DQ5. Linearity as displayed by a two-tone scope pattern was helped drastically by this, which required nothing more than twisting the bias-control pot. In fact, linearity kept improving up to 100 MA, at which point no additional improvement could be noted since it was as perfect as our equipment could show. However, 100 MA leads to rather short tube life for the 'DQ5. Anticipated but not yet tested is substitution of the Tung-Sol type 8236, a direct plug-in replacement which has a carbon anode and is rated for 60 watts plate dissipation. This should allow a 100-MA resting current with ease.

But even without the 8236, the improvement in the Swan at W5PPE has been marked. Later stages of the on-the-air testing were conducted on the early-morning 3810-kc national round-table, where some typical comments were "It's like the difference between SSB and AM" and "Sounds just like a Collins". And a universal question was "How did you do it?" Now you know.

. . . W5PPE, K5JKX

Fig. 2. Layout of the PC board. Notice that this is the copper side.



Ronald Vaceluke W9SEK

TV Converter

For the video enthusiast who wishes to check out his camera or demonstrate it to relatives without a video monitor, the device shown here is just the thing. This is ideal for builders of the Eleemosynary[1] or similar cameras. The circuitry (**Fig. 1**) was borrowed from a commercial ITV camera and works quite well. Although I set my unit up on channel 3, there is no reason it cannot be used on any of the low band channels with appropriate crystal and coil changes.

The crystal is a 3rd overtone type at 30.625 (for Channel 3) and is resonated with L1 and C2 in the collector circuit. The emitter is tuned to 61.250 with L2 and C3.

Video of approximately 1 V P-P is applied to the input (terminate or bridge) and the modulated RF output is put into a conventional TV set. Output impedance is 75 ohms so a balun may have to be used on some sets.

Construction can be on a small punched board or printed circuit. Layout for the latter can be seen in **Fig. 2**. The contacts on the board match an Amphenol 143-015-01 PC connector. Although my board is 3½ inches high, only 1-13/16 is actually needed for the circuitry.

Adjust L1 and L2 for maximum output and L3 for maximum output consistent with good picture quality. . . . W9SEK

[1]Shadbolt, "An Eleemosynary Vidicon Camera for Scroungers." *ATV Anthology.*

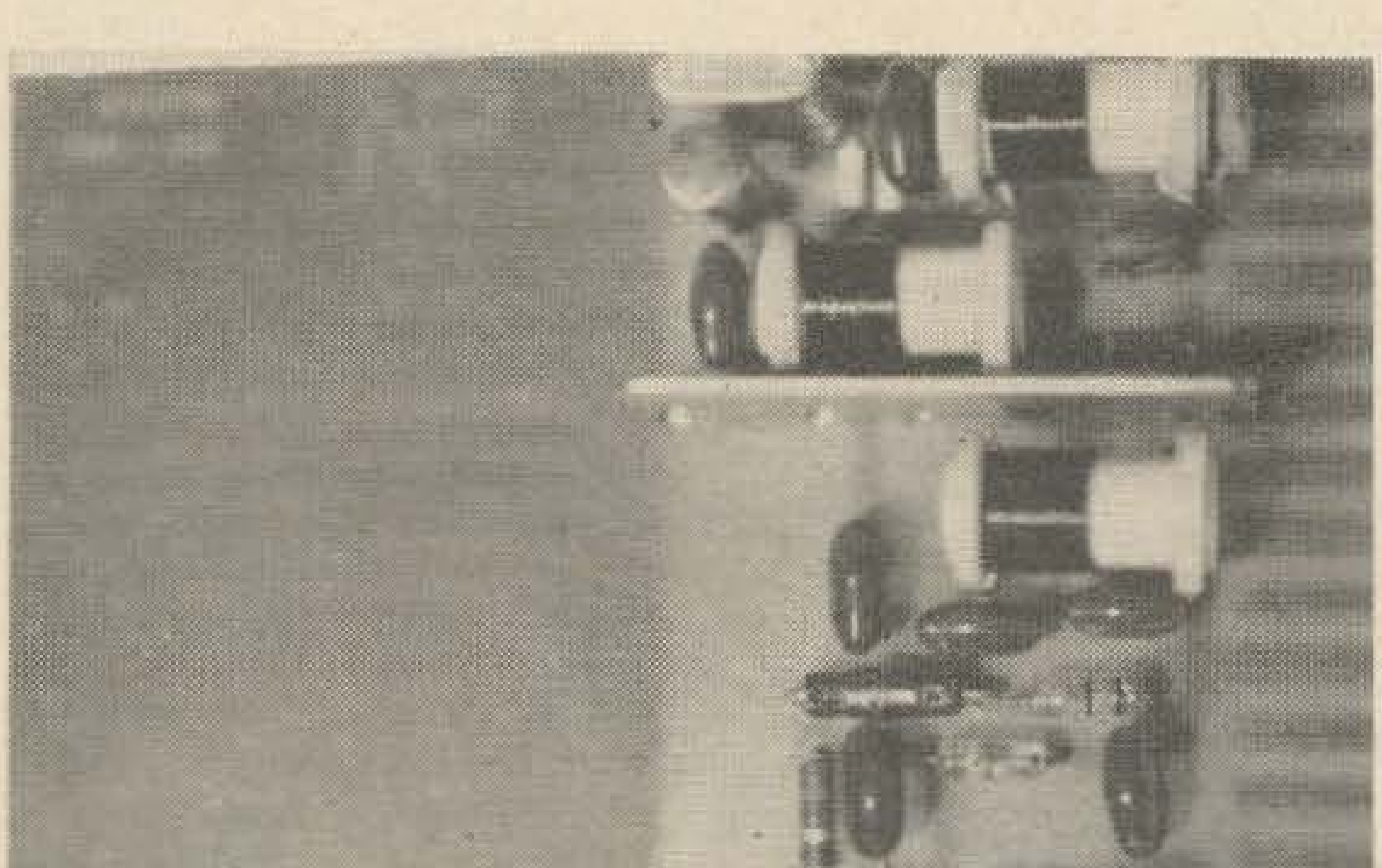


Photo of the component side of the PC board.

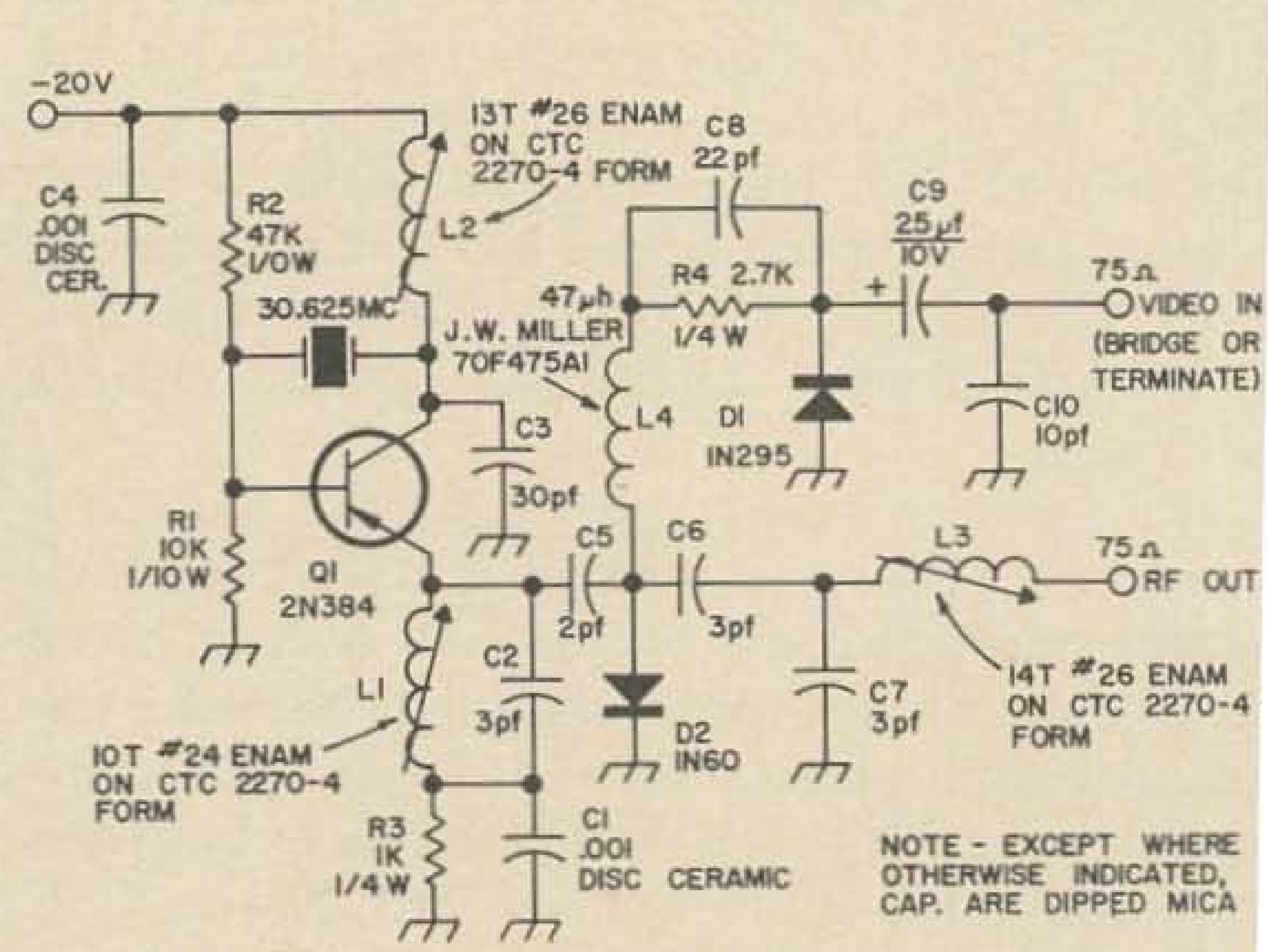


Fig. 1. The video to RF converter for ham TV or other uses.

Jack Laib HB9TL
29 Weinfelderstr.
Amriswil, TG, Switzerland

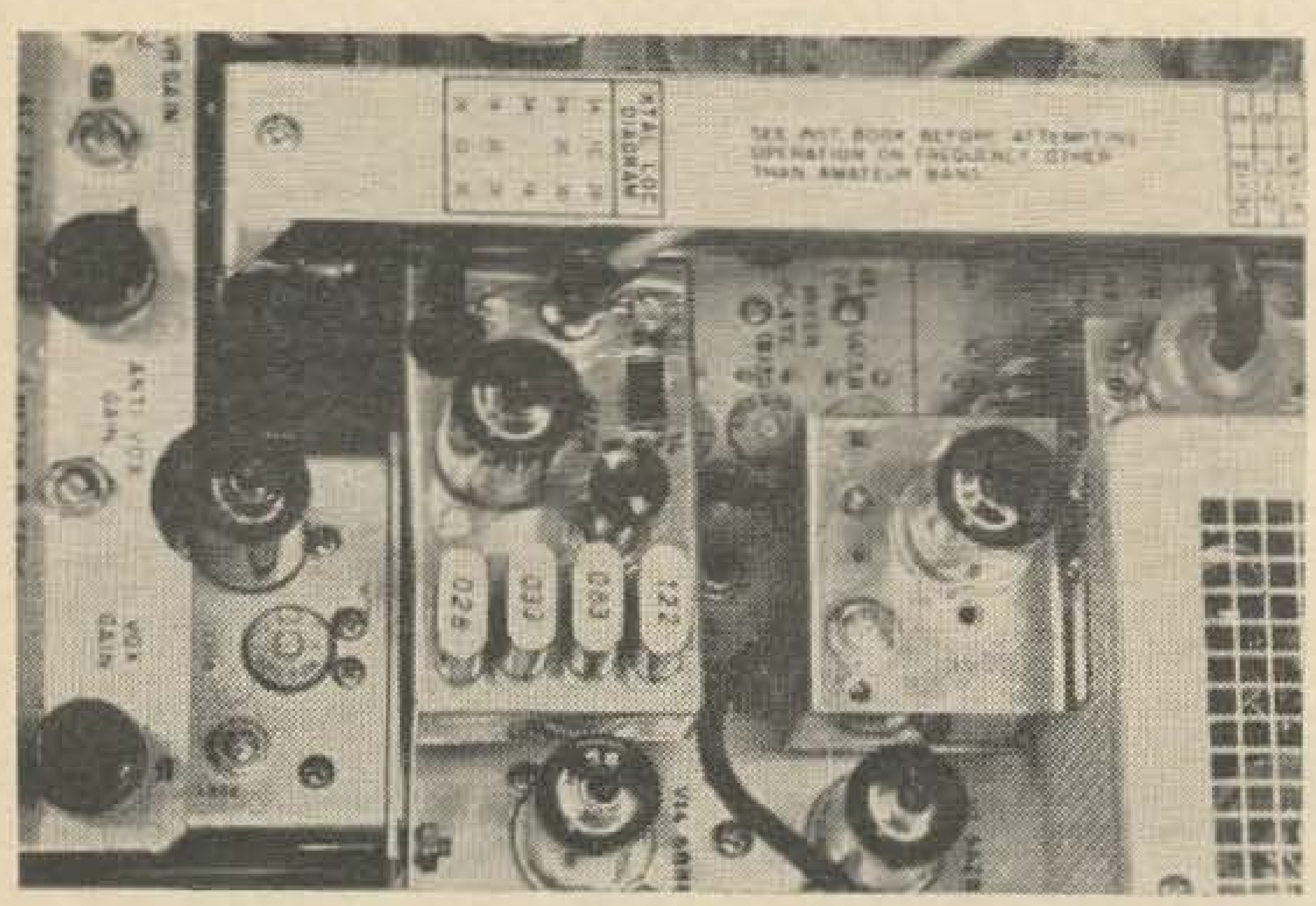
Crystal-Controlled Transmit with the KWM-2

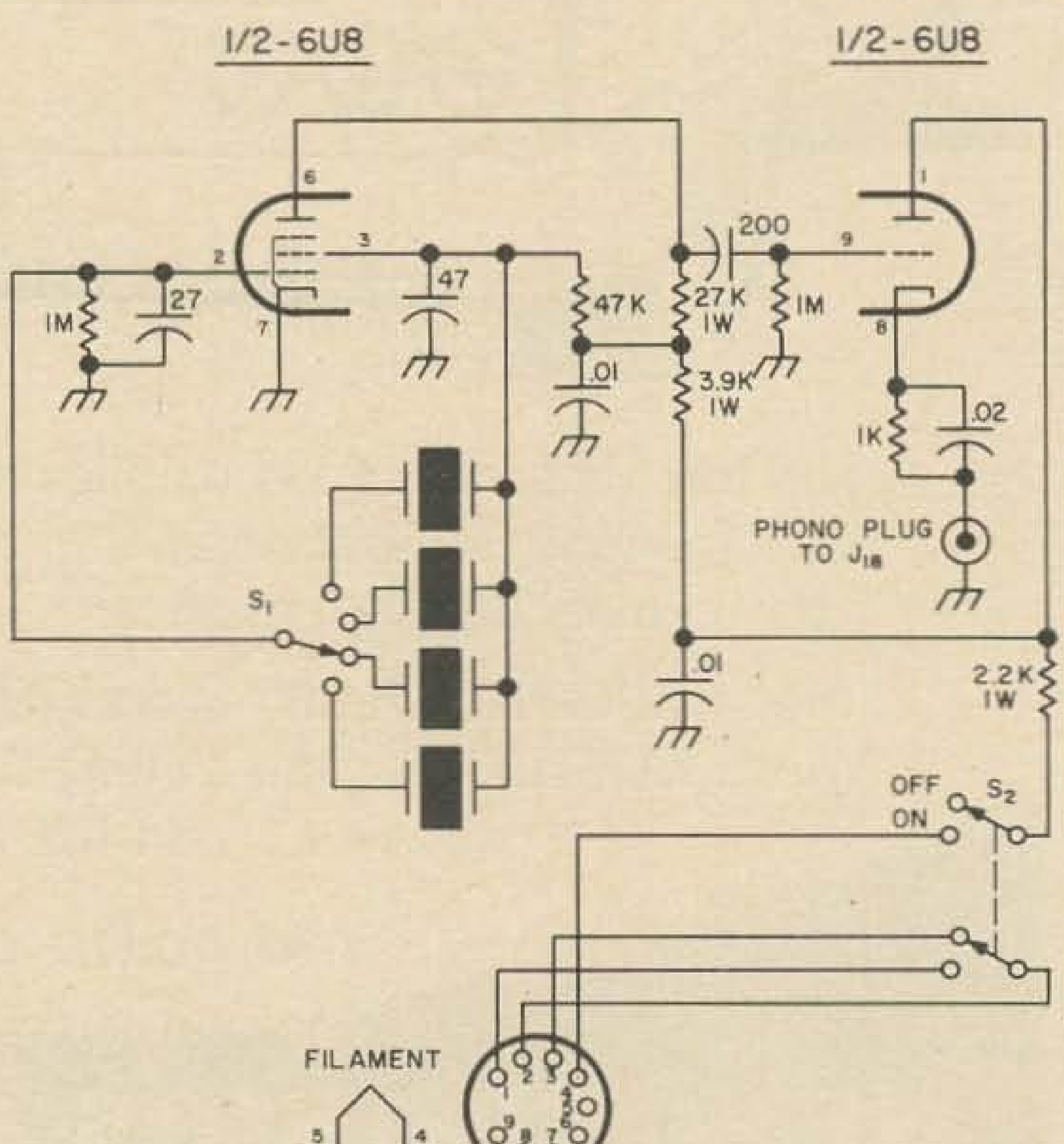
Have you ever been on a DX-pedition with a transceiver such as a KWM-2 ? If you have, you found out the hard way that a transceiver is not flexible enough for fast contacts when the DX-gang jumps on your frequency. One way to dodge the infernal QRM is to work the boys away from your transmitting frequency. This can be done with a KWM-2—but what a job.

One answer to the problem is a crystal oscillator for fixed frequency transmission and tunable receive operation with the KWM-2. Such an oscillator is not only cheap but easily constructed to fit right into the KWM-2 without drilling a single hole into it. It makes the KWM-2 even more versatile, adding nothing to its size and only 4 oz. to its weight.

The pentode section of a 6U8A is used as oscillator in a circuit recommended by crystal manufacturers, while the triode section is used as a cathode-follower with the cathode return completed by R 22 and R 162 in the KWM-2. This arrangement gives more than ample drive and does not hamper normal transceive operation with the oscillator permanently installed. Switch S 2 is the only control necessary to go from transceive operation over to x-tal frequency transmit with tunable receive operation. Switch S 1 selects 4 crystals in the 2.500 to 2.700 Mc. range (International Crystals Co. Type FA-5) giving crystal controlled output in any of the 14 band segments. A 2.672 Mc. crystal gives an output frequency on 028 on the dial (14028, 14228, 21028, 21228, 21428 . . .). For other frequencies, subtract wanted dial reading from 2.700 giving the necessary crystal frequency. Ev: 2.700 - 122 = 2.578 Mc. x-tal. Output frequency will be on 122 on your dial in any band segment. RG 58/U cable with phono plugs on each side is used to connect the oscillator to J 18 (external vfo) in the back of the KWM-2. Tuning-up is done on a crystal frequency and follows the same procedure as in the instruction book.

The oscillator is built on a home-brew aluminium box of 2 ¾″ length x 1¾″ width x 1½″ depth. This box fits either into the space over J 24 (noise blanker) or J 17 (external vfo power). As I wanted to use the


Adapter installed in KWM-2.



oscillator with a Waters Q-Multiplier Mod. 340-PT installed, I had to fit it over J 24 at the same height as the PTO unit. A lip from the U-shaped box cover was used to attach it to the right hand screw which also fixes the PTO to an L-shaped bracket. This gives the necessary clearance for the 6U8A and also for the tuning cable of the Q-multiplier to pass between the bottom of the oscillator and J 24. Power and switching connections were made to the new external vfo power socket supplied with the Mod. 340-PT Q-multiplier by a cable and a 9 pin plug.

If you do not use a Q-multiplier, a male 9 pin chassis mounting plug can be installed into the bottom of the U-shaped box cover and inserted directly into J 17. A lip from the box cover should be used to secure the oscillator with a screw to the amplifier cage.

For 12 volt mobile operation, a 12CT8 can be substituted in the same basic circuit. Only the connections to the tube socket and to J 17 have to be changed.

Such a crystal oscillator was used in my DX-pedition to 9K3-Land and helped tremendously to operate the KWM-2 with pleasure under pressure.

. . . HB9TL

Illustrations by Wayne Pierce K3SUK

Marianne Lattak
625 W. Melrose
Chicago, Illinois

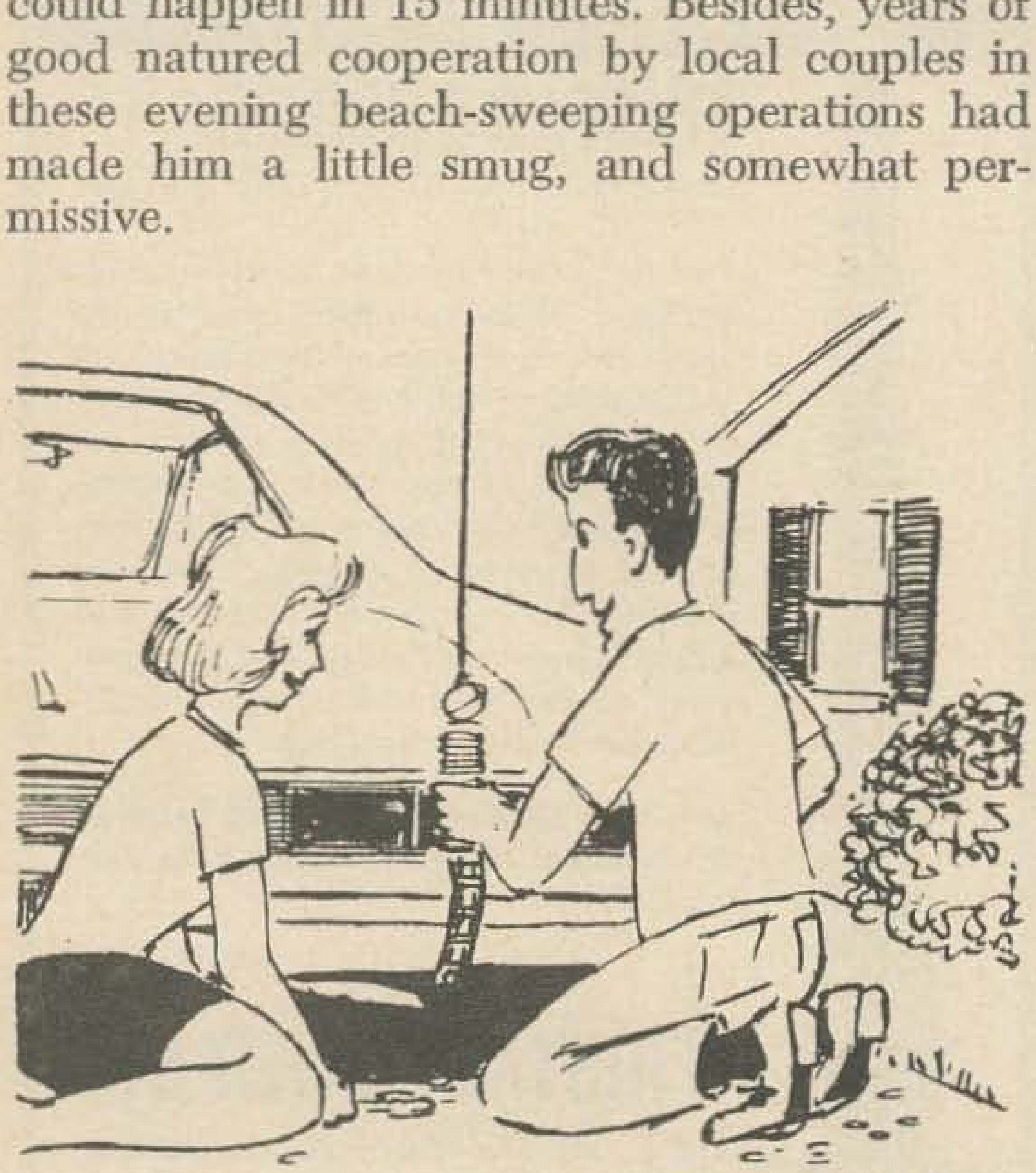
Lovers Lane

One sorry night I parked in lover's lane with a Ham Radio Operator.

This moonlit beach was a time-honored local courting tradition. Parking there was a precision operation that rivaled a military parade.

Cars parked in order of arrival. At 20 minute intervals the lights of a police patrol car would appear in the distance. One after another the cars would drive away in the opposite direction, circle the park, and then return for another quarter hour of uninterrupted parking.

The policeman who drove the patrol car knew full well what was going on, but he romantically maintained nothing "serious" could happen in 15 minutes. Besides, years of good natured cooperation by local couples in these evening beach-sweeping operations had made him a little smug, and somewhat permissive.



So far that season, there hadn't been one hitch in the operation, not even a stalled motor. Then I hit the beach with this Ham Radio Operator I'd been dating.

I should have known, when I helped him drill a hole in the trunk door of his brand new Pontiac, that something like this would happen. I should have foreseen it when I helped him install a six foot long whip antenna, adding a short, high frequency antenna to the roof of the car a couple of weeks later. But it was spring. Robins, tulips and my hormones were in full bloom. I was infatuated with this big, tall, hunk of beef . . er, Ham! He was, after all, quite a wonderful dancer.

When he invited me to go dancing one evening, I accepted, thrilled and planning what I'd wear before I hung up the phone. When he picked me up that Friday evening, the air smelled of fresh things; lilacs, bock beer, spring. I wore a daringly low cut dress of romantic blue chiffon.

We danced well together. His arms were strong and his shaving lotion was fresh, and I hardly felt the floor.

He whispered in my ear. I shivered delightedly. It was the first time he'd invited me to lovers lane. He was getting serious!

So we drove out to the park and took our place in the line of cars along the beach. We sat there, holding hands tenderly, drinking in the beauty of the spring night.

"Got to hand it to Sara Teasdale," I thought. "Is this beauty not enough? Why do I hunger after . . ."

"Spfttptz" went the box at my feet.

"What's *that?*" I demanded, pulling my hand away.

"My squelch."
"What?"
"My squelch."
"Oh."
He bent over, adjusting knobs on a metal box attached to the dashboard. I could just make it out in the moonlight.
"On my radio," he explained, head between his knees.
"What's it for. Do we NEED music?"
"On my HAM radio."
I sat there.
"See," he explained, coming up for air, clutching a two-way mike, "instead of being on all the time, the squelch cuts off bad transmissions. You hear less static."
"Great."
"Listen, I'll search the band."
"Search it," I said bleakly, putting my back and elbow against the window, leaving a wide expanse of seat between us.
"If I'm lucky, I'll get Detroit across the lake."
"Bully," I said.
"I'll see if there's anyone on. CQ, calling CQ, this is W9### calling CQ. Anybody read me?"
"Splutt pfzt," said the squelch, "przft."
"Jiggers," I said. "The cop is coming."
He was beyond me. "CQ," he invited the air waves, "calling CQ. This is W9###, on the shore of Lake Michigan, in Indiana. Calling CQ. Anybody read me?"
"Not yet," I said, "but stick around. Somebody will."
The lead car pulled out. Our turn came.
"CQ," he said.
The car to our right backed up angrily, clumsily, and the rest of the line followed it out of the park. We were alone on the beach, almost.
"All right, you two," said the voice of the law. "Break it up. That's enough. This is a public . . ." his voice trailed off as his flashlight searched out the dismal truth.
"Oh, hello officer," said CQ. "I'm trying to get Detroit. Listen! I think there's somebody on."
"Yeh," said the officer dumbly, as CQ frantically whirled dials from left to right. "Yeh," he repeated.
"Yeah is right," I agreed, shifting my weight a little. My foot had fallen asleep.
"Spfllftsz," said the squelch.
"I was sure I'd get good reception tonight," muttered CQ.
"You could have, you could have," I thought bitterly.
"Have you ever read *Spring Night,* by Sara Teasdale," I asked the officer.
"Nah," he said dully. His eyes had a detached look. He couldn't seem to move from the window ledge, where he leaned on his arms, the flashlight shining haphazardly across the bumper.
"The whole schedule's shot," he muttered pitifully. He stood there, stricken, as the line of cars began approaching the beach from the other direction.
"Officer," I consoled. "You are not alone. How would you like to buy me a cup of coffee and drive me home?"
"Yeh," he said dismally, as I opened the car door.
"Where are you going?" demanded CQ, startled.
I pulled my coat high around my throat so I wouldn't catch a cold in my cleavage.
"To Detroit, sweetie." . . . Marianne

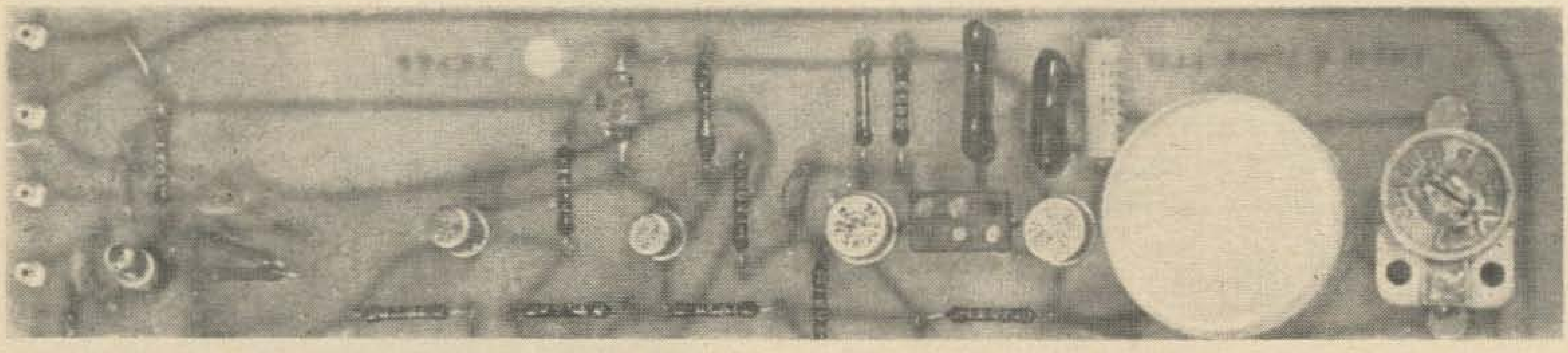
Robert Wilson W5NUW
419 W. Davis
Nowata, Oklahoma

A Modern Frequency Standard

Like all hams who convert surplus equipment or build their own gear I have been faced with the problem of calibrating it. If you are interested in odd frequencies that are not covered by the new ham band-only receiver, you've got problems too. On the other hand if your budget is limited (and whose isn't), it is not practical to buy a new piece of calibrated equipment for each project. After being spoiled by having access to frequency counters and synthesizers at work, it is hard to ever go back to the old inaccurate methods of calibration. What I wanted for my station was a rock solid device that would approach the accuracy of the better commercial devices.

A little applied brain power will give several solutions to the problem. First one might try a harmonic generating oscillator. These have been used for a long time and are quite reliable. Another thought is the slightly more exotic frequency counter; it's really quite simple because of the repetition of simple flip-flop circuits. Some research into *Frequency* magazine or some of the other more specialized journals will add plenty of other possible combinations of flip-flops, Schmitt triggers, adders and so on, which may all be put together in any number of ways to arrive at the required answer. Being a little hard-nosed about it all, the simple calibrated oscillator appears to give you the most for your dollar.

Naturally when one thinks of calibrated crystal standards, the first thing that comes to mind is the self-contained, one tube oscillator and power supply of years past. This was and still is a good means of calibration for many people (including me. It is not complex, cost is reasonable and it may be adjusted to agree with the National Bureau of Standards by beating it with WWV.



A portion of the printed circuit board containing the modern 100 kc calibrator. The rest of the board (not shown) contains flip-flops, mixers, gates and a dirty picture or two.

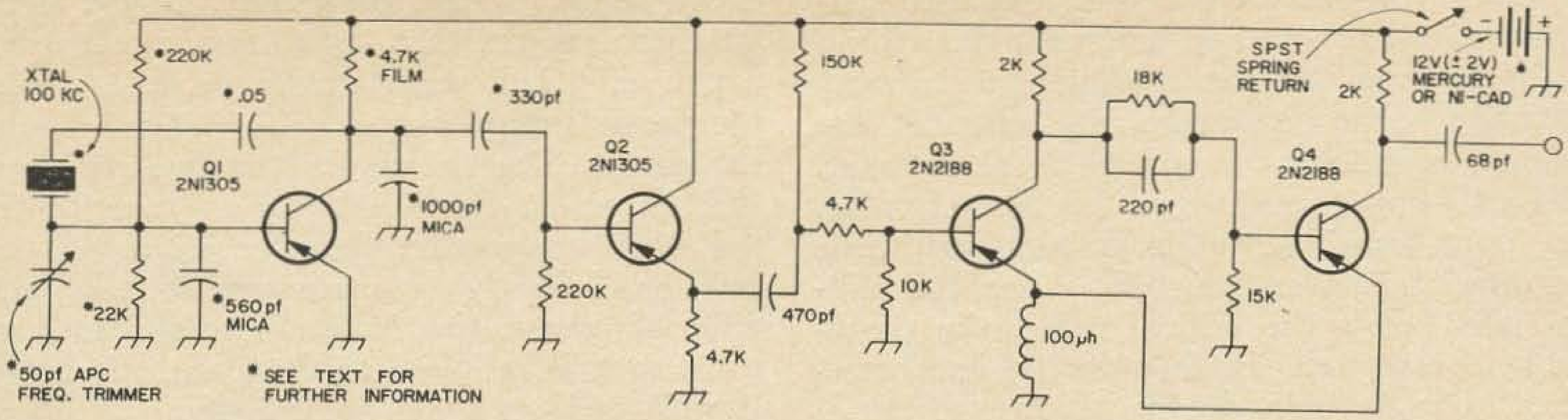


Fig. 1. Schematic of the modern 100 kc calibrator.

Let's get modern about this thing. After all with a little shopping around, for example see some of the ads in the back of this magazine, it is possible to put in four transistors for the price of a single tube. Not only that but you will find that there are almost no shocks involved in transistors which means a lot to us who have grown up the hard way with high voltage. Power supplies may be eliminated by using batteries, thus assuring yourself of a completely filtered "pure dc" signal which can be carried anywhere.

To accomplish these objectives to my satisfaction, the circuit of **Fig. 1** was arrived at after several months of mulling it over. It all starts with the 100 kc crystal oscillator. This is a highly stable circuit which will allow frequency measurements to be made that are far in excess of the general ham requirements. To obtain the best results the whole device may be enclosed in an oven which operates at a temperature somewhat above the highest expected ambient temperature. Common temperatures used in commercial practice are 75° C. in conjunction with tube type equipment and sometimes 50° C. when all other equipment is transistorized. We won't need the five parts in ten to the eighth accuracy here so let's settle for no oven and simply place the finished unit in a location where it stays just about room temperature.

If you will notice the circuit again, it is easy to see that there is a great deal of capacitive swamping used in the Pierce oscillator. Please don't use just any capacitors here. Use the best—silver mica. It will pay off in stability. A word about zero temperature coefficient ceramic capacitors . . . for some reason they never seem to get that ceramic formula exactly compensated and some drift has always shown up when I have used them. The collector resistor should be over-sized so that it will stay cool and not deteriorate with time, better yet use a carbon or metal film resistor with known long life characteristics.

The same thing may be said for the two base biasing resistors (220 k and 22 k). A .05 μf capacitor is used to keep dc off the crystal, almost anything may be used in this position because the reactance is so low that some variation will go almost completely unnoticed. Note that the frequency adjustment capacitor is in parallel with a 560 pf mica. This means that a good deal of capacity change will be required before much frequency change will be apparent; nevertheless use only good quality variables such as NPO ceramics, air trimmers or better yet double bearing capacitors such as those found in VFO's. The 330 pf oscillator coupling capacitor should also be of a stable nature because it couples into the frequency determining circuits.

A word about crystals for the circuit. The one I used was surplus, not hermetically sealed, thus it was possible to play with it out in the open. No doubt there are many commercial crystals that will work perfectly but mine wouldn't hit exactly 100 kc. So with the trimmer set in the mid-range position, it was possible to adjust the frequency up to hit WWV by rubbing up the plating with #600 grit emery paper (lightly, lightly) with the unit turned on. After a few days aging, a little rubbing with a hair pin of solder brought the frequency to the exact spot required.[1]

Only one problem with this type of stable oscillator, the output is so clean that there are no usable harmonics. Besides if you want a stable oscillator, the last thing you should do is connect an unknown external load directly to it. One stage of emitter follower isolation was added so that the oscillator would look into a high impedance load. This means that the load on the oscillator is very light and will not effect the frequency noticeably.

After the isolating amplifier is one of the most useful electronic circuits you will ever find, the Schmitt trigger. In this unit it is used to shape the harmonicless oscillator out-

1. "Grinding Surplus Hermetically-Sealed Crystals", *QST*, March 1963, pp. 30-31.

put into a square wave that is rich with harmonics. There is no question with this circuit of "locking in" to the oscillator; it is automatically done correctly. In essence the Schmitt operates as a voltage level detector. When the input level exceeds a certain value, the input transistor suddenly turns on while the other transistor turns off. When the voltage falls below the critical value, the conditions reverse just as though the transistors were a single pole double throw switch. It can operate much faster than a mechanical switch naturally, but it will create the same type of harmonics. This is one of the best things about it. As shown in the schematic, I have been able to obtain usable signals up to 165 mc.

In general the harmonic strength seems to be governed by the speed of the transistors used. The 2N2188 (Texas Instruments) seemed to be the best for my purposes but 2N2128's and SB-100's worked OK. I expect that almost any high frequency PNP type would be alright. The other transistors are 2N1305's which are about as cheap as you can get. In any case they are stable and seem to work without a hitch as long as they are soldered permanently in the circuit. I don't recommend sockets or transistor shuffling from one socket to the next which invariably happens when they are installed. If you happen to have some silicon transistors, they will undoubtedly function well as long as the frequency response is up in the mc range. My next project is to try some NPN transistors such as 2N705's or some of the new 25 cent epoxy devices made by TI, GE and Fairchild. Naturally I would change the battery polarity before adding the NPN transistors.

The design center of the oscillator and the associated circuits is 12 volts. Don't worry too much about hitting this voltage right on the nose because it is the stability of the power supply that you are interested in rather than the exact voltage. A set of mercury batteries connected through a spring return switch will give you a calibrating signal any time it is required and the batteries will last practically forever. The mercury cells will supply a very stable voltage source until near the end of their useful life when the voltage will suddenly begin to drop drastically. If you insist on an ac supply, then try to regulate it using a pair of 6 volt zener diodes in series across the power supply output or in a series regulator circuit. The reason for the two diodes is that zeners in the 6 volt region have by far the best temperature compensation. If you buy one already compensated, it may cost $50. Of course, the cooler the diode runs, or the less it is required to dissipate, the better it will work, so build accordingly.

Once the oscillator is functioning, it is easy to think up many places to use it, in fact I would feel lost without it. For example, it may be used to calibrate a receiver very accurately. If you first know approximately the frequency to which you are set, you are "in the ball park." The oscillator harmonic will locate the exact 100 kc multiples up or down the band from that spot. By adding a dial calibrated with divisions 0 to 100, work from marker frequency to marker frequency. If, on a particular receiver, the dial must be turned 2.67 times between markers (a total of 267 divisions), this means that each kilocycle will be 2.67 divisions on the dial, or close to it. There might be some variation due to nonlinearity, but this scheme is far better than the approximate calibration silk-screened on most dials. The addition of a couple of flip-flop dividers can do much to refine the readings but this is another story.

Using the oscillator as a band edge marker, it is possible to push the station transmitter right up to the band edge where mere mortals fear to tread (don't forget about sidebands though). With the calibrated receiver, crystals may be ground down to MARS frequencies, or shifted within the ham bands. You can adjust the frequency of your 2 meter converter crystal so that you can read the kc divisions correctly and give frequency reports to less fortunate buddies who still think that buying a calibrated crystal will put them on frequency. But after you have played with it for awhile, there will be new tricks that you will discover.

Remember it costs less than $15 to avoid grey hairs and citations from the FCC. That's a pretty cheap ounce of prevention. . . .

. . . W5NUW

AMATEUR TELEVISION is the EXCITING NEW FRONTIER GO ON THE AIR NOW WITH A VANGUARD TV CAMERA

Model 400 for TV channels 2-6 (closed circuit) Model 440 for ATV 436-450 mcs.	**Only $149.95 less vidicon and lens.**

25 mm. F1.9 normal angle lens in focusing "C" mount $18.95

Other lens available from $15 to $250 for our fantastic F1.4 ZOOM lens.

Complete description in our catalog for 10¢.

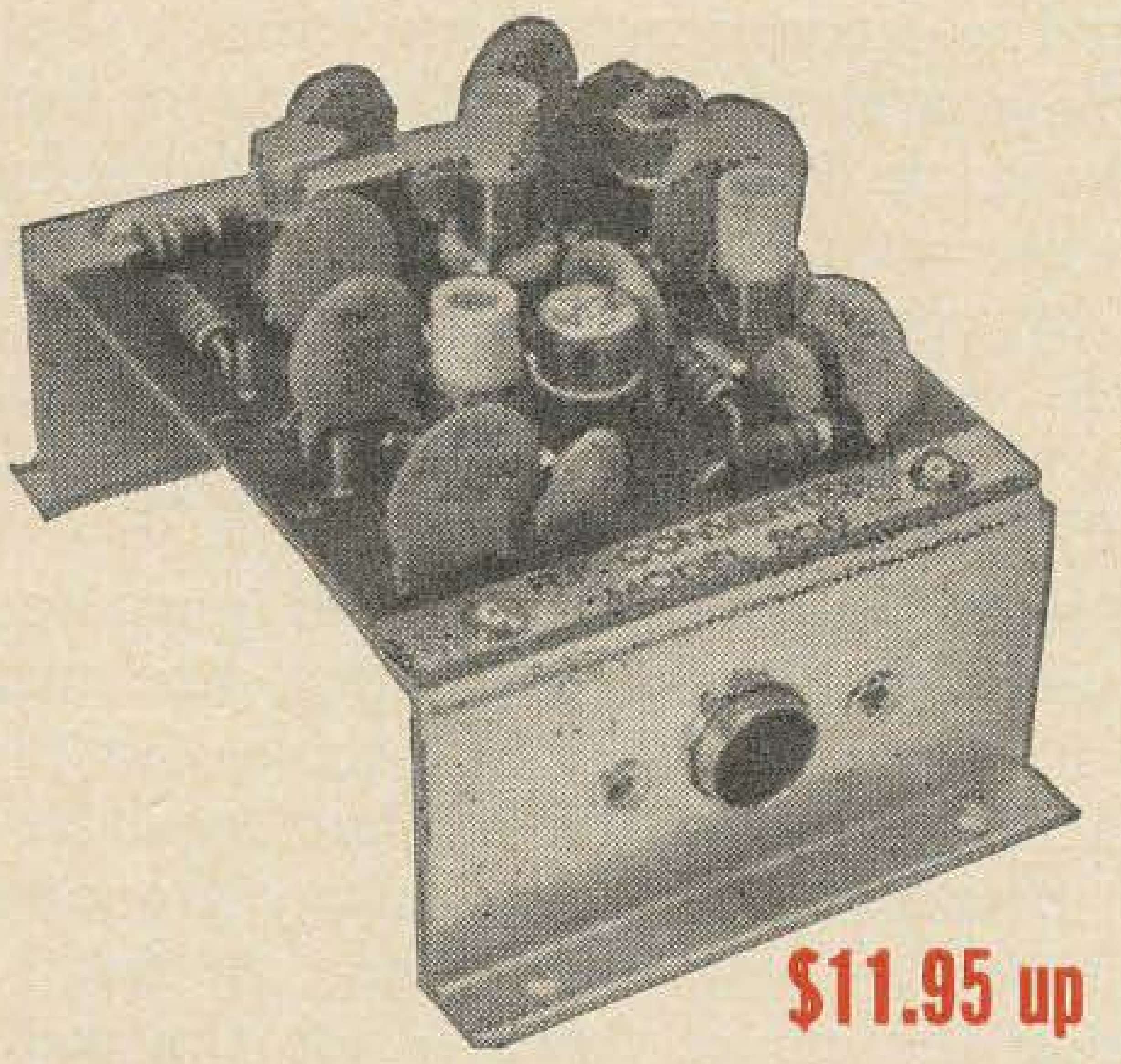
Vidicon tubes:	7038	7735A
Grade A	$85.00	$100.00
Grade B+	$75.00	$ 90.00
Grade B	$60.00	$ 75.00

Grade C Our choice of any type 1" vidicon, new or used—guaranteed to give satisfactory service for amateur use. $35.00

The VANGUARD Models 400 and 440 are factory assembled with the same precision as our industrial cameras now in continuous duty throughout the U.S. Complete with self-contained synchronizing generators, 4 mc. video amplifiers, power supply, tripod base plate and low power TV transmitter which can easily be increased with simple linear amplifiers. Illumination can be as low as 1 foot-candle when using our vidicon and lens. Picture sharpness is guaranteed to be equal to the best capabilities of any standard 525 line TV receiver. Modular construction and printed circuits permit quick replacement and servicing of major circuits. Weighs 11 lbs.—measures approx. 8" x 6" x 6".

Crystal controlled horizontal scan available on either model for only $20.00 more. Add the suffix X to model number.

Building your own TV camera? Our complete line of tested circuit modules and deflection yokes will save you much time and money. Fully described in our catalog for 10¢ coin or stamps.



VANGUARD TRANSISTORIZED CONVERTERS

New series 300 with 3 VHF-UHF transistors, crystal-controlled oscillator, tuned R.F. stage and low noise mixer. One microvolt sensitivity. More than 30 high quality parts carefully assembled and tested. Measure only 3" x 2½" x 2". Operate at 12 volts DC 4-5 ma. All above converters are supplied with Motorola type connectors. For two SO-239 connectors instead, add 75c.

Available in the following models:

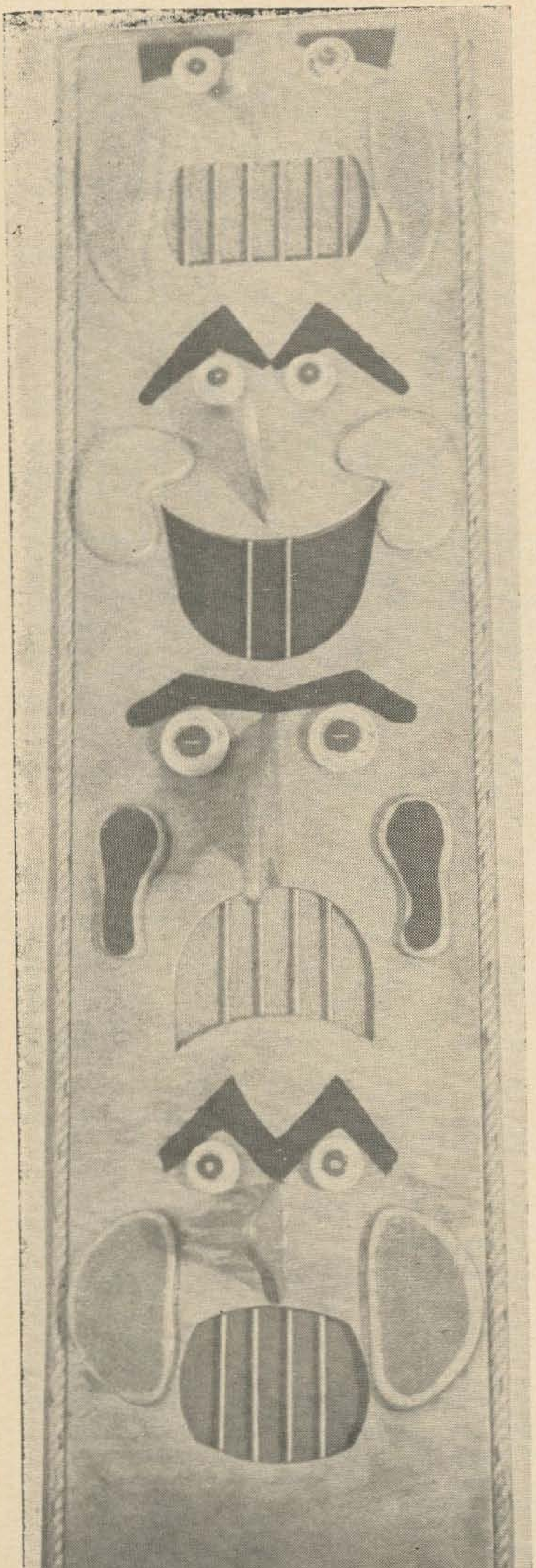
	Model	Input mc.	Output mc.	Price
2M	300-D	144-148	50-54	$12.95 ppd.
2M	300-E	144-145	.6-1.6	$12.95 ppd.
2M	300-F	144-146	28-30	$12.95 ppd.
2M	300-Q	144-148	14-18	$12.95 ppd.
6M	300-B	50-51	.6-1.6	$12.95 ppd.
6M	300-C	50-54	14-18	$12.95 ppd.
6M	300-J	50-52	28-30	$12.95 ppd.
20M	300-G	14.0-14.35	1.0-1.35	$11.95 ppd.
CB	300-A	26.965-27.255	1.0-1.29	$11.95 ppd.
WWV	300-H	5.0	1.0	$11.95 ppd.
Int'l.	300-I	9.0-10.0	.6-1.6	$11.95 ppd.
CHU	300-K	7.3	1.0	$11.95 ppd.
CHU	300-L	3.35	1.0	$11.95 ppd.
Marine	300-M	2-3	.6-1.6	$11.95 ppd.
Aircraft	300-N4	121-122	.6-1.6	$13.95 ppd.
Aircraft	300-N5	122-123	.6-1.6	$13.95 ppd.
Fire, Police etc.	300-P	155-156	.6-1.6	$13.95 ppd.

Nuvistor converters available from $10. Circuit modules and government surplus equipment also available. Send 10¢ coin or stamps for complete catalog.

For prompt shipment please include postal money order or cashier's check. COD's must include 20% deposit. New York City residents add 5% sales tax. New York State residents add 2% sales tax. Include sufficient postage for all items except converters and circuit modules which are postpaid.

VANGUARD LABS

Dept. H-11
190-48 99th Avenue
Hollis, N.Y. 11423



Don Roberts W7PXE
3731 W. Glenn Dr.
Phoenix, Arizona

The Baffling Totem

WHAT IS IT, you ask? Basically it is used to mount and enclose speakers. The unit I built will mount four speakers, but more or less can be used. One speaker is used for two meters, one for six, one for the low bands, and one for a spare.

WHY SO OSTENTATIOUS? is obviously your next question. Besides serving the fundamental purpose of enclosing speakers, I wanted a decoration to liven up my shack. If you have a similar need, believe me, this will do the trick. People visiting the shack for the first time usually express their initial impression by something like "what's that?" After which you have an excellent conversation piece to break the ice with all but the most timid of souls.

This unit also serves a third purpose, and will undoubtedly be a solution for many of you. I was faced with the problem of providing access to my shack for four separate coax runs, two rotator cables, a heavy ground wire, and space for any future needs. At first I tried running the cables down inside the wall, but this proved futile due to cross bracing in the wall which interfered with the cable route. I finally decided to cut a round two inch hole in the corner of the ceiling, and arrange the cables down the corner of the room. Well, fine and dandy, but how to cover up the cables? The Baffling Totem came to my rescue! I mounted it in the corner of the room, and the cables now run down the wall behind it, out of sight, out of mind.

If you are convinced that you should have a Baffling Totem, let's get started with the construction! The following information is for making a four speaker unit, which is one foot wide and four feet high. I used six inch round pin cushion type speakers. You can change the size to fit your own particular speaker/space requirements.

Obtain a piece of ½ inch plywood, four feet long by one foot wide. You can probably find a piece already cut in the "odds and ends" bin at your local lumber yard. If not, then have them cut a piece off, as this will eliminate the need of a table saw to obtain a straight cut.

You will also need ten feet of one by two pine, plus a few scraps of ½ inch plywood to make the facial features. You will also need ¼ pound of four penny (1½") finishing nails, a handful of two penny (1") common nails, one dozen ¾" wood screws, a bottle of white glue, some epoxy glue, sandpaper, ¼ yard each of red, blue, orange, and green decorator's burlap, (or any color that you wish to use) eight round wooden knobs, (the kind you find on inexpensive wooden chests) six feet of ¼ round wood doweling, four 2 inch eye-bolts, and ten feet of ½" manila rope. Painting and finishing will be discussed later.

Start by laying out your design directly on the board with soft lead pencil. Take care to space the speaker openings (or mouths, if you please) evenly down the length of the board. On the plywood scraps, draw the ears and noses.

Now do all the required sawing. A saber saw, jig saw, or coping saw will do nicely. Glue and nail the one by two strips to the back side, countersinking the finishing nails. Fill all holes and cracks with plastic wood or similar filler. Now sand all pieces thoroughly. Be sure to round off the edges of the ears and noses. Don't spare the elbow grease here!

Now attach the facial features to the board by using glue, and wood screws applied from the back side. The eyes may be put on next, by using the mounting screws which come with the knobs. A dab of glue under each knob will secure them tightly.

Next come the teeth. Cut them from the ¼" wood doweling, and glue them in place.

After locating the positions for the speaker mounting bolts drill a ⅜" hole ¼" deep at each location, drilling from the back of the board. The mounting bolts are then set in place with drugstore variety epoxy. This method was chosen to eliminate any countersunk holes from the front.

The speaker openings are covered by stretching and gluing decorator's burlap to the back side of the board. The unit is finished by nailing the manila rope to the edges of the board with the two penny common nails. To keep the rope from unraveling at the ends, apply a dab of epoxy at the joint where the ends come together. Make this joint at the bottom of the board.

After mounting your speakers, you are ready to hang your masterpiece of creativity from the ceiling with two eye-bolts.

Well there you have it, a colorful, functional, inexpensive, off-beat item that will never fail to provoke comments when guests enter the room. It will also give you the strange feeling that you are not "quite alone" in the solitude of your shack!

. . . W7PXE

Bill Hoisington K1CLL

432 mc Solid State Local Oscillator

Among numerous reasons for building this set, a major one is that I have always liked going up in frequency. When listening to the awful mess at times on the "DC" bands my faith and enjoyment in amateur radio is upheld by thoughts of all that nice clean "air" on 432, 1296, and up! I mean actually operating, contacts, mountain topping, etc., including building and tuning up.

When I wrote "Getting Started On 420" back in 1946, I was running 80 watts to a 32 element beam in Rye, N.Y., and working three stations over in N.J. in one evening was a great thrill. This was a modulated oscillator by the way. Since then the band has become "stabilized". First the good old 5 (now 6) meter band, then 2½ (now 2), and now 432. I personally think the modulated oscillator days were far greater fun than the present stabilized operation, but perhaps, taking the "long run" view of the whole picture crystal control does allow more stations on at a time. (Where are they?) And, due to the so-called "bumper crop of babies" of which by now a large number seem to have gotten their licenses, I guess we'll have to use a crystal.

This brought to mind immediately the question of VFO? However, I don't think this is a problem yet on 432. I'll keep my favorite crystal-VFO in reserve for that deal.

Local Oscillator Chain

If you're an "operator," don't read any further. If you really want to know how to get to UHF with transistors, keep plugging.

As you may know from previous articles, this author plays no favorites between tubes and transistors. However, there is a trend appearing. Lot's of people in the TV world are building all kinds of UHF tuners with transistors in them. Brand new fancy ones. Some of the tuners also have such as yet unattainable items as "three gang capacitor, .5 to 30 mmf". Yes, you read it right, one half a micro-micro-farad to thirty! This fancy minimum capacity is required by the wide uhf range of channel 14 (470 mc) to channel 82 (890 mc).

New UHF transistors for these tuners have also appeared. And if the usual course is run these should not be $20, $40, or over $100 (a fact) as some have been in the past, but should get down to under $2. The 432 and 1296 megacycle amateur can profit by these items, so we will start with the transistor chain.

If you double every time, a 50.5 megacycle crystal makes a good beginning. This goes nicely up to 101, 202, and 404 megacycles, the desired local oscillator frequency for conversion to 28 mc *if*, with only four transistors. 50.5 megacycles is also a nice rock for six meters, although that is mainly a VFO band now. Starting high is good for another reason as well. It lets you use fewer tuned circuits in the local oscillator chain. For example, in the circuit shown, it is possible to detect only a slight amount of 454.5 megacycle energy (nine times 50.5) in the output if you tune for it with a good tuned power detector. Tuned base input circuits will remove any trace of this, or a simple 400 megacycle filter can be used, if you're that fussy.

Oscillator: I went all out on this. I wanted to make a good, fool-proof item. It is. The more so because it uses a patent pending circuit of mine, the Crystal Phase Reversing Oscillator. Don't be alarmed at that word phase. That simply means, in plain English, the time relation of one event to another. And it is easy to describe it that way.

Figure 1 shows the circuit. A piece of piezo-electric material such as properly cut quartz, will have a concentration of negative charge on one side and positive on the other when mechanically compressed or stretched.

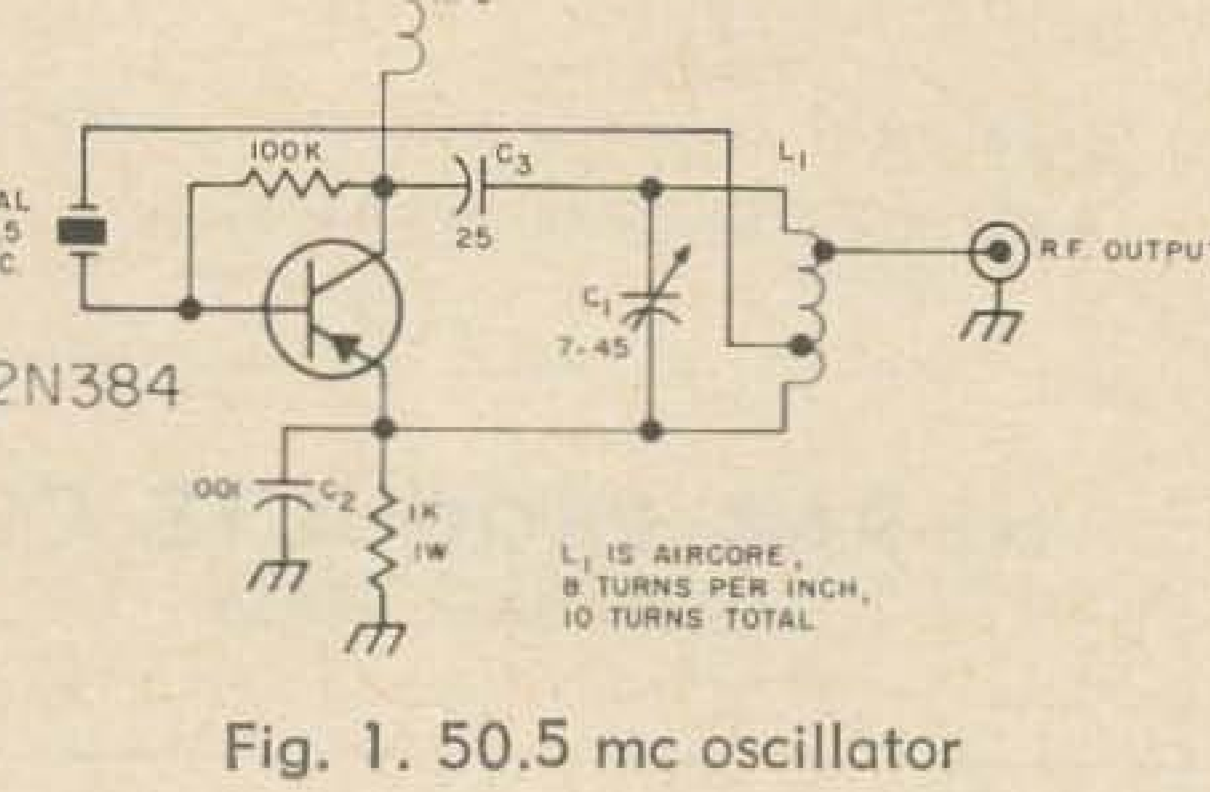


Fig. 1. 50.5 mc oscillator

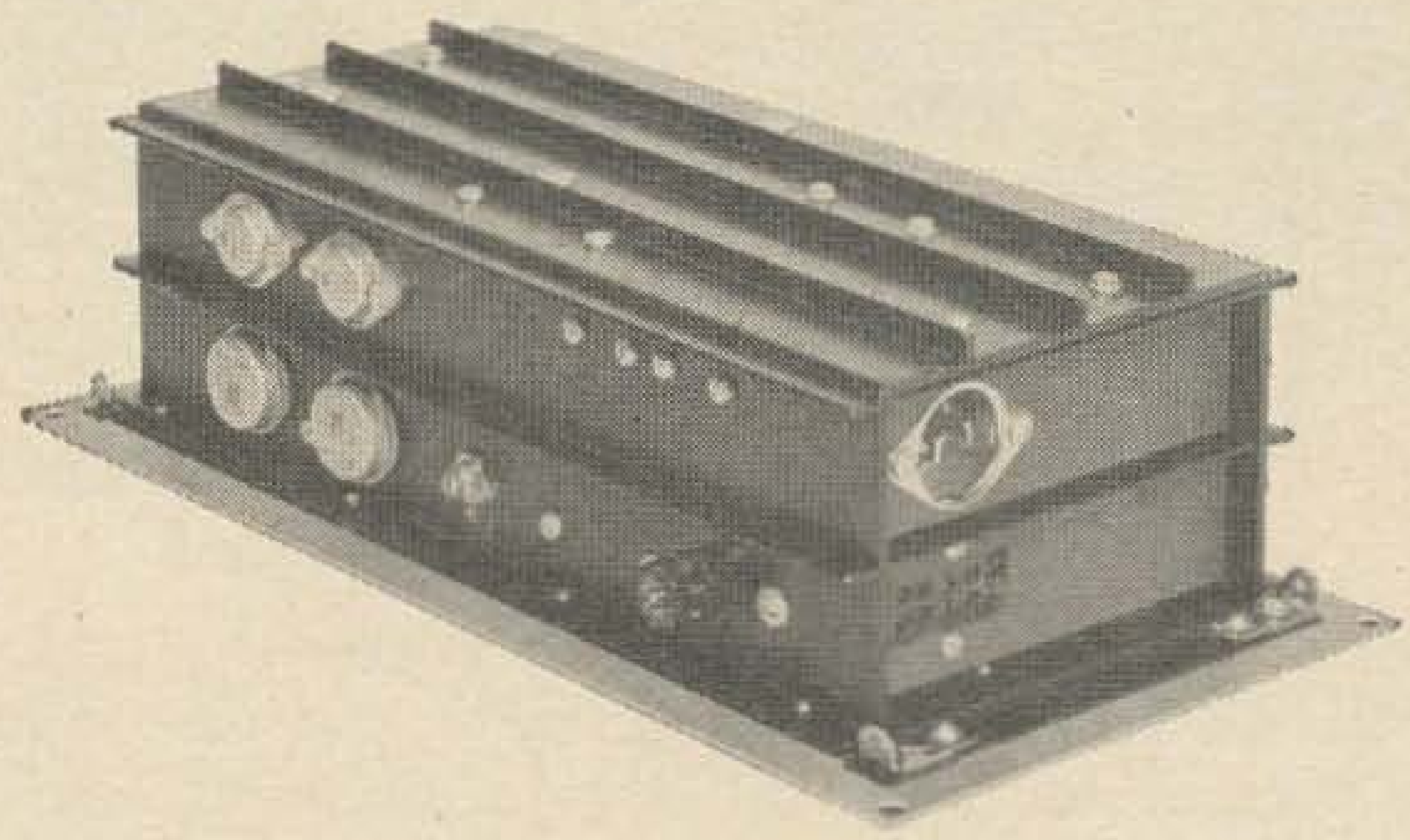
ANOTHER *LINEAR* LS *SYSTEMS 1st!*

« THE COMMANDER »

DUAL INPUT POWER SUPPLY AND CHARGER*

OUTPUTS
850/750/650 volts d.c.
325/285/250 volts d.c.
12.6 volts (filaments)
12.6 volts d.c. (charger)
0-125 volts d.c. (adj. bias)

INPUTS
110 volts a.c., 50-400 cps
12 to 15 volts d.c.
(In emergency service, both a.c. line and 12-volt battery are connected. Unit will automatically select line input.)



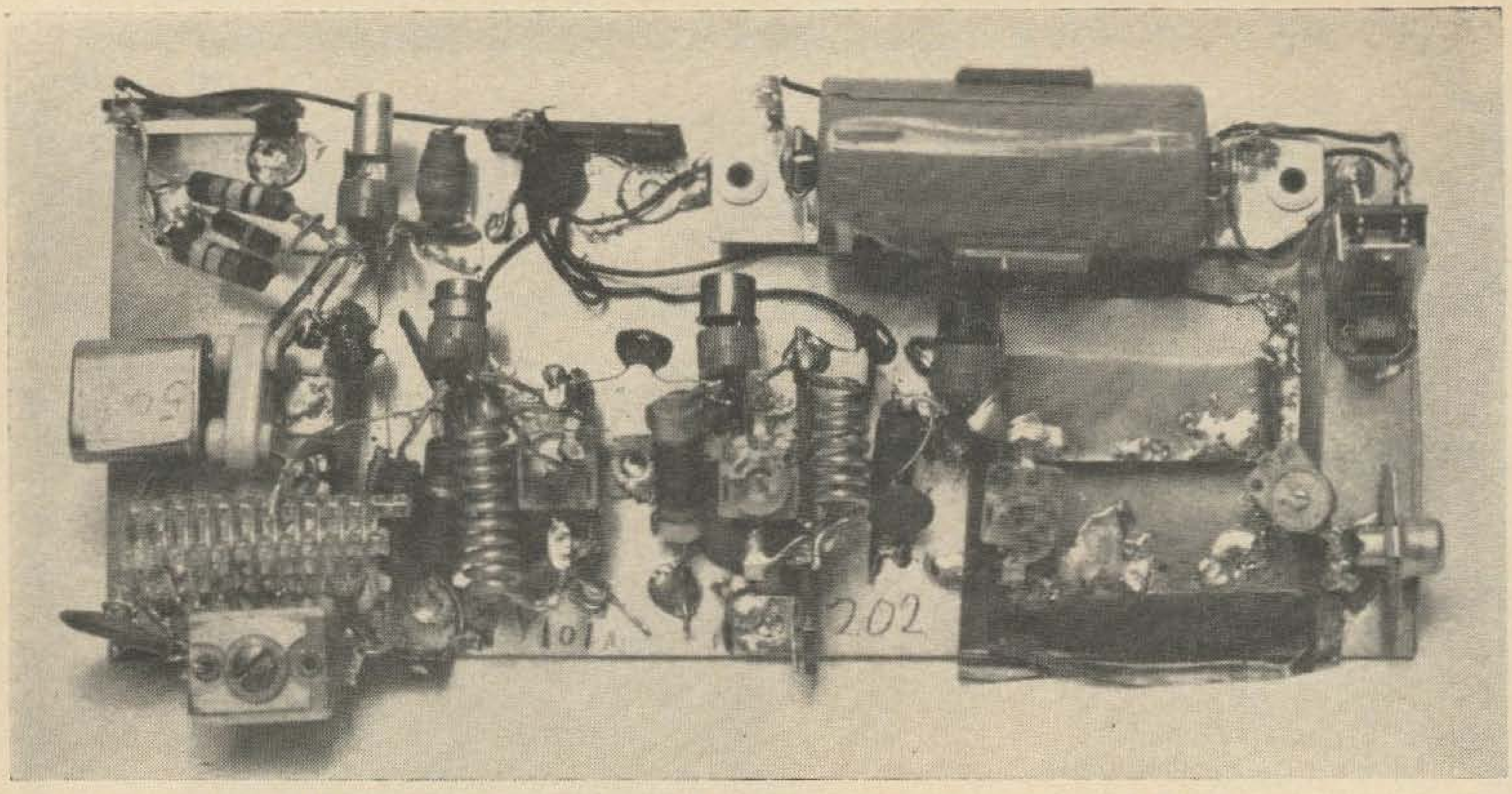
- 110 VOLT A.C. OR 12 VOLT D.C. OPERATION with automatic input voltage selection. Instantaneous voltage changeover prevents loss of power to transceiver, even when transmitting!
- CHARGES 12-VOLT BATTERY AUTOMATICALLY when operating from 110 volt a.c. input. Ideal for that emergency power system you have always wanted at the fixed station!
- SUPPLIES ALL VOLTAGES FOR ANY TRANSCEIVER UP TO 500 WATTS PEP. Multiple high- and low-voltage output taps, charger output, plus bias output adjustable from 0 to 125 volts d.c. gives true flexibility.
- QUICK, DETACHABLE MOBILE MOUNT INCLUDED. Makes moving the COMMANDER between car and house easy. You can even leave everything in the car and tune up the mobile rig using a.c. power. No haywire. No dead batteries!
- IMMEDIATELY AVAILABLE from your local dealer. The price: only $189.50. Seventeen-foot d.c. input and output cables, and six-foot a.c. input cable supplied. (Compare this one low price with the combined cost of separate mobile and fixed station supplies:)

LS

LINEAR SYSTEMS, Inc.

605 UNIVERSITY AVENUE, LOS GATOS, CALIFORNIA
New Telephone: 354-6661 (Area Code 408)
New TWX: (408) 571-7249

 *Patent Applied For



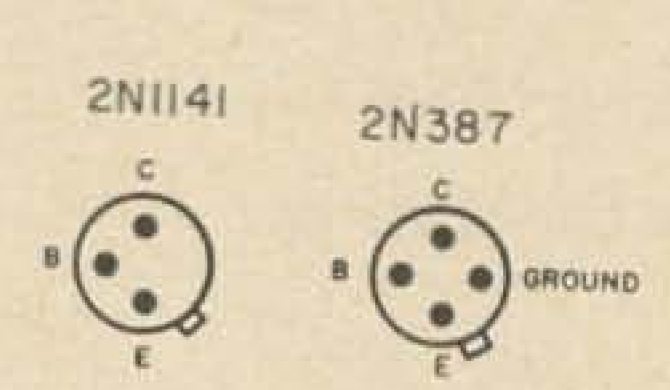
Top view of the local oscillator. Crystal oscillator is on the left.

Conversely, when a dc voltage is impressed across it, it will shrink or elongate. Going further, with ac on it, it will vibrate mechanically, and when doing so fast enough, these "sound waves" in the crystal material will bounce back and forth from side to side, being reflected at the air-crystal interface. To make a long story short, at any given instant there is plus voltage on one side and negative on the other. The next half portion of the cycle later, these will be reversed. So you see that the "phase" of the ac (50.5 mc) going through the crystal is always reversed. It's the nature of the beast. Incidentally, at least one patient examiner down in good old Washington, D.C. does not comprehend this fact yet. I finally had to send several photostatic copies of pages from textbooks on piezoelectricity down there!

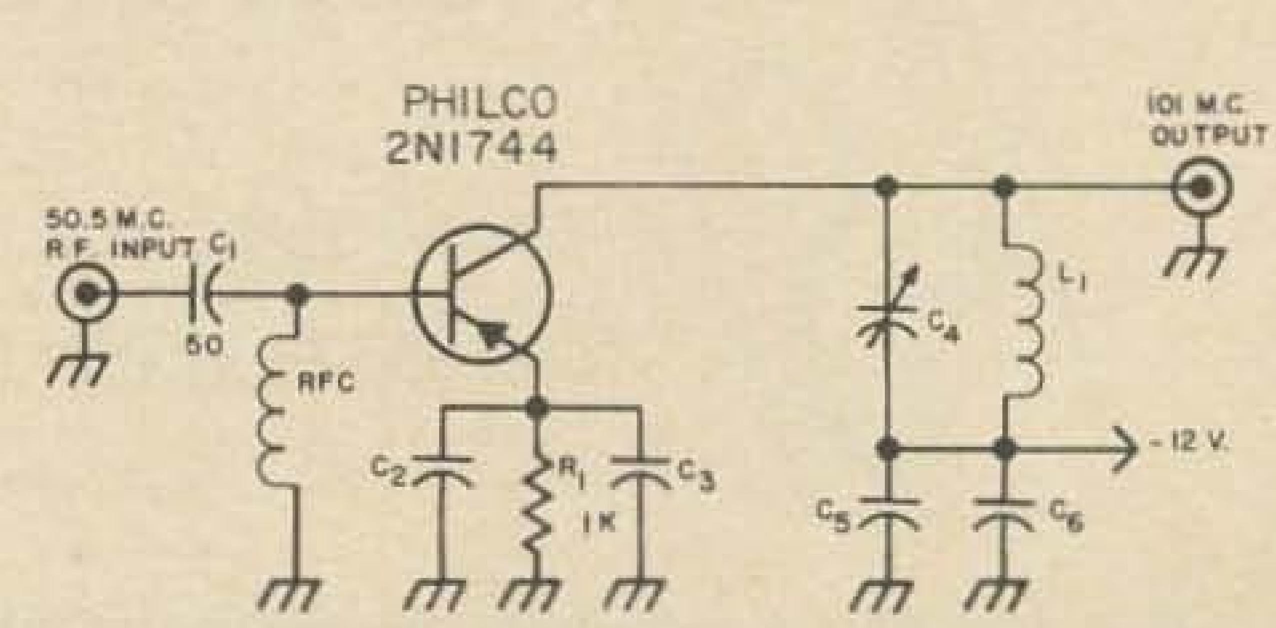
So it got to be a long story anyway. Meanwhile, back at Fig. 1, it will be seen that, rather than the base being at the opposite end of the coil from the collector, as it has to be in non-crystal circuits, the emitter is connected there. However, due to the lengthy process described above, the crystal reverses the phase, and not only oscillates very FB on frequency, but the circuit *refuses* to oscillate off frequency because, at any frequency except that of the crystal, the circuit is degenerative! Try it and see.

Back once again at Fig. 1, we have the ever-present 1000 ohm resistor in the emitter lead. This is bypassed by C2 to allow rf to drive out from ground. If you link couple out you do not need this bypass. The 100 k from minus 12 volts to base starts the oscillator running and keeps it going too, although under certain conditions it will run, once started, without it. I have used the following transistors in this stage. 2N247, 2N384 (good numbers), many of the VHF-UHF Philcos, and Motorola 2N1141. Some of these last go to 1296, so I saved them for the UHF 400 mc stages.

Watch out for the "ground" connection in some of these, see Fig. 2, and the collector connected case on some of them. Just be sure and get the base diagrams when you buy. And be sure whether you have a pnp or an npn. It does make a difference! I just burned out a brand new npn beauty, one of the 2,000 m



Above is Fig. 2, connections for the transistors used. To the right is Fig. 3, the first doubler.



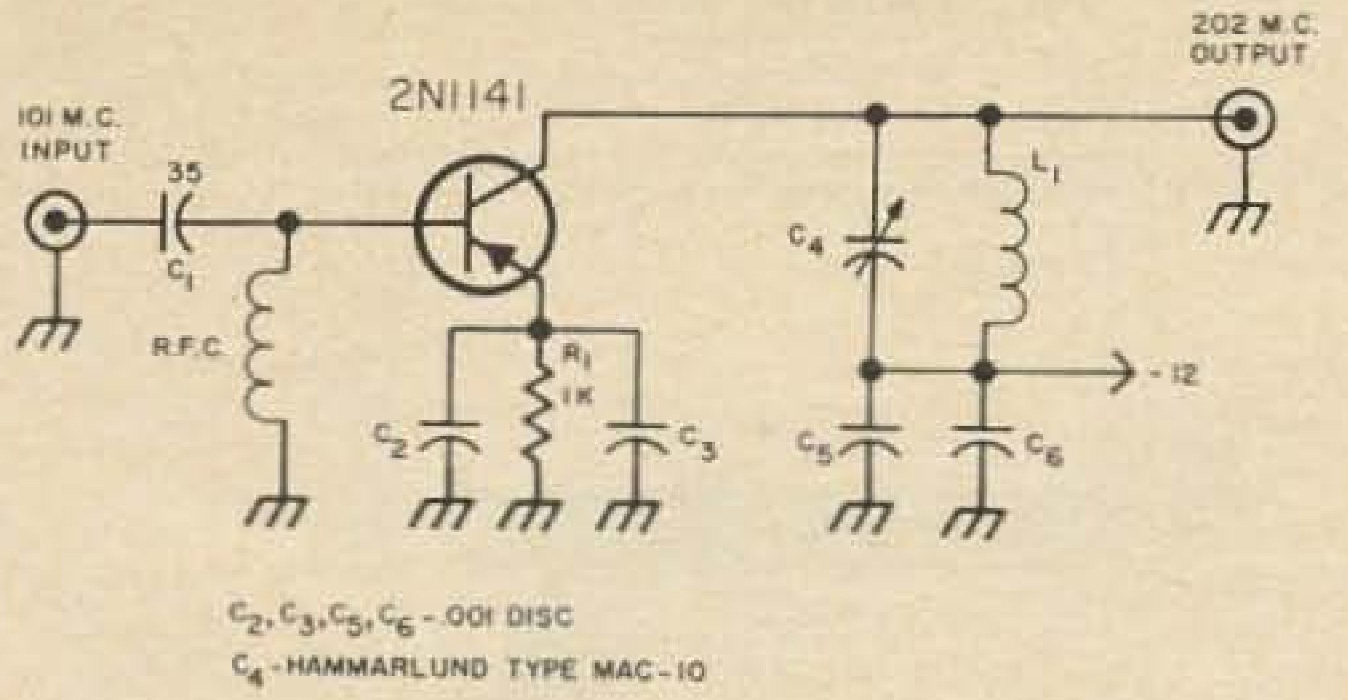


Fig. 4. The second doubler.

et. Simple rule to remember. Like electrons, which are "units of negative electricity" the npn's operate on positive voltage. (on the collector). That's about all there is to the oscillator. If you use the components listed and connect them as shown, it will work! It has to!

First Doubler, 50.5 to 101 mc

As usual, copper-clad bakelite makes a dandy breakboard. Mechanically strong, solders with a touch, cuts with a snips. What more do you want? A young, ready, willing and able novice yl to do it all for you?

Note in the photo that sockets are used. These are Grayhill because so far I have found them best. The thin small transistor leads insert easily enough, hold tight, and do not bind. There's a nice feature with sockets. You can try out your other transistors! I grade them for frequency this way. Plenty with the same number do not work the same!

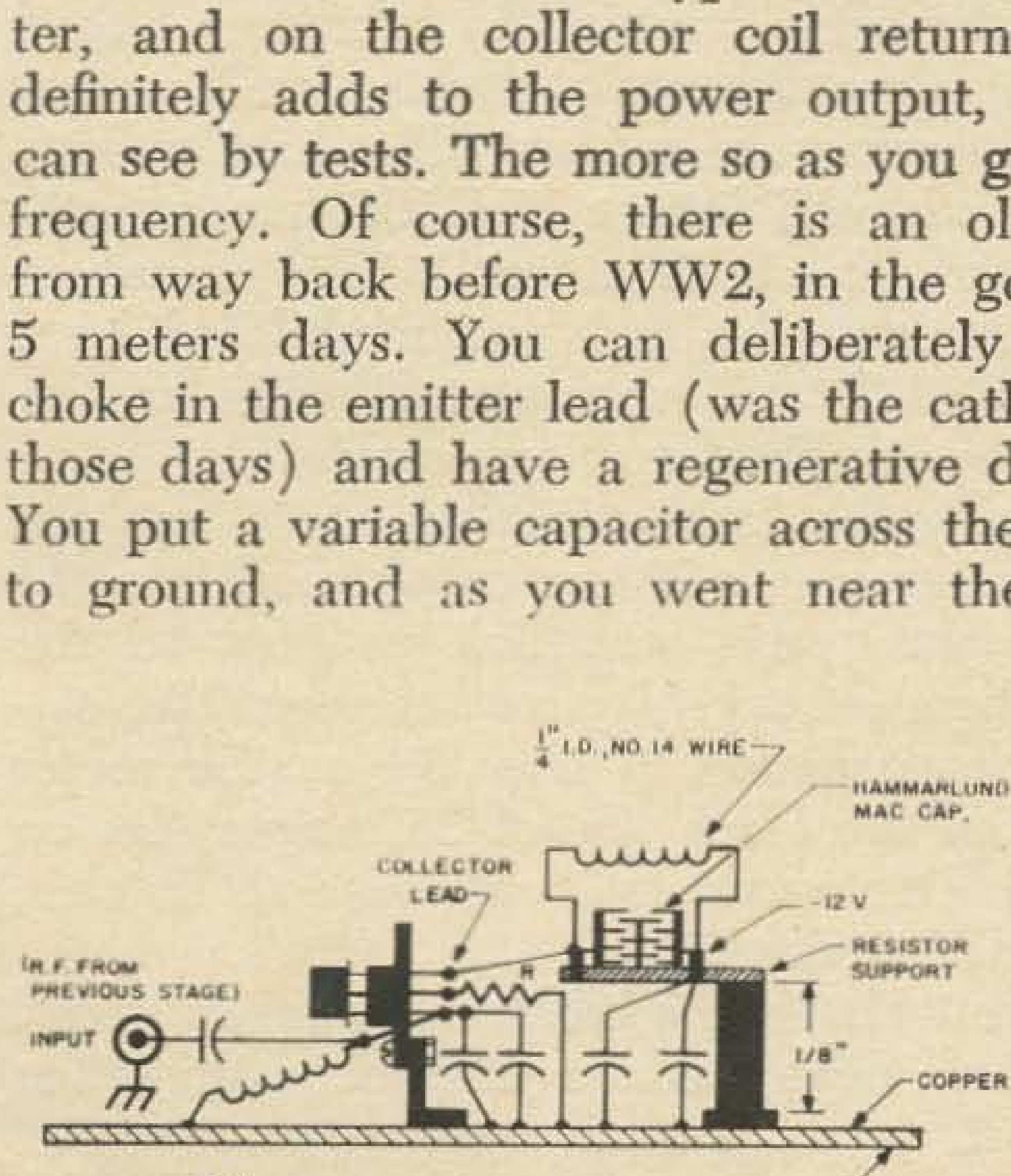
I have found an easy way to mount the little sockets too. A 2/56 nut and bolt will fasten a number 14 wire to the socket. This wire then solders to the baseboard and that's it. These sockets are still working at 400 mc also.

Note that the double bypasses on the emitter, and on the collector coil returns. This definitely adds to the power output, as you can see by tests. The more so as you go up in frequency. Of course, there is an old trick from way back before WW2, in the good old 5 meters days. You can deliberately put a choke in the emitter lead (was the cathode in those days) and have a regenerative doubler. You put a variable capacitor across the choke to ground, and as you went near the minimum the doubler would break into oscillation. However, and don't say I didn't warn you, such a stage can be a source of trouble. Amplitude modulation from mechanical vibration, instability, etc.

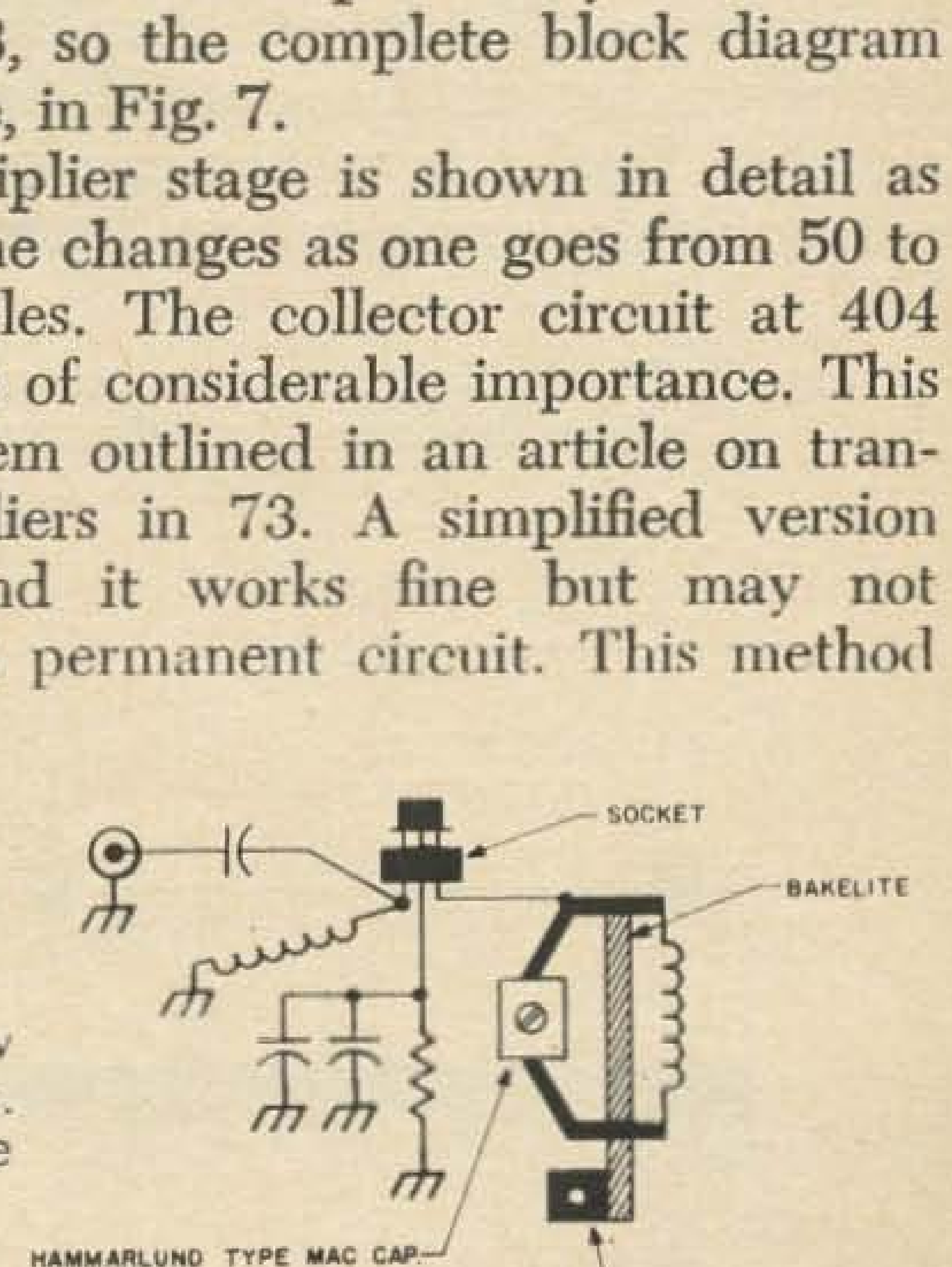
Figures 4A and 4B show some physical details. The resistor support is actually about ⅛ inch from the base board. The bypasses have practically no leads at all when properly connected. The Hammarlund type mac capacitor leads are also soldered directly to the resistor support tabs, which are cut and flattened. As you can see from Fig. 3, a transistor doubler stage can be quite a simple circuit, if you have the required components on hand. As the chain developed, I shifted the minus 12 volt lead going to a 10 ma meter to each stage as it was built. Without rf drive from the previous stage, no current will show, as the base is grounded through the rf choke and does not have any dc excitation on it. This allows a good tune-up procedure into the base circuit, similar go getting grid drive with a tube. In the chain shown, one or two ma showed on the collector milliammeter when the previous stage drove the base into the current region on negative rf peaks. The 1 k emitter resistor serves to limit this current. A little more power can be obtained with 500 ohm resistors and maybe 13 to 15 volts, but "as is" it works fb. No attempt at large power outputs was made, as this chain gives about 500 microamperes of good clean rf at 404 megacycles measured as rectified crystal current in the power detector test circuit. About 100 microamperes crystal current is found in the mixer crystal when the circuit is tuned to 432 megacycles.

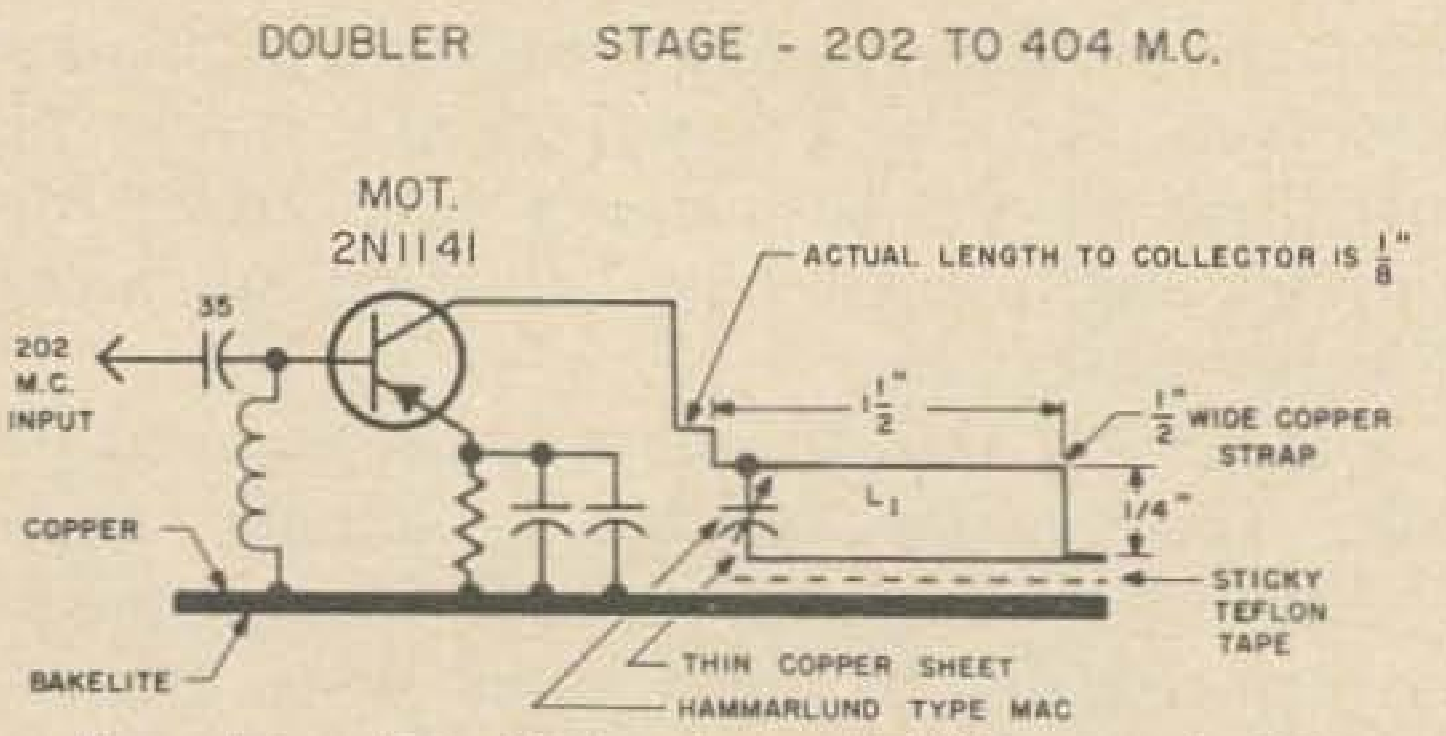
These mixers have previously been described in 73, so the complete block diagram is shown here, in Fig. 7.

Each multiplier stage is shown in detail as there are some changes as one goes from 50 to 404 megacycles. The collector circuit at 404 megacycles is of considerable importance. This uses the system outlined in an article on transistor multipliers in 73. A simplified version was tried and it works fine but may not suit you as a permanent circuit. This method

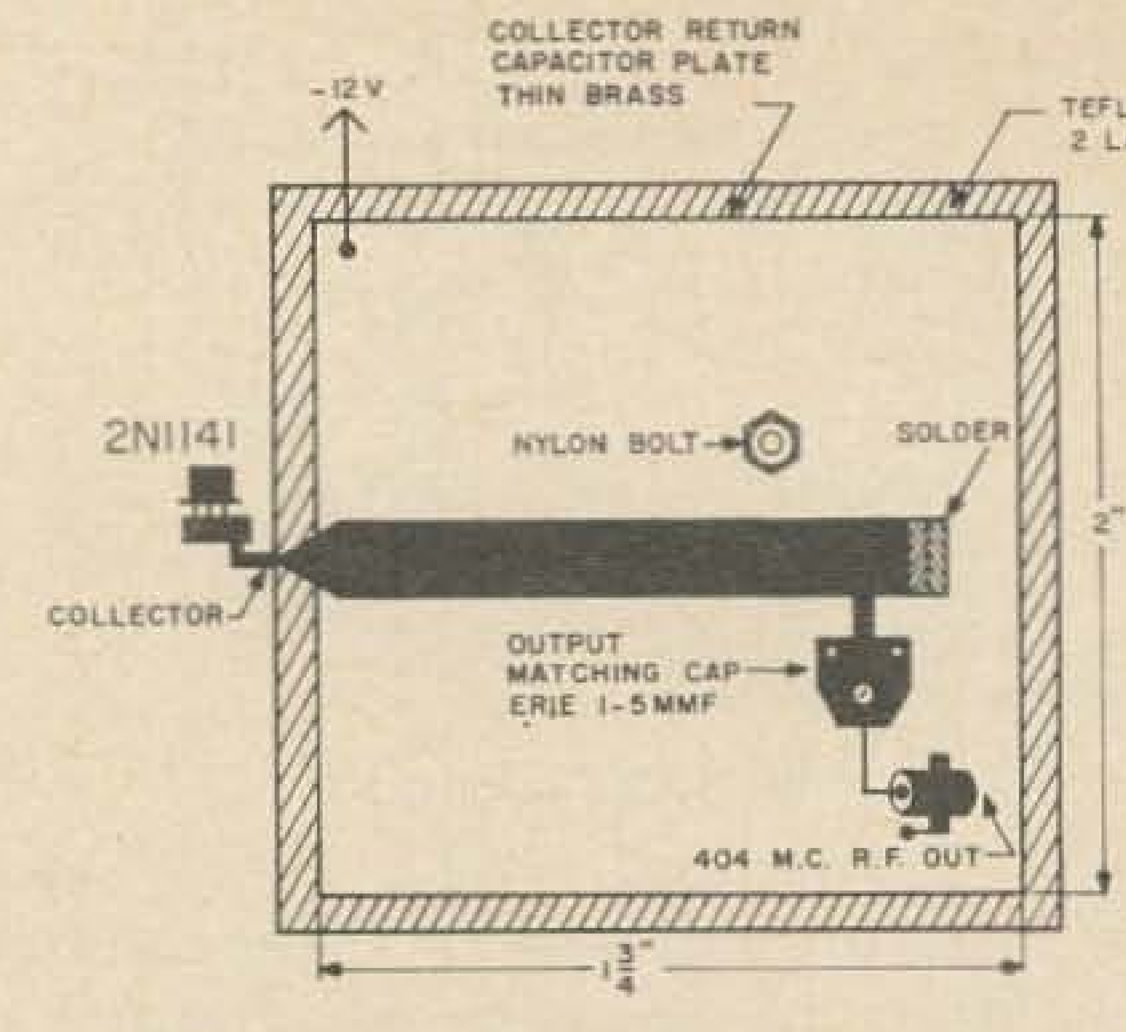


Left. Fig 5A. Side view of the first doublers. Fig. 5B. Top view of these doublers.





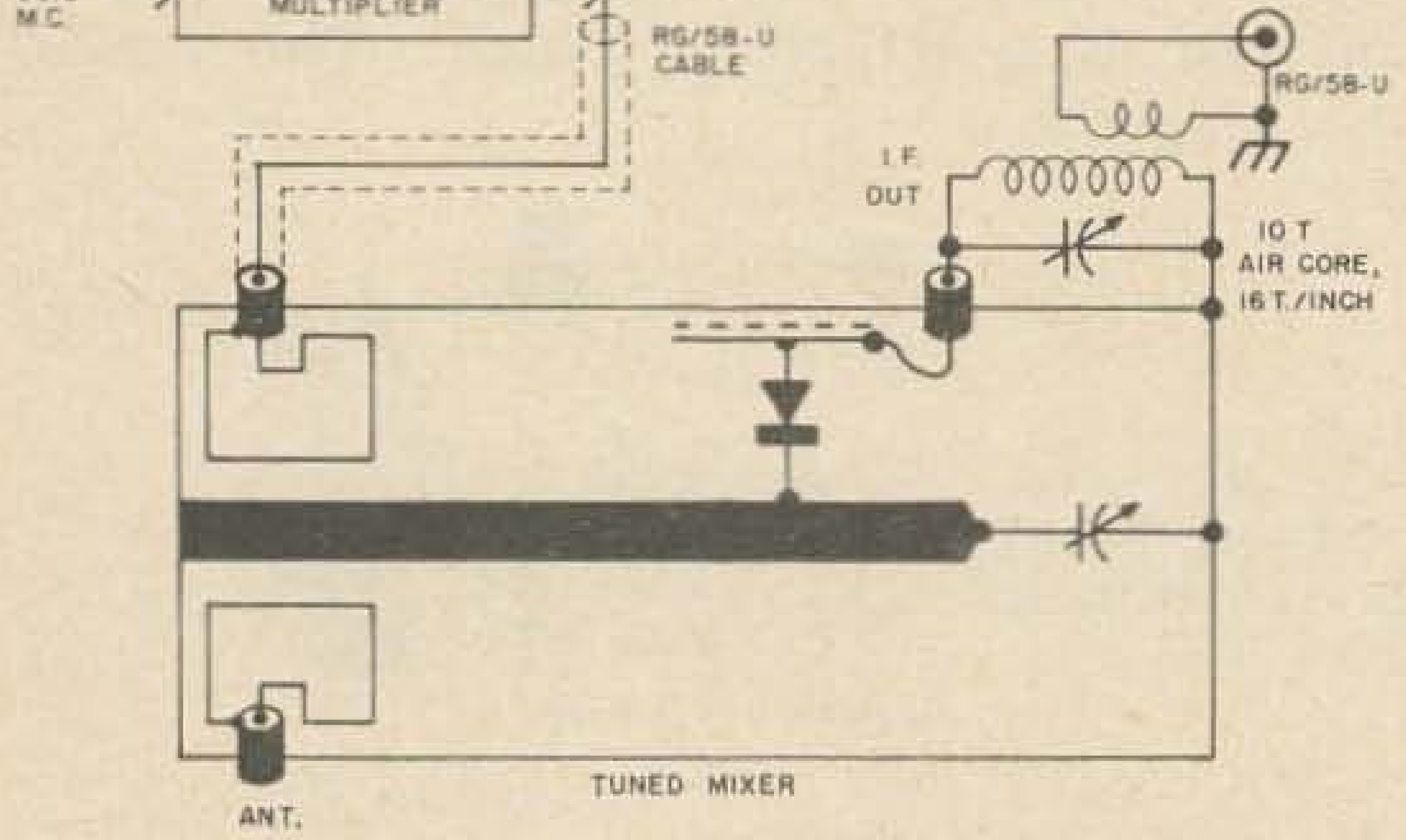
Top. Fig. 6A. Side view of 202 mc doubler. Right is Fig. 6B, the top view.



uses thin copper sheet for the collector return capacitor, separated from the baseboard by Teflon tape and held down by more of the same around the edges. For a more permanent method use .022 brass plate with the insulating material bolts and nuts.

It is of great importance to use doubling, in my opinion, and to be very sure you tune each collector circuit to the desired frequency. By great importance I mean that it is difficult enough to line up the whole rig, even using doubling only, without trying to triple or quadruple. An example. When making up the 432 megacycle crystal controlled in signal source, to be described next, the highest frequency crystal I had on hand that would go to 432 was a 27 megacycle unit. The oscillator worked FB so I proceeded with the next stage and tried it out as a quadrupler from 27 to 108 megacycles. Sure, it worked, tuned up sharp and all, but gave only about 30 microamperes on 108 megacycles. Putting in the doubling coil tuned to 54 megacycles gave an output of over a milliampere with no frequency ambiguity. That is, the first and largest glop of rf energy you come to going up from 27 megacycles with the doubler collector coil is at 54 megacycles. Be sure and check positively for resonance at the desired frequency. Remember that a transistor can sometimes put nearly equal power out at both 50 and 100 megacycles at the same time, under certain conditions.

Fig. 7. Block diagram of whole receiver with mixer described in February 73.



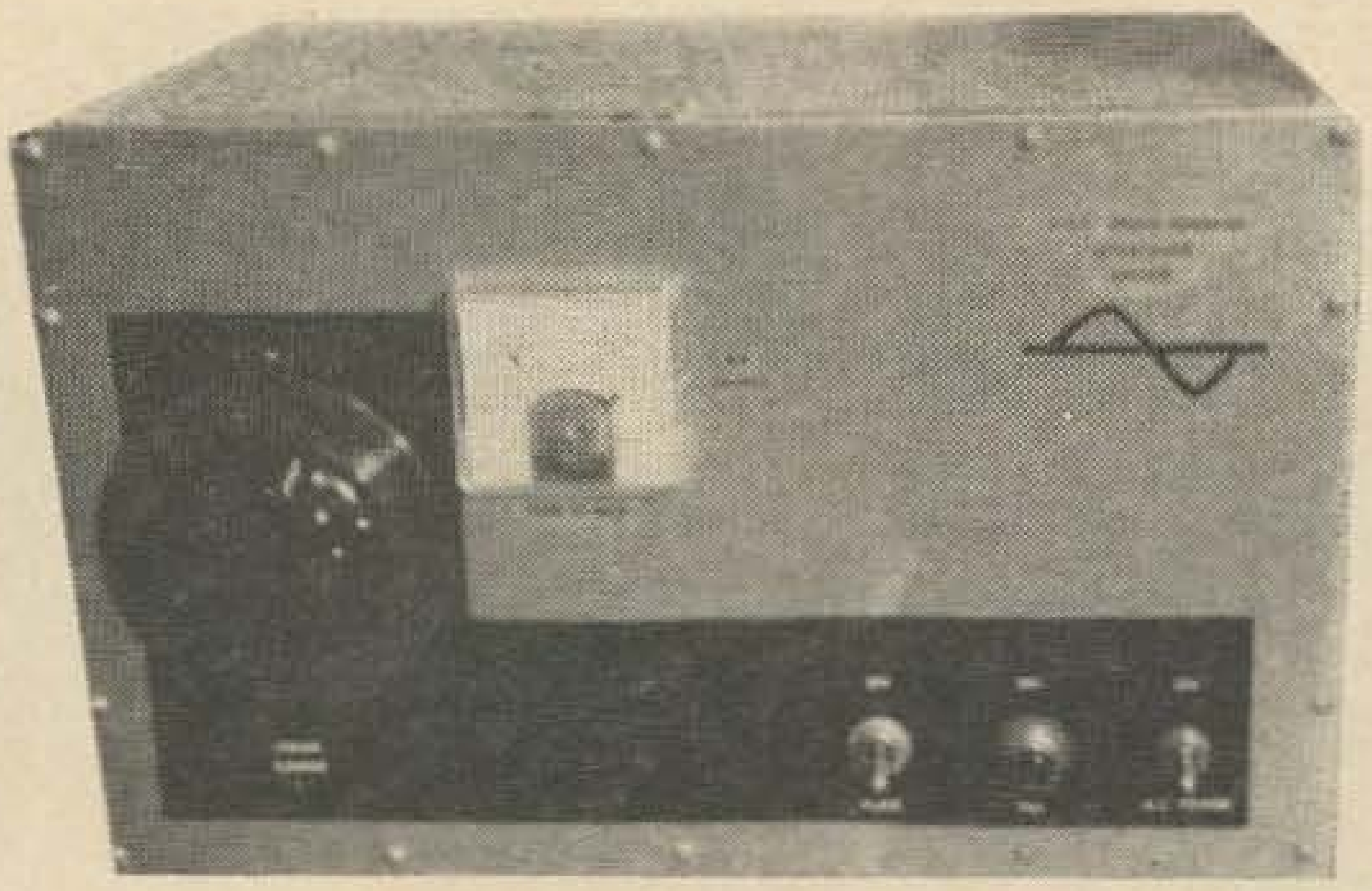
Assembly

At last we get to a narrow-band superhet system. There are two main methods of working on rf, mixer, and oscillator stages when up in the vhf range, and even more so in the UHF region. The first has already been described in the tuned mixer article, where you use a tuned first oscillator and a broad-band *if*. You *have* to use the broadband job. I defy you to hold a tuneable 404 megacycle local oscillator into a narrow-band *if* for more than a fraction of a second. Of course, every time you even go near the rf or the mixer stages you detune the oscillator. This is one of the reasons for the crystal control chain just described. There are others, such as hum modulation, long term drift, etc., but enough of that, let's hook up the three units and see what happens. This is the second method which calls for crystal control of the UHF oscillator, and also, another must, crystal control of the signal source. So I built a second chain like the first only starting with a low cost 27 megacycle crystal (I'll admit to having the odd call letters 1W1596, among others, but that's all I'll admit!) This came out on 432 megacycles and was modulated by a single 2N247 and attentuated with an exceedingly simplified and low cost device.

Plugging the local oscillator chain into the tuned mixer and a 28 mc output coil into the mixer crystal, this was link coupled to the 28 mc band of my Morrow receiver. The signal came slamming in over S9 on the meter exactly on the black line of 28 megacycles on the dial. Of course, it is *supposed* to do this, but how often does it?

Figure 7 shows the block diagram. It works. This whole deal makes a nice low cost 432'er front end.

. . . K1CLL



Joe Owings KØAHD
10217 St. Daniel Ln.
St. Ann, Mo. 63074

6 meter Transmitting Converter

Wishing to get on six meter SSB and not having the cash necessary to purchase any of the few commercially available transmitters, I decided to try my hand at designing and building some sort of hetrodyning unit to use with a HF SSB exciter. I located a real clean Central Electronics 10B phasing type exciter, wound a set of 20 meter coils and went to work on this project.

The oscillator-buffer is more or less a standard overtone circuit using an International Crystal type FA-9, 36 mc crystal and slug-tuned coils. I used a 6U8 tube however a 6EA8 may be used if on hand. As usual, keep all leads short as possible. Voltage to oscillator may be regulated, however I did not and have had no trouble with instability. Tune up is accomplished by merely adjusting both coils for maximum output consistent with oscillator starting every time voltage is applied.

The mixer is a 5763 with 36 mc RF injected at control grid and the 14 mc SSB RF injected thru a voltage divider at the cathode. The voltage divider shown was right for the output of my 10B and will be correct for any exciters with approximately 10 watts output. From my

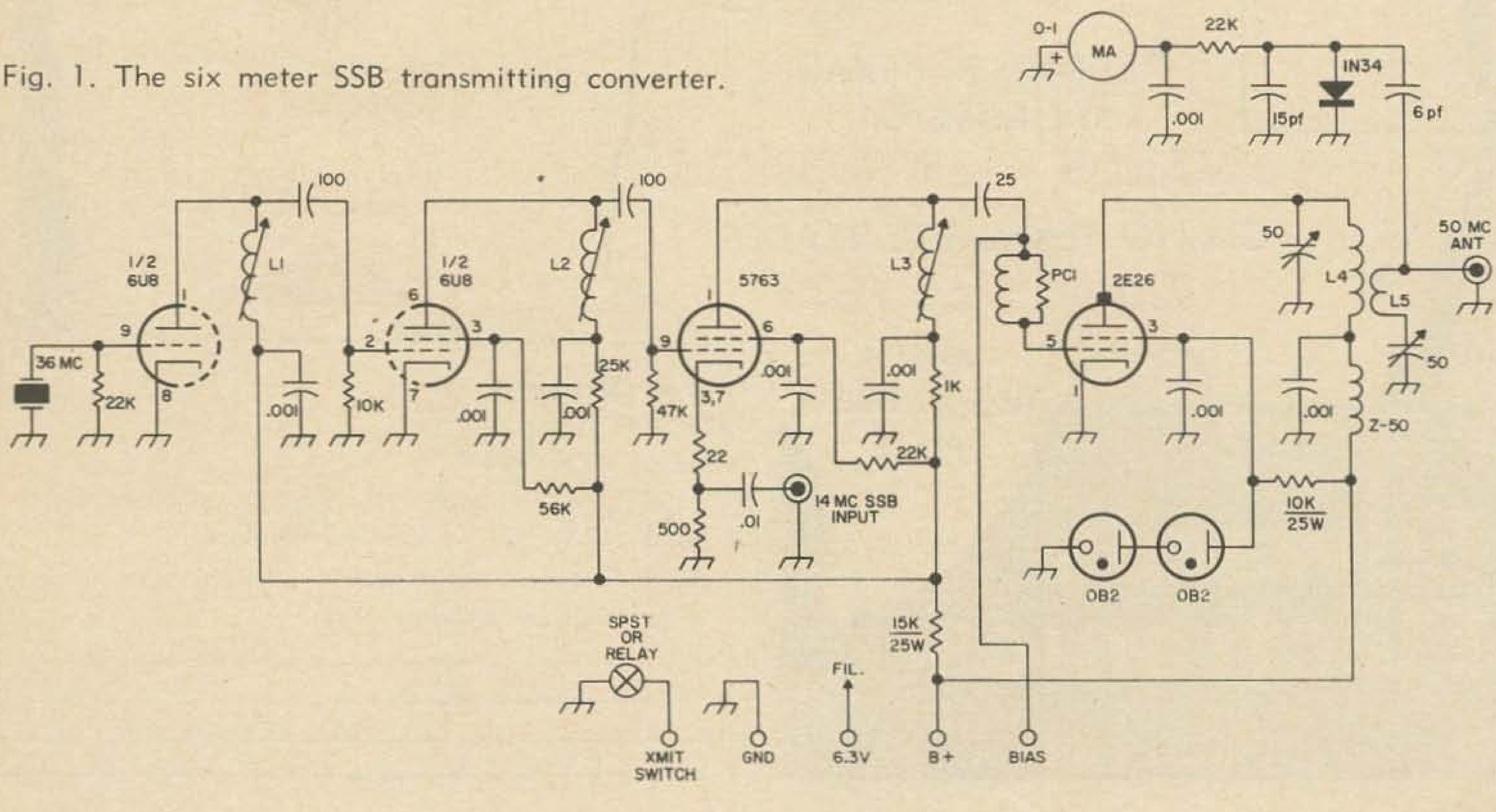


Fig. 1. The six meter SSB transmitting converter.

own experimentation and consulting other home-brewers, it was found that the ratio of 36 mc RF to 14 mc RF presented to the mixer should be 8 or 10:1 for the mixer to work most efficiently and give correct output. I originally tried injecting the 14 mc RF thru a tuned circuit with link coupling at the screen of the 5763 but I found there was too much RF available and too much appeared in output of amplifier due to mixer apparently being over driven at that frequency. Actually cathode injection is easier and requires one less tuned circuit to fool with.

The linear amplifier used is a standard type and either a 2E26 or a 6146 may be used depending on bias voltage and high voltage available. For a 500 volt supply and a 2E26, as shown, the bias should be between −15 & −22 volts; a 22½ volt miniature hearing aid or photoflash battery works nicely and may be permanently soldered into the unit as it will last for almost shelf life. For a 500 to 800 volt supply and a 6146, bias should be between −40 & −50 volts with a 300 volt source for other stages. The screen voltage in either case is a regulated 210 volts. I did not find neutralization necessary in my unit but depending on tubes used and the builders contructional practices, it may be necessary in some units.

General constructional details are left to the individual builder but I will stress again the need to keep all leads as short as possible. My power supply was made from a TV power transformer, surplus filter choke, and 4 50¢ silicon diodes (750 ma @ 750 piv). The cabinet for the unit was hand made using aluminum angle and sheet aluminum, dimensions made to duplicate the 10B cabinet. After testing, the only meter used in the final unit is a 0-1 DC ma with a standard diode detector indicating actual RF output at antenna connector. The only control brought out to the front panel is the final tuning other than power supply switches and pilot light.

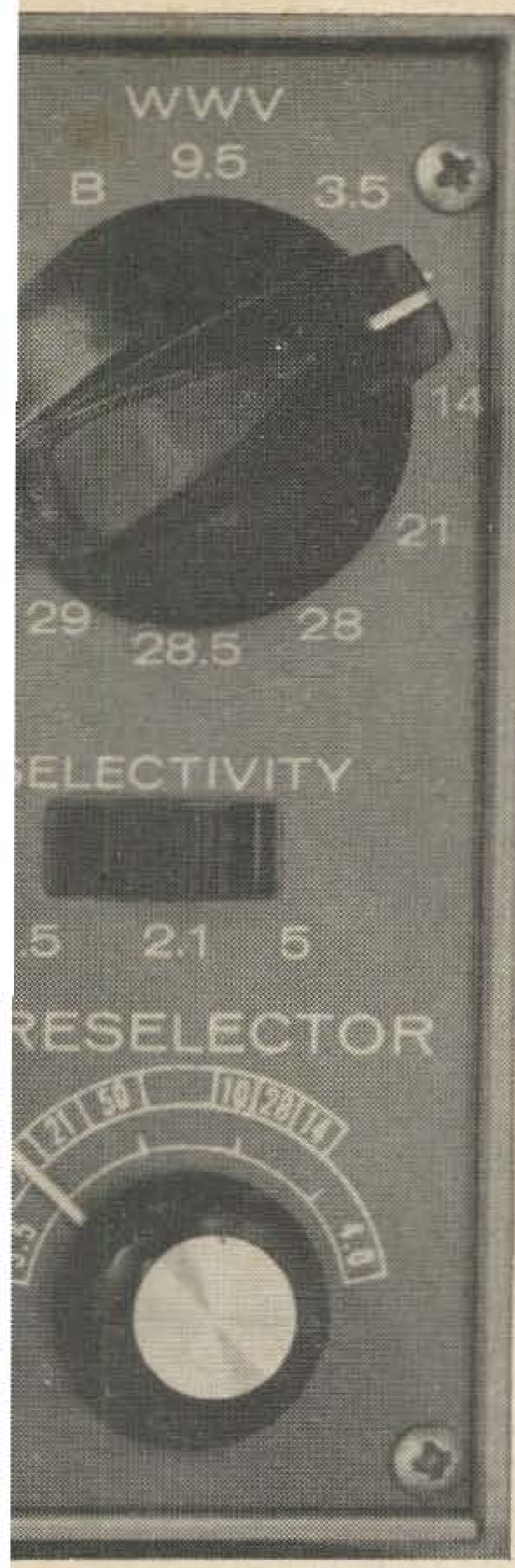
In six weeks of use I have had many compliments on the unit. Its total cost to me was the aluminum angle and the piece of self-adhesive vinyl which decorates the front panel, however, even buying parts new, the cost should not run over $20 or so. Plans are now in the making for a two meter unit.

Good luck on VHF SSB and I will look forward to seeing you on six or two.

. . . KØAHD

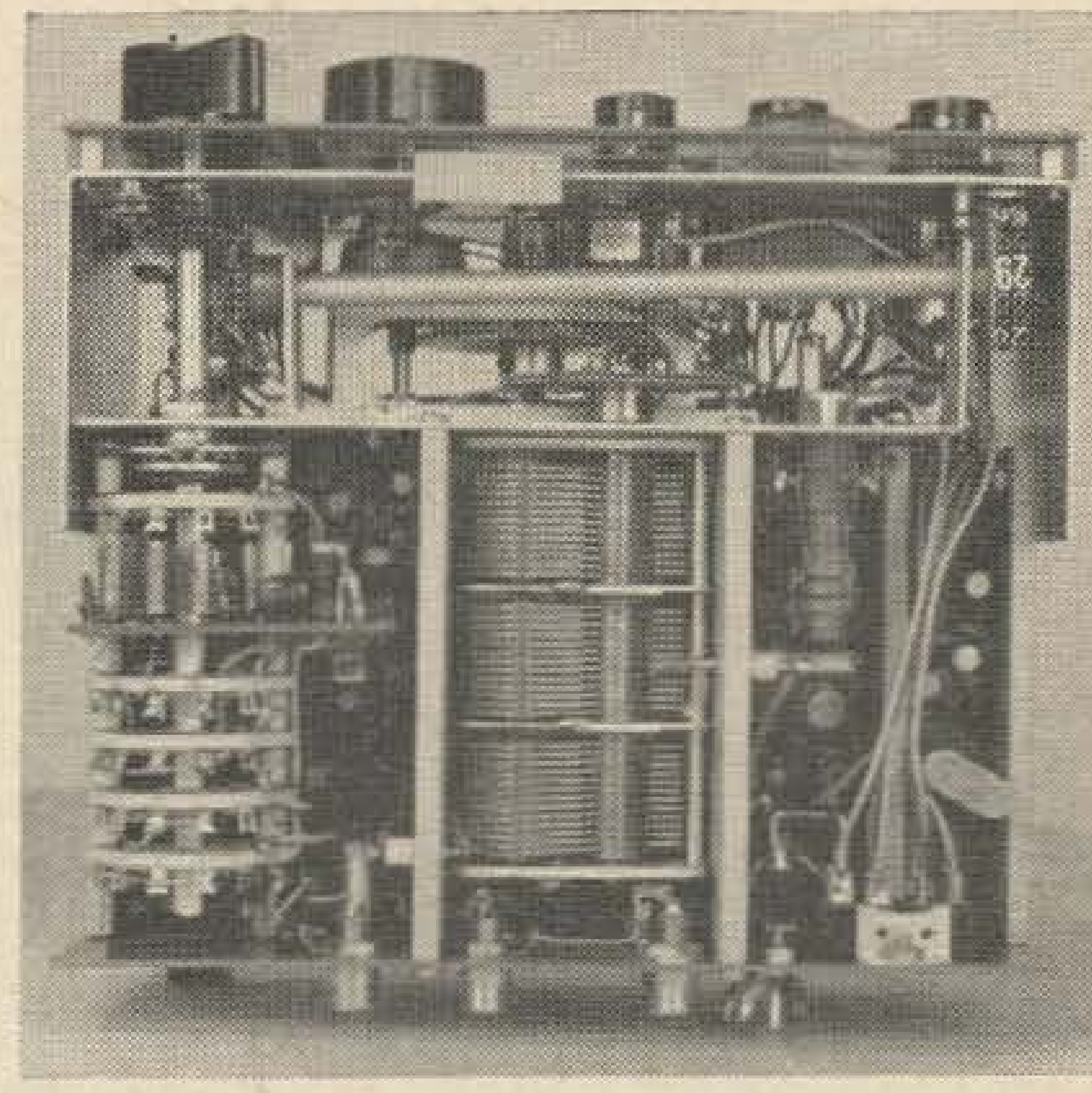
Coils

L1, L2 . . . 9T #20 wound on ⅜ inch slug tuned coil. Resonate at 36 mc.
L3 . . . 6T #20 wound on ⅜ inch slug tuned coil. 50 mc.
L4 . . . 3T #18, 1 inch diameter, PIC 1746.
L5 . . . 2T #20 link inside L4.
PC1 . . . 4T #20 on 47 ohm 1 watt resistor.



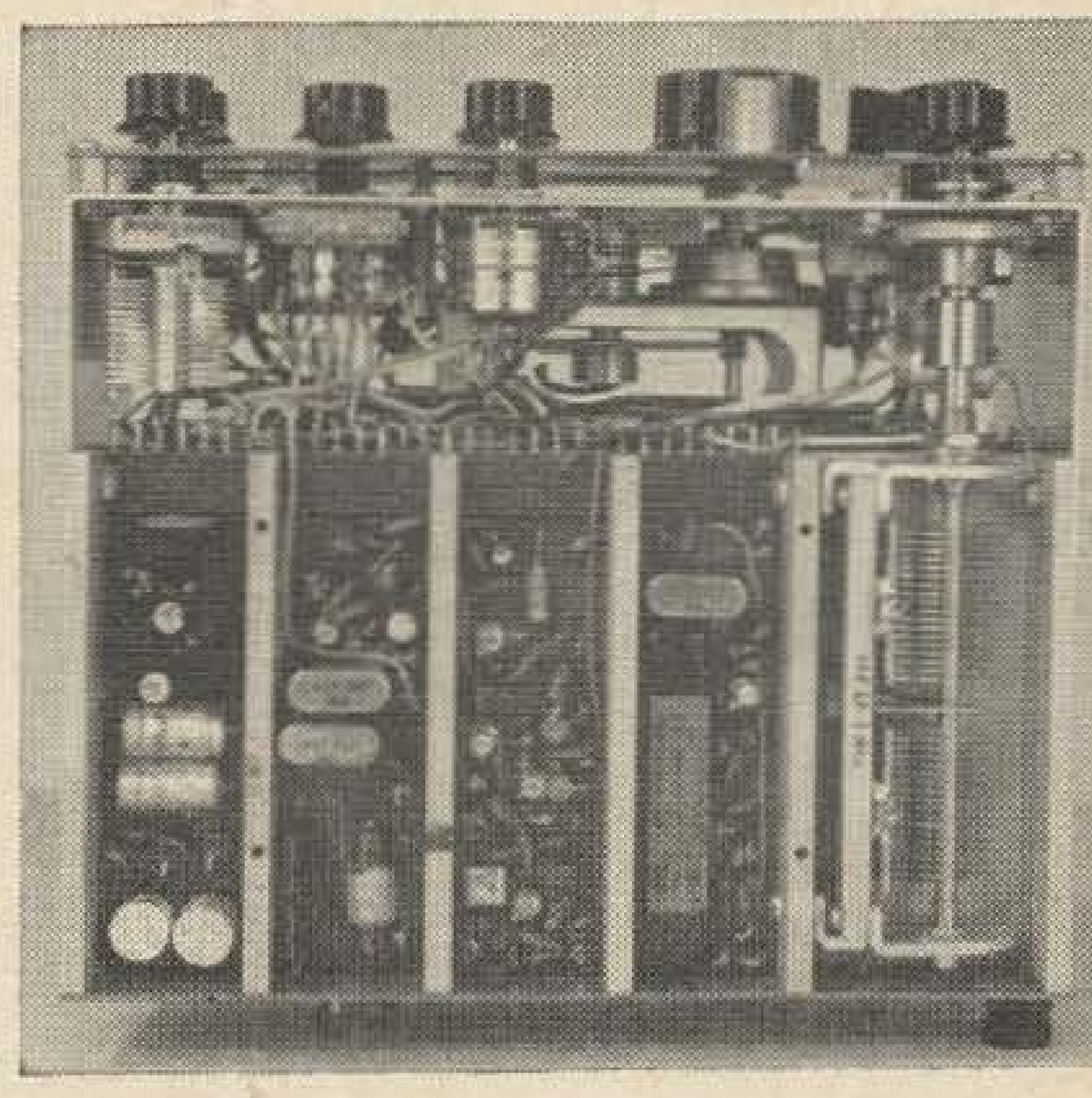
The all solid-state DAVCO DR-30 communications receiver—now with FIELD-EFFECT transistors

for maximum sensitivity with freedom from cross-modulation and overload problems. A spectacular advance in communications technology—made available to you in the DR-30.



The DR-30 is 7⅛" x 4⅛" x 6½" and weighs eight pounds. It operates from 12 to 16 volts DC and draws about 150 ma without the panel lights.

DAVCO products are available direct from the factory and are fully guaranteed. The price of $389.50 includes insured AIR shipment within continental USA. Export orders are welcomed. A Time Payment plan is available ($17.50 per month after 10% down; write for details).



Professional users: the precision performance of the DR-30 makes it an outstanding laboratory and research instrument. Write regarding your particular frequency requirements and other specifications.

Write for our new technical brochure:

DAVCO ELECTRONICS, INC.

P O Box 2677 2024 S. Monroe St. Tallahassee, Fla. 32302 Phone 904-224-4322

Bill Smith KØCER
1301 Churchill
Sioux Falls, S.D.

The VHF Newcomer

Since the initation of the VHF column in this magazine I have received a number of letters from new licensees, and some that were not so new, asking for information on how to get started on VHF.

After looking through several years of the amateur publications it is obvious why these letters were received. The newcomer to VHF has been virtually ignored in the maze of pump oscillators, moonbounce, satellite antennas and the like. Granted, this reflects the advancement of the state of the art, but doesn't offer the neophyte the information he needs.

All of the questions have centered around the basic pieces of equipment . . . transmitters, receivers, converters, antennas and transmission lines.

This article is intended for the newcomer and I hope it will offer a suggestion and answer or two.

In general, bandswitching transmitters for VHF are inefficient because of the wide separation of the frequencies involved.

You will notice very few of the construction articles include bandswitching rigs. They are generally more complex and less efficient than single band equipment. There are a number of excellent single-band transmitters described in the *VHF* handbooks, *73 Magazine* and *QST*.

The only draw-back of a single band transmitter is that you will have to decide which band you want to operate, or build two rf sections and use common modulators and power supplies.

Which band should you choose? This depends entirely on you and what you want to do. However, I would suggest you select either six or two meters because things are not as sticky on these frequencies and they offer a good place for practical experience before tackling the higher frequencies.

You fellows who live in high population areas will find activity on either band. Those of you who live in more sparsely settled areas should check around and find out which band is being used most, unless you care to pioneer.

Six meters will offer consistent groundwave contacts over a one-hundred mile radius or so depending to a large extent on how much power and how good of an antenna you're using. Some of you will disagree with that statement, but remember I'm talking about an "average" station operating under "average" band conditions.

During the late spring and early summer months, and again in December, (although it can occur anytime) sporadic E becomes the fancy of the six meter man. Signals, propagated in the E layer, can cover distances to about 3,000 miles with exceptional strength from even extremely low-powered transmitters.

'F' layer openings occur during years of high sunspot activity and a number of stations have worked all continents and many countries. These signals are similar to those propagated on the low-frequency DX bands.

Another form of propagation, which you can't believe until you hear, is auroral reflection. Under certain conditions, radio signals can be reflected off the auroral curtain and cover distances up to several hundred miles. AM signals are badly demodulated by the aurora. CW or SSB is a necessity.

There are other forms of propagation available on six meters, but most are beyond the scope of the beginning VHF operator.

Two meters offers some of the same types of propagation as six but comparisons are difficult.

In general, groundwave conditions are somewhat better than six with tropospheric bending entering the picture. At times, this allows contacts over several hundred miles with strong signals.

Sporadic E skip can, and has, happened on two meters but it is not common. When it does, signals are similar to six meters.

It is doubtful if 'F' layer openings ever occur on two meters because solar radiation would have to be extremely high.

Auroral propagation on two is similar to six although signals usually are not as strong. However, at times there will be auroral propagation on two when there is none on six.

Also, there are other forms of propagation on two meters but they fall under the same classification as stated about six meters.

These comments about propagation are intended as only a rough guide as to what to expect, there are exceptions and volumes have been written on VHF propagation. Much is still to be learned about propagation on these frequencies.

Transmitting powers of 25 to 50 watts are generally adequate on both bands for the types of propagation mentioned. High power does help and you will probably want several hundred watts after you get your feet wet.

By all means have your transmitter capable of CW operation as well as phone. For a given amount of power CW will cover more miles per watt than AM phone because none of the power is wasted in generating sidebands unnecessary for communication. Don't shy away from CW. It is fun and the majority of VHF'ers use slow speed CW or will slow down if you ask. Slow speed CW is helpful on long-haul groundwave work when signals are rapidly changing in strength.

When building your modulator, figure how many watts of audio you think you will need and then double it. Audio, or lack of it, is probably the biggest single fault to be found with VHF AM rigs. A well modulated signal will be readable even though the strength may be near the noise level. Those of us who have operated on the VHF bands have tuned many signals that were strong enough to work but because of lack of audio were no more than a senseless carrier. I can not stress the need for plenty of modulation too highly!

Now for the station receiver. Most of you have a separate receiver of one kind or another in your shack. Whether or not it will do an acceptable job on VHF is another thing.

Very few of the so-called all-band receivers are really good in their VHF range (unless they have a built-in converter) but will satisfy most newcomers. The usual shortcomings of these receivers are lack of image rejection, stability and calibration as well as high noise figure.

The most common receiving system used by experienced VHF operators is a communications type of receiver with a crystal-controlled converter feeding into one of the ham bands (*if*) at 40 meters or higher depending on the receiver and how it functions on the higher bands. The *if* that is probably used the most is 14 megacycles, or if you have a receiver in the Collins class a 26 or 28 megacycle *if* would be the best choice.

There are many good used receivers available for the same money, or less, than you would pay for some new receivers which would not serve your purpose nearly as well. Read "Evaluating Receivers" on page 52 of the December 1964 issue of 73 for some good tips on buying a used receiver.

What kind of a converter to put ahead of the receiver? If you have a well-stocked junk box, or know someone who has, you may want to build. All of the magazines and handbooks have circuits and construction information. Briefly, use good components, plenty of shielding, short leads and take your time. Whether you build around tubes or transistors is up to you of course. However if you choose tubes, I'd suggest Nuvistors . . . and there are many transistors available that will give the best Nuvistor a run for its money.

If you don't have the necessary parts and have to buy them you will probably be ahead (dollar-wise, not know-how) to buy a commercial converter. There are many available. Some are good, some are not. I'm not going to mention my choice as being the best for obvious reasons. Most of the Nuvistor models are pretty good. Mass production does not allow every manufacturer to align a piece of equipment perfectly for competitive cost reasons. Depending on the band and whether or not it has a built-in power supply, you can expect to pay $35 to $55 for a good converter. Check around with some other VHF'ers and determine what they are using for a converter.

Dollar for dollar, you are likely to improve your VHF station the most in the converter and antenna departments.

Now about those controversial pieces of aluminum known as antennas. The various VHF handbooks and amateur magazines have several excellent configurations which can be built with materials starting at about $5.

I believe it would be safe to say that most VHF operators, except some of the old-pro DX'ers, buy a commercial antenna.

Here is a place where you can really get "taken-in" if you believe all that some manufacturers claim in the way of gain and front-to-back ratio. Ask around and do some reading.

Obtaining a good beam solves only half the antenna situation. The installation deserves careful consideration.

Use a good quality of coaxial cable or twin-line. Both come in various impedances, material, loss factors and prices. If you choose coax make it the polyfoam variety, RG-8 for 52 ohm or RG-11 for 72 ohm. Don't use RG-58 or RG-59 because they absorb too much received and transmitted RF at VHF frequencies. And if you select twin-line, select the type intended for transmission purposes, not the so-called TV stuff. It also absorbs too much precious RF. Connectors? The UHF type will get you by, but types N and BNC are better.

Now that you have a beam, feedline and connectors, where to put them? You can't put the beam up too high. Your pocketbook will dictate how high it will be. If you can't get the beam well up in the air, at least mount it several wavelengths from the nearest tree or utility line. Both will tend to absorb signals, and in the case of power lines, introduce noise into your receiving system. Many have done very well with a beam mounted in the clear and only 25 feet high, but a 40 foot height is a reasonable place to start.

No matter where, how high or what type of a support you choose, you will want to be able to rotate the beam. Almost any of the TV rotors will handle a VHF antenna of the type we are talking about. Some offer thrust-bearings for added strength or they may be purchased as an accessory for a small amount. And choose one that has a direction indicator of some type.

On the other hand, if you're not able to purchase an automatic rotator there is always the "arm-strong" method, (turning it by hand.) But who likes to go outside when it is 20 below zero or raining. It never fails.

Well fellows, that's it in a nutshell. You can get on VHF for as little or as much as you wish, it is entirely up to you. There are many kilocycles in the VHF spectrum just waiting to be used for experimentation or cross-town, QRM-free QSO's.

I hope this article has answered some of the questions you newcomers have, and if you have any specific questions drop me a line. I'll try to answer them or refer you to someone who can. That is how WØPFP gave me my start 8 years ago.

Good luck to you on VHF.

. . . KØCER

Gus Browning W4BPD

Gus: Part VII

In last month's issue I had cleared Czech customs with the assistance of my Red Star badge, or an Auspice Day, or my usual dumb look. I was on my way to Munich, Germany, to see some of my friends. After an uneventful train trip (at least it was uneventful after getting in Germany) the train arrived in the big Munich railroad station at midnight. I wandered to any number of hotels and found that it was impossible to get a room. Some sort of international convention was taking place and all the hotels were filled. Now what would you do at this ungodly hour of a chilly night in a strange city? Well, back to the railway station I went and walked up to the ticket window and said, "Give me a ticket to Vienna, please!" After about 4 or 5 hours' wait I was on my way to Vienna. After that it was Zagreb, Yugoslavia; Sofia, Bulgaria; Bucharest, Rumania; Budapest, Hungary; Warsaw, Poland; Copenhagen, Denmark; back through Hamburg and Frankfurt, Germany; on to Luxembourg. Then Paris and to Andorra in the Pyrenees; Lisbon, Madrid, Barcelona, Gibraltar, Ballarec Islands, and Marseilles, and on to Viernheim, Germany to visit Hans DL3JJ.

Up to now I had only been a tourist ever since I had left Munich with their filled-up hotels. I had no one to visit in these countries between Munich and Viernheim; I had not yet received my equipment. These trips through Europe were by train and bus, the costs being very low, and I had a wonderful time just seeing these places, if for only a few days at each spot. I had no definite schedule on this portion of the trip; I just stayed at each place until I figured it was time to move on. Incidentally, this is the best way to make any trip if you have the time and are not in a hurry trying to meet a tight schedule.

I got off the train at what I thought was Viernheim; later on I found that it was some other 'heim not spelled with Viern. To be truthful, I was not pronouncing the name properly to the train conductor and he let me off the train at what I suppose was some town that I was kind of pronouncing. Now this was about 5 a.m. No one was at the railway station and I wandered up the street of this little German town. Very few people were on the streets at that hour. I asked a policeman how to find DL3JJ's home, and he spoke no English at all. I continued up the street trying to question other people, and not one of them spoke any English. Finally I stopped in a service station and the attendant could not speak English either, but while I was trying my very best to talk with him and not getting anywhere at all, a truck stopped in for some gasoline and this driver did speak fair English. He even offered to take me to DL3JJ's QTH, which was about 20 miles out of his way.

Upon arrival there I found that Hans had a small electronic manufacturing business in his back yard, but that Hans was away on business. Working for him, however, I found Mahmud SU1MS who welcomed me, took me down to a nearby small, very neat German hotel and checked me in and in the end paid my hotel bill for me. Mahmud gave me a note written in Arabic with a telephone number. He told me when I arrived in Cairo, Egypt, to call this number and I would be taken care of in good style. Hans was building some of the very nicest precision measuring equipment I have ever seen. Direction finding units for their FCC was an item he was making when I was there, a very beantiful piece of gear.

Mahmud was just as nice a fellow as I had thought he was when I worked him on CW. I have found that everyone I had QSO'ed, even on CW, and formed an opinion of usually was the type of fellow I expected him to be. I cannot say the same holds true of how you picture people to appear. This will fool you, and I mean nearly every time.

After spending a very pleasant few days with Mahmud, meeting Hans' very sweet mother and a YU chap that also works for Hans, I departed for Nienburg to visit Hadi DJ2PJ.

I found that Nienburg was another typical small German town where nearly everyone knows everyone else. All the people I met there through Hadi's introduction were most friendly. They offered me German beer, which I very gracefully turned down since I am a 100% non-drinker of anything containing alcohol, so we all had a cup of good German coffee. Sometimes I even ran into a Coca Cola. Hadi speaks very good English, I understand he teaches it in school. His parents were very friendly and nice to me; I stayed at his home and did a little operating of his station. After spending a most enjoyable week with Hadi and his family I departed, again by train, for Hamburg and another short eyeball QSO with Gus DL6ZZ and his nice XYL, Helene.

A phone call to Amsterdam Airport informed me that my radio equipment had arrived and was QRX for me to pick up. Off to Amsterdam by train. Upon arrival I immediately took a taxi to the airport and located my equipment without any trouble at all. Yes, locating the equipment was no trouble, but getting it was the rub! In fact, they more or less told me that they would not release it to me. I tried to tell them that I was on my way to Monaco and that was where I wanted to use it. They said FB, we will air freight it to you down there. I asked them how about sending it by train. But when they told me the costs to send it by train I was floored. There were all kinds of charges tacked on: airport handling, railway charges, the charges down in France, tax and other charges. In the end it was much cheaper to have it sent on down to Marseille by air freight.

I was learning a little about some of the many troubles and costs of shipping things around instead of carrying them with you as surplus baggage. Of course, surplus baggage costs more, but after giving many thoughts to the various difficulties you run into when things are shipped separately, it's by far a better idea just to pay the added costs of air freight. Then you don't face the problem of your equipment not being there when you arrive, and customs is a lot less trouble when you have things along with you. As a rule customs at the airports is in just as big a hurry to let you pass through as you are. Generally they don't have any place to store things at the airport and this makes them want you to take your equipment along with you. Of course, cut down every single ounce, because in the end they will cost you bucks! I know nearly everyone who makes a trip abroad takes by far too much clothing, just as I did at the beginning. Somewhere during my trip I sat down and gave lots of thought to this big batch of clothing I was lugging all over the world and decided I was going to cut this to the bone. I shipped home everything I had with me except the following items: 3 pairs of undershorts, 3 undershirts, 3 shirts, 3 pairs of pants, one pair of shoes, 3 pairs of socks, one sweater, and one dress coat. You can put all this in a small air passenger bag. Right now I have even cut this down to just two changes of clothing. Be sure everything you have is the very best you can buy and is drip-dry; wash your clothes every night and hang them up over the bath tub (if there is one) and the next day you again have two changes of clothing. Of course, if you are going to be where it's cold you have to carry a few heavier things with you. It's actually a lot cheaper in the end to carry the bare essentials and BUY what you need along the way.

Well, after shipping my equipment frcm the Amsterdam Airport I boarded a train and made a slow trip on through Holland, Belgium, and France on down to Marseilles. Upon arriving there I checked into a small hotel and waited three or four days there for Leny (then VQ4GT–ex-VQ8CB and VQ8AB), his XYL Lillette and daughter Gertie to arrive. It was quite an experience there. I hung around some of the waterfront places looking at all those people drinking all that wine and I saw some of the doggondest dancing I had ever seen. They called it "The Apache," and it's real rough stuff. They throw the girl down, pull her up by the hair, slap her face and also slap other parts of her, and a lot of other rough stuff like that. But she likes it and keeps coming back for more!

Leny and family arrived and we met for the first time, after the many QSO's we had had.

We each had written the other as many as a hundred letters, exchanging photos of our families and I thought we knew each other quite well. I had told Leny all about my exact financial status and everything else about me that I could think of. I don't know what kind of fellow he expected to see when he met me, but here I was, a little fellow living in a cheap hotel, pinching every penny. I was not the Rich American that people usually expect to meet overseas. Any of you fellows who know me personally know I don't try to put on a Big Front just to impress people. I try to always be humble and as unassuming a fellow as possible. To put it mildly, I think Leny and family were a LITTLE bit disappointed in what they met. In the end, though, we all had a fine stay in South France, traveling all over in Leny's new Volkswagen helping to make the mileage high enough so that he could take it back to Kenya with him as a "used car." As it turned out, Leny took me all the way to Monaco.

There I went to the Hotel Le Siecle and told the man behind the desk I was a radio amateur and wanted a room. He said, "Yes, I have been expecting you and I have a room on the top floor waiting for you." At the moment I thought this was rather odd, because I had not told anyone I was going there, but to save an argument I just kept my mouth shut. We went up by a stair case that ended up right on the roof. There were four nice 25 or 30 foot poles lying on the roof (it was a flat cement roof with a wall around it). There were even four metal bands mounted on this cement wall for the poles to be mounted in! I was taken to room 39, where there were two tables end-to-end at the back window to set equipment on. He said he had fixed it all up for me to use! I could see that DX'pediting in Monaco was going to be a lead pipe cinch; everything was all set for me even before I got there! The manager told me he always gave hams room 39.

That afternoon I was directed to the Ministry of Finance to see about my license. I walked in and told the pretty French secretary what I wanted, filled out an application, and was told to come back the next day at ten o'clock to pick up my license. This one was "duck soup." The next day I picked up the license and my call sign was 3A2BW. This, incidentally, was the easiest place in all my travels to get a license.

Up on the roof I went and in a very short time I was on my first DX'pedition tryout! Back then 3A2 was still on the relatively rare list and I wish I could tell you the thrill of being the chased, instead of the chaser. After getting on the air I had a chance to try out all the many ideas I had had for all these years as to how to operate a DX'pedition the right way. In many ways my ideas were good and some of them I found were no good at all. For one real surprise I had never given much thought to how bad European T-7 QRM could be, the many lids that kept calling on my own frequency, the UA boys insisting on giving me their name and telling me their power was 200 watts (most seemed to be named Vlad at that time). And what stopped me was they all insisted on my giving them my name, power, QTH, etc.

At Monaco I took out my little hand compass to see how the lay of the land was in the direction of the USA. I found that the highest mountain, the one that was the closest to me, was in the exact middle of the path. If ever I go back to Monaco I want to try my very best to operate from that neck of land that protrudes into the Mediterranean Sea, which would give a very fine signal path to everyone in ALL directions. The prices, the food, and the service at the Hotel Le Siecle are very nice, but for a good DX'pedition it's no good until someone removes that great big mountain. When you can't move the mountain YOU move!

Departure time arrived; we packed up everything and boarded the train that was taking us to Milan (on our way to Campione d'Italia, INSIDE Switzerland. I thought maybe a new country, but it wasn't). Well, this train stopped when it arrived at the Italian-French border and the fun began. If you want to cause a lot of excitement, try going into Italy with two suitcases full of radio gear, one of the pieces being a transmitter with markings for key, mike, antenna, etc., very plainly marked on the front panel. I had put a deposit with the French customs upon my arrival in France; at the border check point they had given me back this deposit and I had walked through a little gate that separated France from Italy. Now the Italians upon finding me with this equipment said that I couldn't bring it into Italy without an import license and to carry it back through the gate into France. Back I went with my suitcases. Then French customs said, "You can't bring that to France without an import license!" Well back and forth I went any number of times. Finally I just put my suitcases down in the exact middle of that door. Neither of them seemed to like this, but it's a sort of no man's land and they could not do anything about it. BOY, I WAS LEARNING, I sure was! The biggest fly in the DX'pedition ointment is ALWAYS customs. I

wonder if that small neutral zone between France and Italy would count as a new one.

Well after about a six hour delay and many phone calls to Rome we were permitted to bring our equipment through, but a deposit of something like $169.00 was required (this was sometime in late 1959 AND TO THIS DAY Italian customs still has that deposit of mine!). But we (Valdo I1IN and I) were on our way to Campione d'Italia IC1IN was the call sign issued to us.

The train was one of those coal burners and with all the tunnels in northern Italy, it's a wonder we all were not stifled to death; some of these tunnels are quite long and the trains always go very slowly through them. Sometimes they would stop for maybe five minutes right in the middle, and you thought you would sure enough stifle with all that smoke from the engine. My lasting impressions of northern Italy, and in fact nearly all the rest of Italy are: there are lots of very small villages; each one, even though it looks very drab and about to shrivel up and disappear, has a great big Catholic church; there are Catholic priests everywhere. Grape arbors! Oh, yes, they have them by the hundreds of acres, all over the place. All for making that Italian vino. Italian women like to talk and talk especially on the trains; it's always a talking marathon on these trains with these ladies. Everyone drinks their vino; sometimes a big bottle is all gone with a meal. I thought for sure that every place would serve spaghetti with nearly every meal, but do you know, I had a hard time finding a good spaghetti dinner in all of Italy. Just like I had a hard time finding sauerkraut when in Germany.

While walking down the street in Milan, right in the middle of the city on top of its highest building (I guess it was about twelve stories) I saw the doggondest thing—a five or six element 20 meter beam up on top of a 70 foot tower. Brother, this fellow had himself a real site for his beam. I asked Valdo who lived there and he said Bruno I1RIF. Later on—about three years later on—I visited Bruno and will tell you all in a later chapter of one of the world's best ham stations.

After spending one night in Milan, off we were for ICI-land by bus. At the Swiss border there were those customs fellows again. But upon producing our license for Campione d'Italia we were permitted to pass through without any difficulty at all except a deposit, which they gave back when we left.

Upon arriving in Campione d'Italia we found our little hotel—the only one in town—with one of those impossible roofs. So we ended up with just about the worst antenna that I have ever tried to use. The hotel room we had was on the third floor. The 20 meter dipole was a length of antenna wire from one window around the corner to the other. It was a dipole with a 90 degree bend in its center; the SWR was about five or six to one. It did load up kind of half-way. I tuned up the rig and said to Valdo, "Well, here I go with my first CQ with the world's first IC1 call sign." Valdo had already secured the license well in advance of our arrival but then he said, "No, no, we cannot go on the air yet. There are a number of things we must do first."

Our first call was at the office of the Governor, and after explaining to him the purpose of our visit and getting his approval, we went to the Police Chief's office for more explaining. We were told not to go on the air until the police came by and inspected our equipment. We then went to the Post Office and saw the Postmaster and did more talking, and he said OK. This took over half a day. We arrived back at the hotel about 2 p.m. and finished a very slow meal. We then went back to our room and had a short nap and fiinally about 4 or 5 p.m. three policemen came around to "inspect" our equipment and to also inspect us! These fellows knew absolutely nothing about radio; a radio amateur—ha, ha—they didn't even have the faintest idea what these words meant. So Valdo tried explaining what a ham was, and after about 30 minutes of fast Italian they departed. I said, "Is everything OK now, Valdo?" He said, "Yes, all is OK; we can now operate."

The results of this operation were not very good, mostly I think because of the antenna system. Also, to every QSO we had to explain where we were, and tell them that it would not count as a new one. All of this took a lot of time; then sometimes Valdo had to call CQ Rome and this took up some more time. The European QRM was fierce from this spot. The QSO's with the USA as far as I can remember were few.

We stayed there about seven days and away we went to San Marino. Valdo had been issued the call sign of I1IN/M1 and I had W4BPD/M1. The trip from Milan to San Marino was made by train again—all those smoky tunnels again. We arrived at a small sea port town, and then we boarded a bus to San Marino, some 35 miles away.

San Marino, as far as I remember, is just one whole mountain; it covers the mountain from its base to its top. It's strictly a tourist spot. When we arrived there I saw about a hundred big buses, about the size of our

Greyhounds, all from Germany. Tourists were all over the place snapping pictures, and every little shop was full of them. It sort of reminded me of Asheville, North Carolina, in the middle of summer with the tourists there.

We checked with the police again and got their approval. But up to this point we had not selected our QTH! They told us when we got located to come back and let them know where we were going to be operating from. We wandered around to a few hotels, all of them quite steep in rates and not too well located to suit us. Then I suggested to Valdo that we try to get permission to operate from the high watch tower that overlooks all of San Marino. He said that he thought this was not possible but we could try anyhow. So away we went.

To get to the top required walking up 880 steps (I counted them myself!). We found a very nice guard named Joe in the old castle that's under the high watch tower and after a good long talk he went to his boss and it was decided that it was OK with him for us to use the small room right at the very peak of the tower. This is the very highest spot in all of San Marino; it's about 100 feet or more high and on top of that it's on the peak of the mountain—it's even a better QTH than W3CRA has! So up the steps we lugged everything and we strung out our string of dipoles in tandem: 10 meters, 15 meters, 20 meters and 80 meters, all between the two tower peaks. We had a real antenna system. With the assistance of Joe, our guard friend, we got 230 volts up to our room.

After everything was installed we went back to the police chief to check in with him. Then we went up the 880 steps to our shack and away we went with our first CQ. The results here were fantastic; we got the best reports and really had a ball. Joe brought us up two Army cots to sleep on and even a small electric heater and a few blankets, and on top of that a big plate of spaghetti that his wife had cooked for us, and boy she really knew how to cook REAL Italian spaghetti (the kind that is so hard to find in Italy.) After staying there a few days and walking up and down those 880 steps, which was killing me, I asked Joe if I could pay his wife to cook us a big plate of that good spaghetti every night for our dinner. This she did, thereby saving us many steps up and down. Occasionally we would go down to have a meal at night and let me tell you, it is spooky walking through a number of rooms in an old castle with the walls covered with instruments of torture, old guns, coats of

armor and many other relics of ages long past, and only a flashlight to see where you are stepping.

Every night at about 11 p.m. it started to rain and this continued every night we were there. Lots of wind blew all the time, day and night, and lots of weird sounds were heard with this wind blowing through the old castle. One night, just as one of these rain showers started, the most awful noise started coming out of the phones. It kept building up and up, and finally the S meter was reading S-9 plus plus plus! All signals were blotted out, of course. I turned off the set and, believe it or not, the noise was still heard! I started hunting for the source and when the light was turned out I saw a very thin blue halo on the end of each of the unused antennas. I reached over to ground one of them, but it reached for me first and what a jolt I got! When I had grounded the center conductors of each of the unused antennas I then observed that the outside shield was still arcing from every unused antenna to the concrete wall. After grounding every unused antenna and its shield, all the noise disappeared from the 14 mc antenna and back I was on the air.

One night the wind was almost at cyclone force, but I kept on operating anyway. I noticed the SWR went up a little higher than usual in the middle of this storm, about 10 p.m., but I operated on until about 2:30 a.m. anyway and went to bed. The next morning I went outside to look over the antennas to try to see if I could find out why the SWR had gone up. I found that the whole string of antennas had fallen and was strung out down the mountain side, lying right on the surface of the mountain. Except for the slightly higher than usual SWR I could not see that there was any noticeable effect on getting out.

Many amusing things happened while we were there. All day long tourists came and went, walking around the little stairway around our little shack. After the first day we decided to keep our door closed to eliminate them QRM'ing us with a lot of questions. Sometimes when they were outside and saw the closed door one of them would say something like, "I bet if this old tower could talk it could tell some interesting stories about people being killed in these rooms." That's when Valdo or I would let out a blood curdling yell or a good loud groan and hit on the door with a shoe. Then you should have seen them scram back down the spiral stairs leading away from the spooks in the Belfry Tower! This happened any number of times every day and was a good pastime for us.

The operating at San Marino was very good and Valdo and I departed for Rome with a very satisfied feeling. The trip to Rome, as usual, was made by train and they were jammed full as is usual there. We went third class to save our money and we arrived the same time the first class arrived. We went directly to the Vatican and met Dominico HV1CN. I asked him to let me operate HV1CN for a few days, just on CW. There was a lot of hesitation and a few questions, including what was my religion. I guess when I said Baptist I must have given the wrong answer or maybe it was something else. But anyway, he did finally say, "OK, you can operate some on CW." After getting the keyer out of the drawer and blowing the dust off (the mike was nice and clean) I plugged her in and while Dominico was telling me to give only signal reports and under no circumstances to give my name, I let loose with a fast CQ on 15 meters and boy, the old dead band really opened up. In nine minutes I had 11 QSO's, all Europeans. While I was writing down the call sign of the next caller, Dominico reached over and pulled out the power plug and said, "Well, it's time for lunch." I asked him if I could come back after lunch and do some more operating and he said, "I will get in touch with you." That was the end of my HV1CN operation. I can at least say that there has been one Baptist who has operated HV1CN, even though it was for only nine minutes.

On over to Yugoslavia with a brief stop at Zagreb and on to Belgrade and a one week's stay with YU1KC and his son YU1EH, where I was treated royally. A fine place, Belgrade, and fine people these Yugoslavs. Some day I want to return and get to know them a lot better.

Off to Athens where I was met at the airport by SV1AB and SV1AE, good old George and Sock. I spent about a week with George in his home, was taken all over Athens and saw all the historic sights. George doesn't have coffee for breakfast—it's a cup of good HOT milk along with his breakfast each day. I did not think it was possible for me to take this, but I did and it stayed down, so sometimes you fellows try a cup of hot milk for breakfast and you will see what I mean. It will not kill you, but—well, try it!

That's all for this time—next month it's ole Rundy OD5CT, Cairo, Khartoum, and Kenya. Then off to the Seychelles and octopuses, Lee Bergren WØAIW, some /MM and ole Harvy Brain. Stick with me, boys, there's a lot to tell yet!

. . . Gus

HARVEY OFFERS THE WIDEST VARIETY OF FAMOUS BRANDS AT THE BEST PRICES ANYWHERE!

HARVEY
RADIO CO. INC.

103 WEST 43rd STREET
NEW YORK, N.Y. 10036
(212) JUdson 2-1500

For over 38 years Harvey's has kept pace with the popularity of ham radio throughout the world. And during this time the company's initial aim was and remains the same: Offer the widest variety of ham and electronic equipment at the lowest prices. Today more than ever we extend a hand to ham radio operators everywhere by efficient inventory of equipment and parts for quick delivery – and at the most competitive prices.

That's why you can rely on Harvey's for preferred service by the most experienced staff who are qualified hams themselves. We agree that it takes a ham to talk to a ham. At Harvey's you can feel confident that your specific needs and problems will be solved by experts who can aid you in making the right choice at the most economical prices. And remember everything you buy at Harvey's is always guaranteed.

To get the most for your ham dollar and the fastest mail order service, it pays to check Harvey's first. Serving the world from the nations crossroads in midtown New York.

– Elliot Berelson, WA2HDP

Watch for opening of new Harvey sales center in Woodbury, L. I., in September.

Paul Franson WA1CCH

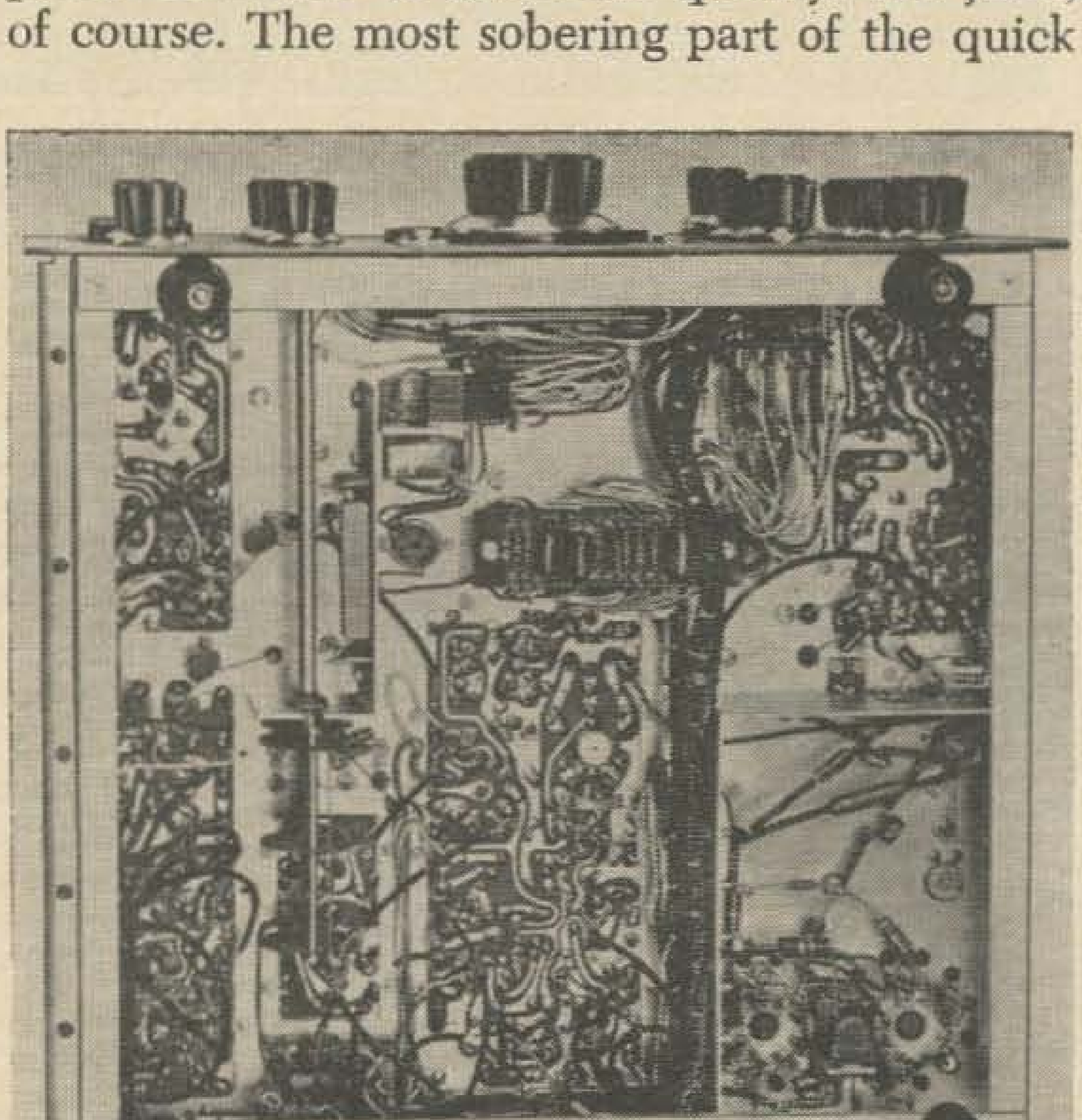
A 6 meter transceiver for the fine Heath SB-Line

73 Tests the Heath SB-110

Has 6 meter sideband arrived? Yes, it has. Anyone with interest in the band–and anyone who listens to it–can't help noticing that the gentle quack-quack is becoming more and more prominent. Half a dozen firms are making 6 meter SSB transmitters and transceivers now, and more are expected very soon. The reasons for this growth are obvious. The Technician license class now contains the second largest number of hams. Most of the active Techs are on six, making it one of the most popular ragchewing and mobile bands. As the band becomes more heavily populated, interest grows in better equipment to make more satisfactory contacts possible and the increased activity makes manufacturing SSB–and transceive operation–have proved themselves overwhelmingly on the major HF bands. Now Heath has provided excellent SSB equipment for 6 in kit form.

The Heath SSB-110 is a mighty attractive piece of gear. It matches the other members of the well-proven Heath SB line in appearance and performance. Briefly, it offers: exceptional receiver sensitivity, stability, selectivity and resistance to overload with an excellent ALC controlled SSB-CW transmitter which delivers about 100 watts PEP with minimum distortion and unwanted mixing products. Both the receiver and transmitter sections are well designed, solidly and reliably built (If you follow Heath's excellent instructions) and convenient to use.

The SSB-110 arrived in a large box one morning. Since I am the most curious person since Lot, I immediately opened it up. Ignoring Heath's instructions to check the parts list carefully (I should have. Nothing was missing, but there were these two dial pulleys, one with a 1/4 inch shaft and the other with 9/32 . . .) I noted the incredible number of parts. All were of excellent quality. No junk, of course. The most sobering part of the quick



snoop was the bag after bag of solder I uncovered which made the job look fearsome, so I stuffed all that I could back in the box (how do they get it all in there?) and went back to work.

That night I attacked the construction. I won't claim that it was a two hour job, but it wasn't hard or unpleasant. Most of the parts went on five printed circuit boards and the whole assembly was so well-planned that there wasn't a hitch in construction. They even have things figured out so that the procedure is self checking. I found my little stupidities very quickly so that the final check disclosed no uncorrected errors. There weren't any real tight spots either, though wiring the relay with 18 contacts was rather challenging. Heath furnished two wiring cables that took some of the fun out of the construction—thank goodness.

All in all, it took about 35 hours of evenings and weekends to build. I have built quite a few kits, and suspect that someone with less experience would take a little longer (and probably do a neater job). Incidentally, even a rank beginner could probably do a good job on the construction if he followed instructions carefully and took his time.

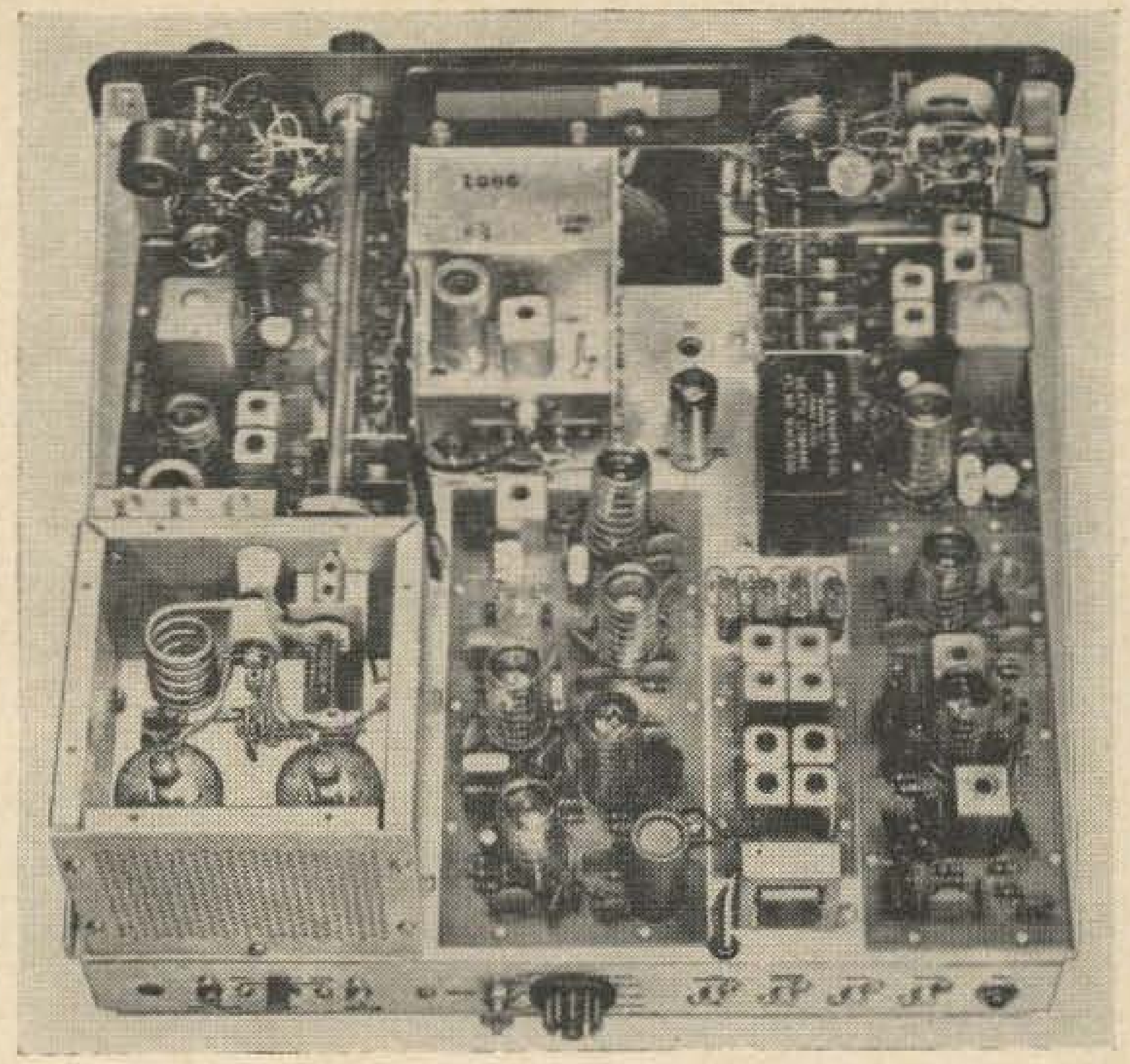
When the assembly was finished, I checked the recommended resistances to make sure that the first test wouldn't be the last. Everything was fine, so I built the matching HP-23 supply. It took about an hour and a half.

It didn't blow up. In fact it couldn't since a few vital resistors weren't connected until later. It just made a pleasant receiver noise. Next I aligned and tested everything. Here again, the instructions are completely lucid and foolproof, but not assistant-editor proof. I didn't read the instructions properly at a few places and had to backtrack. You need a VTVM, dummy load (like a Heath Cantenna) and a receiver that will tune WWV (or even a BC station on a multiple of 100 kc) for the alignment. Heath furnishes the alignment tools.

My home location couldn't be worse if it were underground, so I drove up to Wayne's place on Mt. Monadnock (known as 73 Mountain to some) to connect the transceiver to a good antenna.

To tell you the truth, it didn't work too well at first, I couldn't hear a single station. But things improved remarkably after some slight adjustments . . . like connecting it to the antenna instead of a dead end cable going behind the bed.

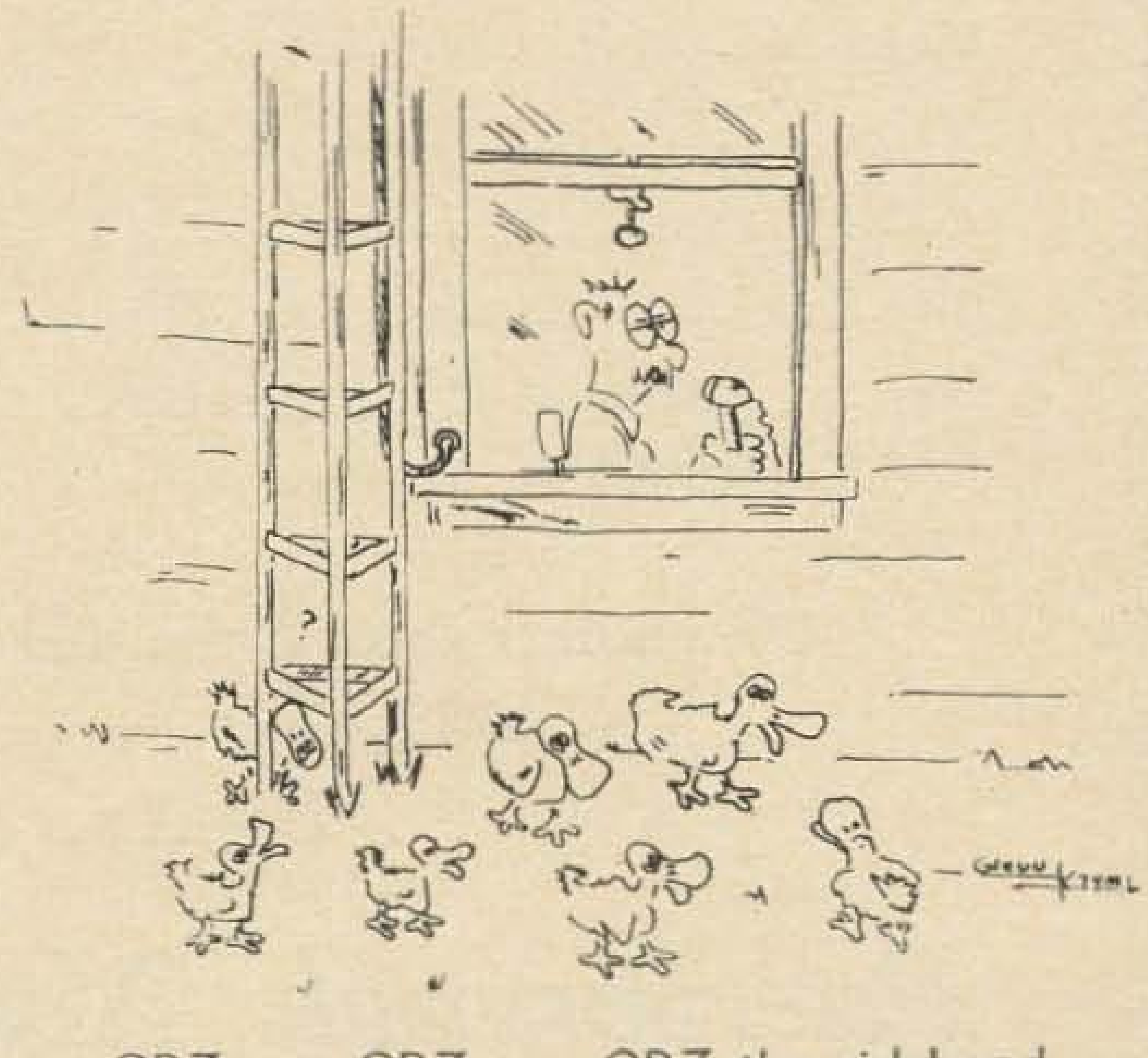
Performance was outstanding. I compared the receiver to a couple of well known 6 me-



ter transceivers and it beat them flat. The tuning is soooo smooth and slow. It really dug out the weak ones while ignoring the FM station that usually comes in so well on 6 up there. I tuned around a bit and decided that the maiden contact would have to be with an SSB station in Connecticut, about 150 miles away. He came back instantly and reported everything was fine. In fact, he was using an SB-110, too, and I can verify that it puts out a fine signal. Closer stations also said that the signal was perfect. I think that Heath has done an excellent job on this transceiver. I suspect we're going to be hearing lots of them on the air.

. . . WA1CCH

PS. About that solder, I only used a small part of it. Turned out the job wasn't so bad after all . . .



QRZ . . . QRZ . . . QRZ the sideband station . . . you're all over the band, OM. Copy you all over the band . . . QRZ . . . QRZ . . .

SERVICE TESTED EQUIPMENT

ORDERS PREPAID WITH CASH REMITTANCE IN CONTINENTAL U. S.

TRANSCEIVERS

KWM-1 (like new)	$375.00
KWM-1 AC pow. sup.	75.00
KWM-1 DC sup. w/mob rack	119.00
G-76 Gonset w/AC pow. sup.	189.00
Swan SW-120	149.00
Swan SW-140	149.00
Swan SW-175	149.00

VHF EQUIPMENT

Clegg Interceptor	$249.00
Gonset Communicator II 6M	79.00
Gonset Communicator III 6M	129.00
Gonset Communicator IV 6M	199.00
Gonset 3112 220 mc (CD XCVR)	199.00
Poly Com PC-2, 2M XCVR	249.00
Poly Com PC-6, 6M XCVR	229.00

TRANSMITTERS

B&W 5100	$125.00
Collins 30L-1	375.00
Elmac AF-68	119.00
Hallicrafters HT-40	49.00
Heath Apache TX-1	119.00
Heath DX-100	75.00
Heath Marauder	289.00
Hammarlund HX-500	379.00
Johnson Valiant	139.00
Johnson Thunderbolt	279.00

RECEIVERS

Collins R-388	$549.00
Collins 51J4	695.00
Collins 75A3	219.00
Collins 75A4	419.00
Elmac PMR7	69.00
Elmac PMR8	89.00
Hallicrafters SX-96A	119.00
Hallicrafters SX-100	149.00
Hammarlund HQ-100A	129.00
Hammarlund HQ-110C	129.00
Hammarlund HQ-180C	329.00
National NC-300	149.00
National NC-303	199.00

MISSION HAM SUPPLIES

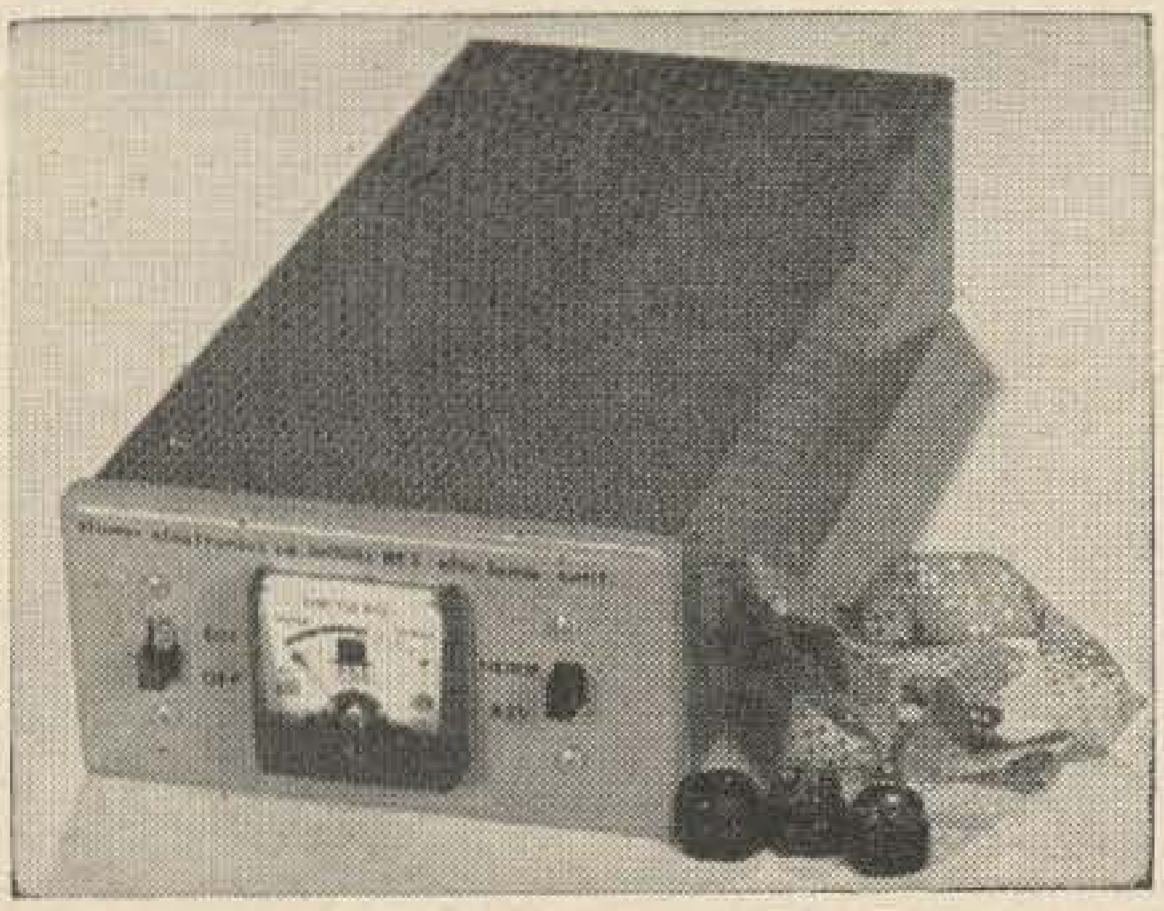
3316 Main Street
Riverside 3, California 92501
Phone 683-0523 (area code 714)

THE NEW W6TNS

"Beatle Box"

TELETYPE CONVERTER!

DESIGNED AND BUILT BY DON STONER W6TNS OF STONER ELECTRONICS!



RT-1 WIRED AND TESTED

$99.50

LISTEN TO UNITED, ASSOCIATED, AND REUTERS PRESS RELEASES!! RECEIVE TOMORROW'S NEWS TODAY! COPY DX RTTY STATIONS AROUND THE WORLD! USE THE "BEATLE BOX" IN CONJUNCTION WITH YOUR PRESENT RECEIVER AND A TELETYPE MACHINE.

ORDER TODAY

MISSION HAM SUPPLIES
3316 Main Street, Riverside, Calif. 92501

☐ SHIP ONE "STONER" RT-1 CONVERTER:

☐ QUOTE trade allowance and terms.
☐ Please send latest HAM flyer.
☐ Put me on your mailing list.

(Cash orders shipped FREE in continental U. S.)

NAME .... Call ....
(please print)

Address ....

City .... State .... Zip ...
(Calif. orders add 4% tax)

Howard S. Pyle "YB" of W7OE
3434-74th Ave. S.E.
Mercer Island, Wash.

Are You Really a Technician?

Maybe your license says you are, but *are* you? Certainly you are legally recognized as such as attested by your ticket. Are you actually performing in that capacity however?

The Technician class license was established by the FCC with the primary purpose of encouraging amateur experimental and development work among those hams with little interest in other phases of amateur activity such as all-band, two-way communication, participation in code speed and the myriad other types of contests, DX contacts and many more such diversified interests. Experimental work by the bona-fide Technician class however, has produced some interesting developments. Fortunately, there are a reasonable number of serious-minded Technicians who accept the privileges permitted by their license, as a responsibility toward advancement of the art. They have no particular interest in amateur *communication* as such, although the FCC has provided them with a few limited communication channels. With these, they can communicate with other experimenters in their relatively local areas for the purpose of an exchange of ideas in connection with their work. Such channels however, all too often become simply amateur "rag-chewing routes" by the non-experimenters and much of the communication is entirely contrary to the intent of the Technician classification. "Round table nets" are often formed by this class for the express purpose of general "chit-chat" on channels assigned primarily for experimental purposes. Most of this casual conversation is entirely foreign to technical experimentation and development. Such use is most certainly completely unfair to the conscientious Technician licensee as it often deprives him of the few communication channels allotted to him through which to exchange technical information and ideas. It therefore represents a most selfish view-point on the part of those "lazy" amateurs who take advantage of the Technician communication channels for general amateur communication. We say "lazy" because such action on their part is a pretty direct indication that they do not care to put in the time and effort to master the radio telegraph code to the extent of 13 words per minute. If they would do so, *all* of the privileges open to United States amateurs would be theirs. This would include all of the Technician class assignments as well when they desire to use them for *experimental* purposes. For the ham who qualifies for a General class license, there is no need to use the Technician class frequencies for other than purely experimental work and communications pertinent thereto; he has so many other bands which he may use for general amateur communication.

In the technical development field, amateurs have always been almost awesomely predominant and have pioneered the way for a great deal of commercial development. Is it right that we should narrow such experimental activities by creating interference, often of a most aggravating type, to the technically-minded experimenter who is exerting most of his effort to development and improvement of the art of Hertzian wave propagation?

Certainly we recognize the fact that in addition to the 13 wpm code speed requirement there are a couple of other considerations which enter into choice of a Technician class license rather than that of a higher grade, even though the applicant has no particular leaning nor desire to contribute to the advancement of the art through experimentation. First, to repeat ourselves, is this "lazy" attitude toward acquiring the code speed for a higher grade license? Why shy away from that, however? No doubt you put in many more hours in your study of math, general science, physics, history etc. in your school years in order to attain a passing grade. It may take a small child two or three years to begin to recognize and understand the simple phrases tossed his way by adults: "Ah, ah . . . mustn't do that" . . . "Baby, stop that", "No, no . . ." etc. Likewise, before he can pronounce simple words in a decipherable form such as, "Daddy" . . . "Mommy" . . . "Kitty" . . . etc., he goes through many months of learning this simple oral vocabulary.

As a Technician licensee, if such license is what you have decided to apply for, assuming though that you want to be an all-around amateur rather than an experimenter, but because the 13 wpm code speed scares you off, do you know that it will take you far less time to attain this speed than it takes a baby to learn to walk from creeping? To use a common expression, you're "chicken" if you don't dig in and concentrate on getting your code speed up to the required 13 wpm which will enable you to by-pass the Technician grade if it is general amateur communication which you want. The FCC is most generous in allowing you a year as a Novice in which to build up the meager additional 8 wpm code speed required for the General class license. Assuming that you have average intelligence and a reasonable amount of spare time for Novice operation on the air, you can accomplish this in a period of only two or three months. Naturally, you must increase your knowledge of radio principles by study of the 'theoretical' aspects of radio communication as well, for your examination for a higher grade license than Novice, be it Technician or General, will require that you answer correctly, approximately 74% of the 50 questions with which you will be presented in the written examination for either the Technician or General class license examination.

So . . . what are you faced with in choosing between applying for a Technician or a General class license examination after your period of 'apprenticeship' as a Novice? The written or so-called 'theoretical' examination is the same; the only differentials are that for the Technician class you do not have to increase your code ability beyond the five words per minute required for a novice examination but you *do* have to demonstrate, through written examination, that you have much more familiarity with the equipment which makes radio communication 'tick' than you had to do in your Novice examination. In fact, you are going to have to pass a written examination in this latter subject which is the equivalent (and practically almost identical) with what you will face when you apply for a General.

If you are interested mainly in the experimental aspects of amateur radio and would like to put your "two-bits' worth" into experimental and development work along these lines, then you should rightly apply for the Technician grade of license. On the other hand, if you are interested in the broad field of amateur two-way communication with little emphasis on the experimental angles, you belong in the General classification. With the examination in written form being practically identical for either the Technician or General class license, your only problem is the differential in code speed required. Again that puts it strictly up to you; as a prospective Technician licensee you have no real reason to acquire a 13 wpm code speed ability, if the sole purpose in applying for a Technician class license is for *experimental* reasons. Most of your communication with other experimenters in the limited frequency bands assigned you, will probably be by radio *telephone* anyway. The code speed requirement of 5 wpm for this class of license happens to be a Federal requirement and you are going to have to meet it, whether you use the radio telegraph code or not. On the other hand, if you plan to apply for a Technician class of license with the major purpose of using it for rag-chewing and other types of, shall we say, "social" communication, this immediately places you in the "lazy" class of ham; you should take a little more time and devote a few more hours of study so that you can make the grade as a General class amateur!

Another consideration enters the picture here. As we all know, the Novice class license is good for only one year, cannot be renewed and can never again be issued to you. So, if you don't qualify for the Technician or General class within that year, you are out on a limb. Sure, you can take the higher grade examinations at any future time if you wish and, should you fail, come back in 30 days and try again . . . repeatedly. Once you are successful in passing the examination for either class, you are issued a license which *is* renewable every five years, for your lifetime, without examination of any kind, including code, if your application for such renewal is filed *before* expiration of your current license.

In addition to the renewal privilege which both the Technician and General class licenses provide, we have another factor to consider and which we might term the 'personal pride' angle. Once a Novice class licensee has passed his examination and been issued formal Federal call letters, he looks on them with pride; they are his identification in the realm of hamdom. The Novice looks forward eagerly to the day when he can drop the 'N' from his call by reason of acquiring a higher grade license. His call letters become his 'nick-name'; J. P. Morgan, of Wall Street brokerage fame was most frequently referred to as "J. P." and he liked it. Your neighbor James, much prefers to be called "Jim"; Robert, down the street, glories in the nickname of "Bob". Even this author much prefers to be referred to and addressed by "YB" rather than his given name.

That introduces an additional reason for applying for a Technician class license after the Novice period. To carry on the initial call letters (dropping the 'N' after the Novice year) has become practically traditional. When the eleventh month after receiving his Novice license rolls around, the embryo amateur who feels that he cannot qualify in the 13 wpm code requirement, becomes a bit panicky in that he feels that if he cannot pass the General class code examination, he will probably lose his call and thereby the identity which he has attempted to establish in his year as a novice. So, with the code speed requirement for Technician being only that which he has already acquired (5 wpm) he elects to become a "Technician" with the five year renewal privilege and retention of his present call letters, minus the 'N' which stamped him as a novice.

Is this fair . . . is it right? With an entire year in which to qualify for a code speed of 13 wpm if he wants to be a full-fledged radio amateur with *all* privileges, doesn't his lazy streak stand forth glaringly?

None of the foregoing has been intended in the least as a tirade against the bona-fide, non-communication minded *experimenter* who is really seriously interested in contributing his bit to the progress of the art. Our hats are off to them; they have actually been and still are, the backbone of ham radio. We *do* though, say "shame" to the 'lazy' ham who wants to carry on casual two-way communication using the Technician frequency assignments to avoid increasing his code speed, just because such use, unfortunately, happens to be legal, although frowned upon. He is definitely handicapping the legitimate, Technician licensed experimenter who recognizes his obligation to the art and to his fellow hams. If you have been, or currently are using the Technician frequencies for casual, social interchange, think it over! . . . W7OE

73 Reviews

the Transcom SBT-3 Transceiver

The newest entry in the sideband transceiver market is a tiny little unit put out by Transcom Electronics in California. This is the smallest and lightest transceiver ever made, weighing in at 11½ lbs and being 4½" high, 11½" wide, and 9" deep. The clever design of this unit uses transistors in all but the final stage (8042's) which is instant heating. Thus on receive the whole transceiver only draws a half ampere. On transmit it draws 12-15 amps for 160 watts PEP input.

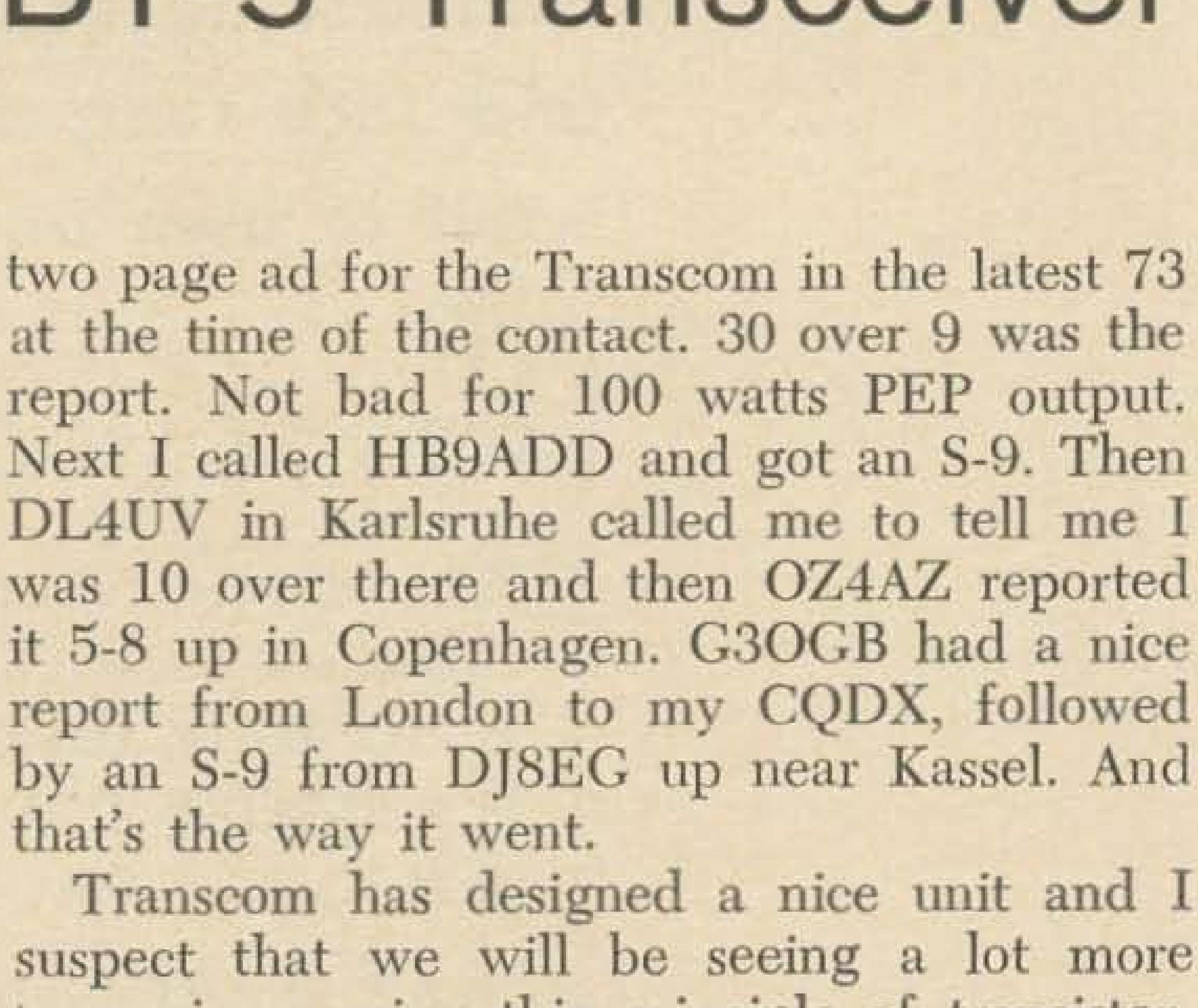
The Transcom is particularly designed for mobile operation. It covers the 20-40-80 meter phone bands only, and with generous bandspread . . . calibration every 5 kc. Most of the controls are knurled knobs which take up little panel space and can be operated by one finger.

The dc power supply is surprisingly small, weighing under 3½ lbs. This certainly could be fitted into the most crowded engine compartments or up under the dash.

In use barefoot with a three element twenty meter beam the rig brought in good S-9 reports from all over the States and plaudits from Europe and South America. Signal reports were universally complimentary and the receiver seemed to really pull them through with no difficulty. Drift was not noticeable.

In a short test period in late September we called a short CQ, got called by K4IKR in Alabama, who happened to be reading the two page ad for the Transcom in the latest 73 at the time of the contact. 30 over 9 was the report. Not bad for 100 watts PEP output. Next I called HB9ADD and got an S-9. Then DL4UV in Karlsruhe called me to tell me I was 10 over there and then OZ4AZ reported it 5-8 up in Copenhagen. G3OGB had a nice report from London to my CQDX, followed by an S-9 from DJ8EG up near Kassel. And that's the way it went.

Transcom has designed a nice unit and I suspect that we will be seeing a lot more transceivers using this principle of transistorization with instant heating final tubes. It certainly is most efficient for mobile operation.
. . . W2NSD



Buy your Drake TR-4 SSB Transceiver From Freck

DRAKE
TR-4

All features of Drake TR-3
PLUS . . .

- ★ **Solid State VFO** with linear permeability tuning for maximum stability
- ★ **Automatic Transmit/Receive Switching on CW** (semi break-in)
- ★ **CW Sidetone Oscillator** built-in
- ★ **VOX or PTT on AM**
- ★ **Connections for External Receiver**
- ★ **Diode Detector on AM**
- ★ **Relative RF Outjut Indication**

$585 Amateur Net

Super-combination for transceiving . . .

The new Receiver-controlled Exciter . . . **DRAKE T-4 RECITER** + **DRAKE R-4 RECEIVER** = The ultimate in transceiving

Model T-4
269.95

Model R-4
379.95

Drake T-4X Complete Transmitter (less power supply)	**$379.95**
AC-3 Power Supply	**$79.95**
DC-3 Power Supply	**$129.95**
MMK-3 Mounting Kit	**$6.95**
MS-3 Matching Speaker	**$14.95**
RV-3 Remote VFO	**$79.95**

T. T. Freck W4WL, President

W. F. Beck K4QOK

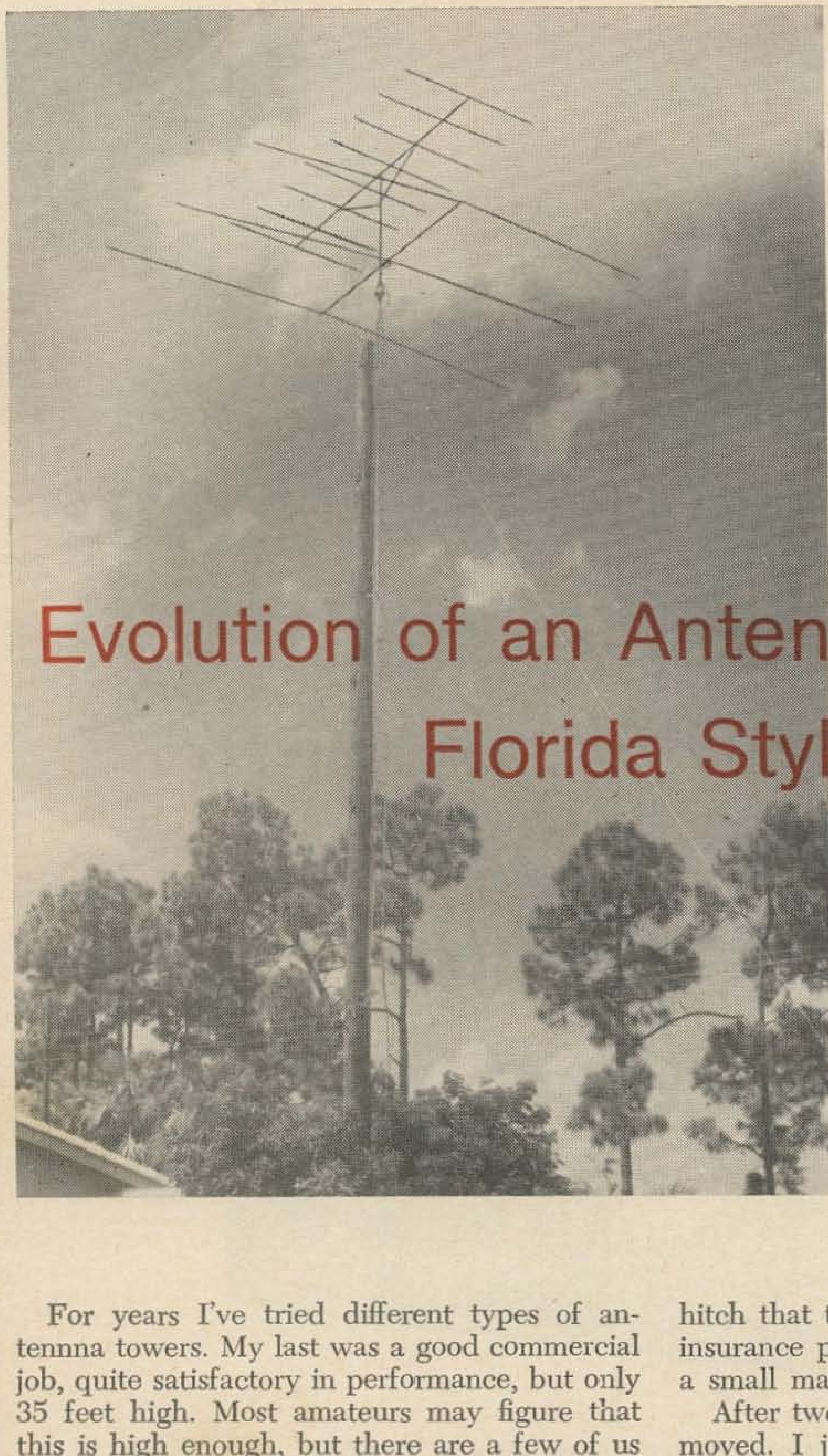
Freck Radio and Supply Co., Inc.

AL 4-9551

AL 4-9552

38-40 Biltmore Avenue

Asheville, North Carolina



Earl Spencer K4FQU
1413 Davis Dr.
Ft. Myers, Fla.

Evolution of an Antenna Tower—Florida Style

For years I've tried different types of antennna towers. My last was a good commercial job, quite satisfactory in performance, but only 35 feet high. Most amateurs may figure that this is high enough, but there are a few of us that are not satisfied unless we sport the highest beam in the country.

I had been on the lookout for a used telephone pole for a long time, but none seemed to be available over 35 feet high. In final desperation I approached the higher ups in the local power company and they finally located what I wanted lying in an obscure corner of their yard, marked "Out of Service". This meant that it could no longer be used as a transmission pole, but was still sound and would serve my needs. The pole was a Class "A" type transmission pole, 80 feet in length and over 30 inches thick at the base. I was overjoyed at the gift, in spite of the slight hitch that they could not deliver it due to an insurance problem. I figured that it would be a small matter to get it home.

After two weeks of trying, the pole was unmoved. I just couldn't find anything capable of transporting it through the city and was pretty discouraged. It was frustrating to have a dream pole and not be able to get it the six miles to my home.

Then came a stroke of luck. While talking to a good friend who works for the telephone company, I mentioned my plight with the pole. When I told him how big it was, he changed the subject. I thought I was still batting zero until I almost ran over it that night in front of my house. The telephone company had picked it up at the yard and delivered it free of charge. How they ever carried it with their small rigs is still a mystery, but I am grateful, and won't ask questions.

Now all I had to do was get it in the ground.

How do you get an 80 foot pole, weighing many tons, twelve feet into the ground? I started getting estimates from various contractors that do this kind of work, but the cheapest price I could come up with was $50. I later decided that the price was not as bad as it sounded, and in fact would have been a bargain.

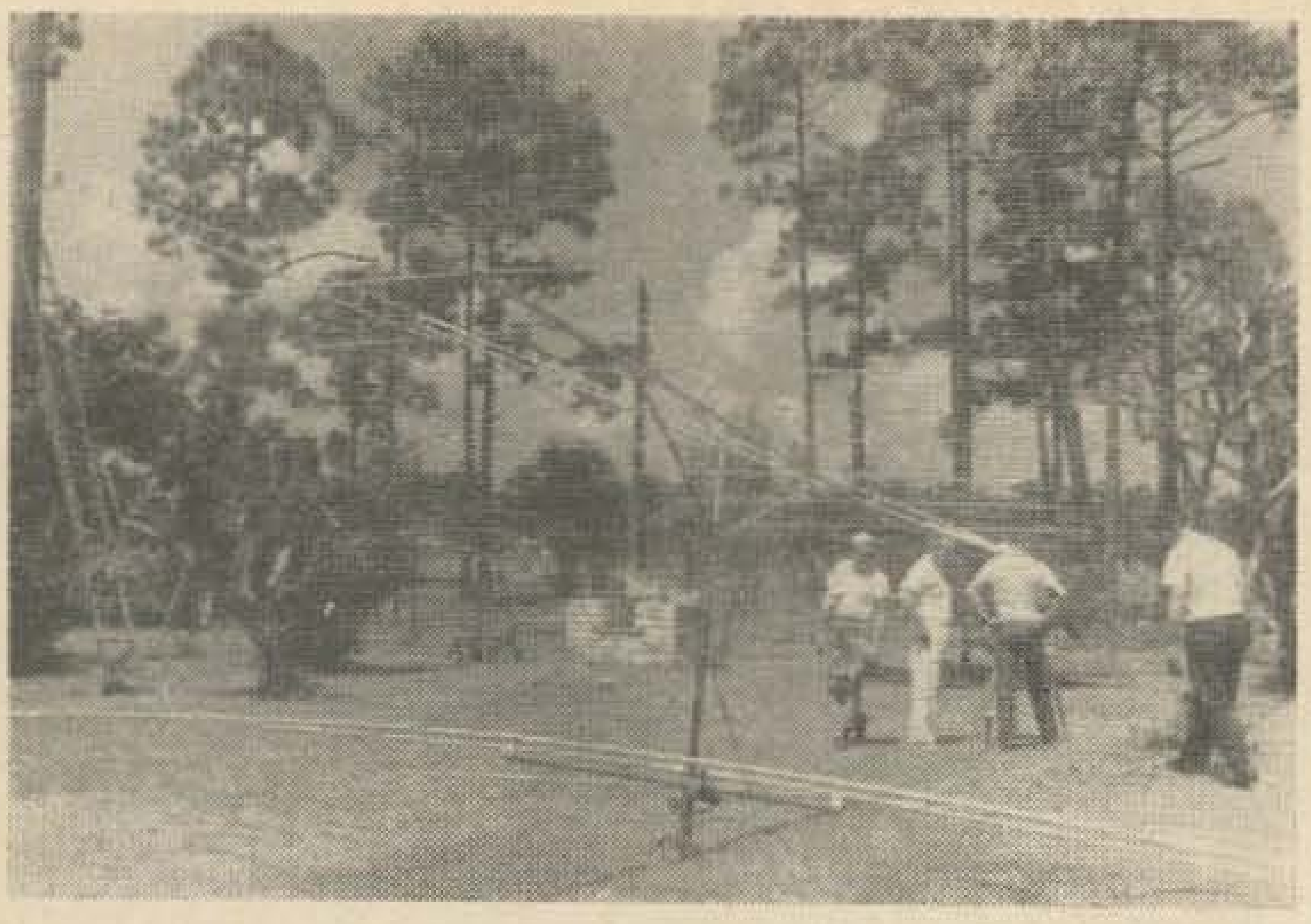
I decided that I would set the pole myself to save the money. I borrowed a small drag line with a 30 foot boom from a friend. All I had to do was dig the hole. I let him talk me into it, as the price was right up my alley: nothing. Before I had finished digging the hole, I wished I had hired someone to do it.

The power company recommended that the pole sink 12 feet in the ground. I started to dig. At four feet I hit water. Three more feet down, the water started giving me trouble. When as much dirt fell back in the hole as I pulled out, I figured it was time to go for help again.

I had dug this far with a shovel and a four foot post hole digger, which meant that I was reaching into the hole better than two feet. I conned the power company into loaning me a ten foot post hole digger, and it took me a week to dig the hole, working nights after work.

Saturday and the crane arrived at the same time. The crane could barely lift the pole enough to drag it the 150 feet from the street to the hole. It hooked the pole just high of center balance and started to lift it into the air with the base end hanging over the hole. The base started to slide, and dropped into the hole on the first try, splashing 8 feet of muddy water all over. The crane boom caught the pole short when it hit bottom and held it upright. We jockeyed it around until it looked plumb. The crane boom was locked in place and left for the weekend while I filled the hole. The entire operation was the most nervous hour I ever put in.

My wife decided that it looked too unstable, and convinced me that she was right. I headed for the hardware store on the double. My first expense for the pole came to $28. I used 300 feet of ⅜ inch galvanized steel cable for the guys, along with 30 cable clamps, 3½ inch by 14 inch turnbuckles, and 3½ inch by 12 inch eye bolts. The pole was guyed at the two thirds level and it was secured by wrapping the cable around the pole and fastening with two cable clamps spaced two feet apart on each cable. To keep the cables from sliding down the pole, I drove a ½ inch by 8 inch lag bolt into the pole on three sides and left one



Typical seedy Ft. Myers hams chasing an alligator before the antenna goes up.

inch sticking out of the pole. The cable rests over these three lag bolts and prevents it from sliding down the pole. The guys are anchored by driving a 12 foot pipe into the ground at an angle running back towards the base of the pole with a foot left above ground. The guy wire is fastened to this pipe by a turnbuckle and an eye clamp. The guy was propped by a four by four directly in front of the pipe 5 feet off the ground. Down through the top of the four by four I drove a large eye bolt and ran the guy through it to keep it from slipping off the post. This prevented people from tripping or hanging themselves on the guy wire. The guys are broken up by a large insulator which was scrounged from the power company. We did not pull the cables tight, but left a couple of inches of sag in them.

The pole stood for a little over a year without an antenna. It took me that long to gather up the ideas and the parts to finish the tower.

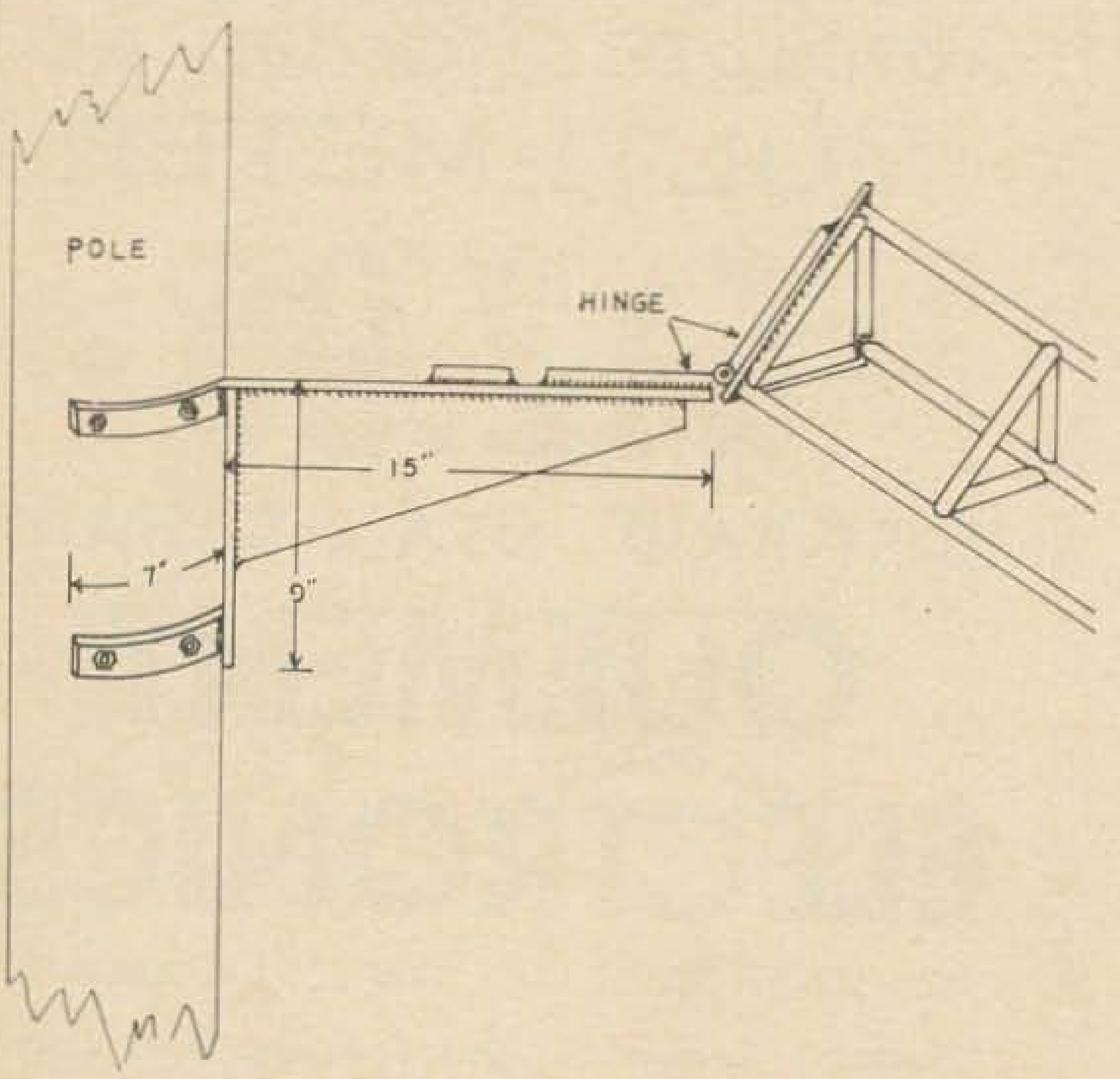


Fig. 1 Base plate assembly. All 3/8 steel plate, electric arc welded.

The tower consists of two different sections of an E-Z Way crank up tower. The bottom "Donna." We got them for nothing from various radio and TV repair shops. The sections were in slight need of repair, which I managed to have done by the time they were needed. They were stripped, cleaned thoroughly with an electric wire brush, and painted with aluminum paint.

The top section is the five inch inner section of an E-Z Way crank up tower. The bottom section is part of an eight inch tower, make unknown. The two sections were welded together. Note the offset in the tower due to the two different sizes of the tower. The top section rests on a steel plate welded to the first rungs of the bottom section. The bottom of the tower was then welded to a piece of ½ inch by 8 inch by 8 inch steel plate and one leaf of a 4 inch steel door hinge was welded to the bottom of this plate. The other leaf of the hinge was welded to the base plate assembly (see **Fig. 1**) which a welding shop made to my drawings for a price of $12.00. We cleaned it and painted it with aluminum.

We started to raise the tower by installing the permanent gin pole at the top of the telephone pole. The gin pole itself is a 48 inch length of ¼ by 2 inch by 2 inch angle iron to which the hook of the gin pulley is welded at the top inside apex of the angle formed by the V. The pulley hook is welded with a slight downward angle so that the pressure will be pulling straight at the pulley when the tower is down. The gin pole is bolted to the backside of the pole with 3½ by 4 inch lag bolts and extends about 12 inches above the top of the pole so that the pulley is centered over the top of the pole. Next we ran ⅜ inch galvanized cable through the pulley and down the inside of the gin pole, passing the lag bolts to one side, and on down to the ground. The other half of the cable went to the ground on the front side of the pole. See **Fig. 3.** This cable was then fastened to the top section of the tower immediately below the rotor with a pair of cable clamps. The base plate assembly was installed to the bottom of the lower section of tower by mating the two leaves of the door hinge.

We pulled the entire tower assembly in an upright position against the pole. It took two men pulling on the gin cable to hoist the tower to the top of the pole. We anchored the tower to the pole temporarily while we fastened the base plate assembly to the pole. 2½ by 6 inch lag bolts were used in each strap to hold the base plate to the pole. Then we let the tower drop over until the rotor was accessible from

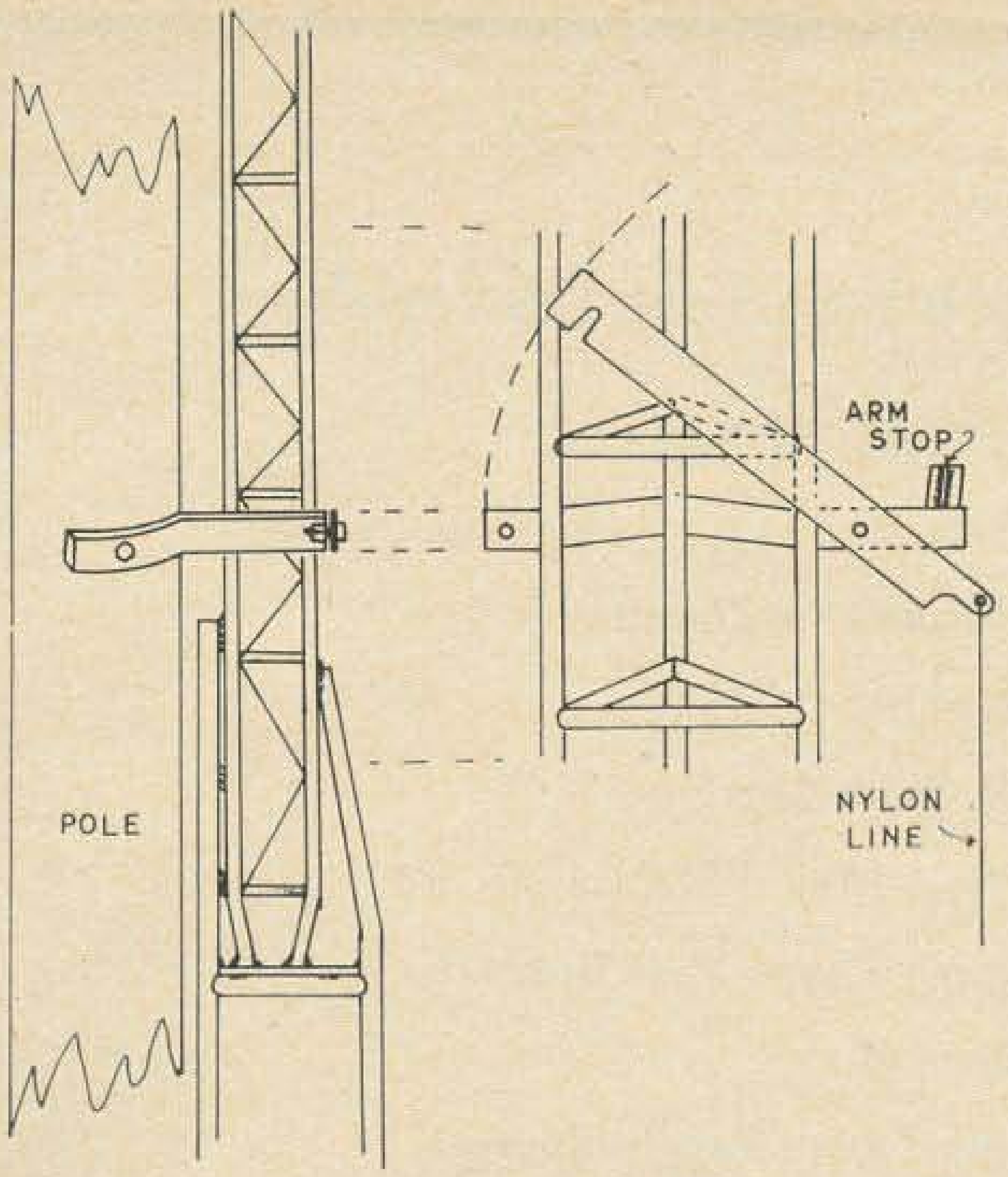


Fig. 2 Center support detail.

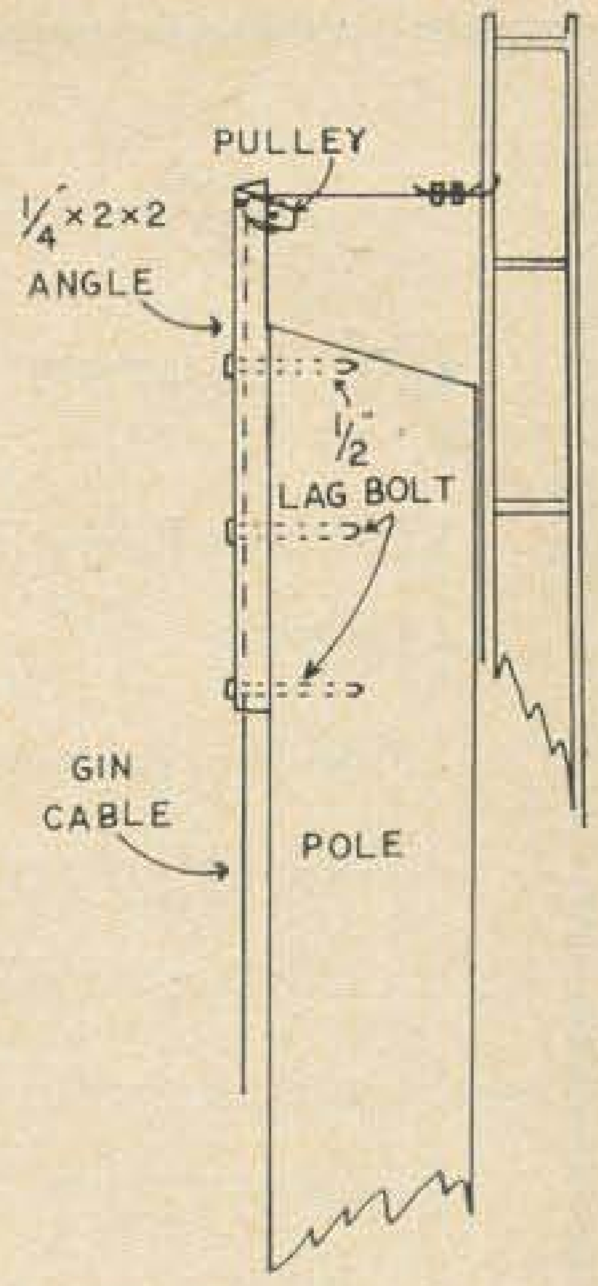


Fig. 3 Gin pole detail.

the ground. We tested the tower a few times to be sure it worked and then proceeded to install the antennas.

The length of the boom on the tri-bander made it impossible to stand on the ground to work, so we had to prop the tower up until the boom cleared the ground. I wound up driving my truck under the rotor and working from its roof. I realized that this would happen every time I let the tower down. In the future, I shall use a heavy piece of aluminum pipe 12 feet long, capable of supporting the weight. This will be attached to the tower just below the rotator with a small hinge which will allow it to hang free alongside the tower. When the tower is let down, gravity will pull the leg out and it will hit ground first, holding the antennas off the ground.

When the coax and rotor cable had been attached to the antenna, we fastened the center guide support to the tower, which has a small rope tied to the right handle of the front bar. See **Fig. 2.** Note the arm stop above and to the right of the front arm. This stops the arm from flopping over and allows the center to remain open so the tower can be lowered. To operate, simply pull quickly on the rope and the arm will swing over and rest on the stop. To close the support arm, whip the rope slightly and the arm will fall and lock over the pin, using its own weight to hold it in place. Thus the tower is held rigid in three places: at the bottom by the base assembly, at the center by the guide support, and at the top by tension on the gin cable.

After checking over the entire rig, we were ready to raise the tower and its antennas. At this point I still had no winch, so we had to raise it by the armstrong method. It took the combined efforts of 4 men on the gin cable and 2 men pushing up on the tower at the rotor to start it on its way. When it was raised about one third of the way, we found that three men could handle it; and from the halfway point, one man finished the job.

We were worried about the tower bending in the middle due to its length and the small top section, but it went up without a trace of a bend except for the little that looked as though it should be there. To pull the tower into place, we ran the cable straight down the back of the pole and through a pulley about 3 feet off the ground and pulled parallel with the ground.

The permanent arrangement will use a double block assembly above the winch so that one person can raise and lower the tower easily. When the tower was halfway up, the sag had disappeared completely. The white line seen leading away from the tower serves to help guide it. When it was in place, the lead line was pulled tight and tied to a small boat cleat at the base of the pole.

Erecting the tower took about 7 hours and a case of 807's. The rotator was a CDR AR-22, but Ham-M or TR-44 would be better. The AR-22 drifts a lot, although it does a nice job of turning the array.

The top antenna is the Civil Defense beam, Hy-Gain 8 element 6 meter array. The bottom beam is a Hornet Tri-Bander, TB-500, somewhat modified from its original egg-beater condition of four years ago. The mast is a 10 foot piece of 2 inch steel pipe. The estimated weight of the array, including the rotor, is about 60 pounds; its total height is 83 feet. This installation has withstood winds in excess of 60 mph without budging. Total cost was about $50.

. . . K4FQU

Did you enjoy the articles in this 73?

Of course you did. So look at what we ran last November:

VHF Log Periodic
SSB VFO
Color the Grommet Gone
A Tuneable Antenna for 432
On the Air on 432
Precision Audio Attenuator
6 meter VFO Transmitter
Sterba Curtain for Two
Electrolytic Saver
KMW-2 Voltage Regulator
80-40 Vertical
Transistor AFSK
2 meter mobile
Mobile Phone Patch (?)
KWM Operating Notes
SJS Part III
UHF Transistor Circuitry
6 meter QRP Station
Mobile Noise Limiter
Ham Operating, FCC Version
Designing Phase Shift Networks
The Easy Way
Failsafe Power Supply Control
Incremental Tuning of the NCX-3
SB-33 and MP-10
Return to the Art
Heath Applications Series
Kentucky DX'pedition

And November 1963:

Another Approach to TVI
Surplus 432 Converter
The Perfect Match
SWR/PWR Meters
All Band Conical Antennas
Tool and Workshop Section
AC Adaptor
Come-a-Longs
Of RTTY
73 Tests the SK-140K
The Amateur's Cape Canaveral
Listen Fellow Amateur
Communicator IV on CW
Premium Tubes
73 Tests the B and W 6100
The Battle of the Century
Shocking . . . but True
Slow Scan Vocoder Transmission

Interested? We still have a few copies of each available for 50¢ apiece. Why not order a few to keep you company these long wintry November nights?

And in fact, we have copies of most of our back issues around. All are 50¢ apiece except 1961 and June and November 1962. 1960 and January 1961 aren't available.

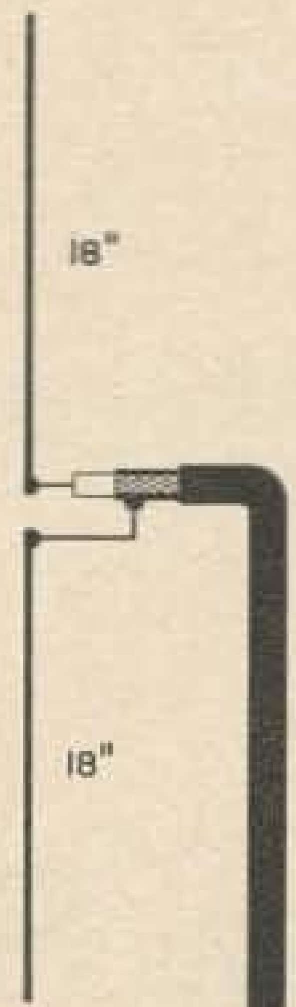
Or maybe you'd like our assortment of 20 different back issues of 73 for just $5. Much better than *Peyton Place*—and the editorials are just as scandalous.

73 Magazine

Peterborough, New Hampshire 03458

Maurice Lewton WA6PHR
1323 Via Del Carmel
Santa Maria, California

Two Meter Beacon



A remote signal beacon is very useful during alignment, antenna checks and other amateur testing. This simple low cost two meter beacon uses a cheap 8 mc crystal and very little else. It can be heard about half a mile away using 1 ma at 1.5 volts, or the input can be reduced for closer work.

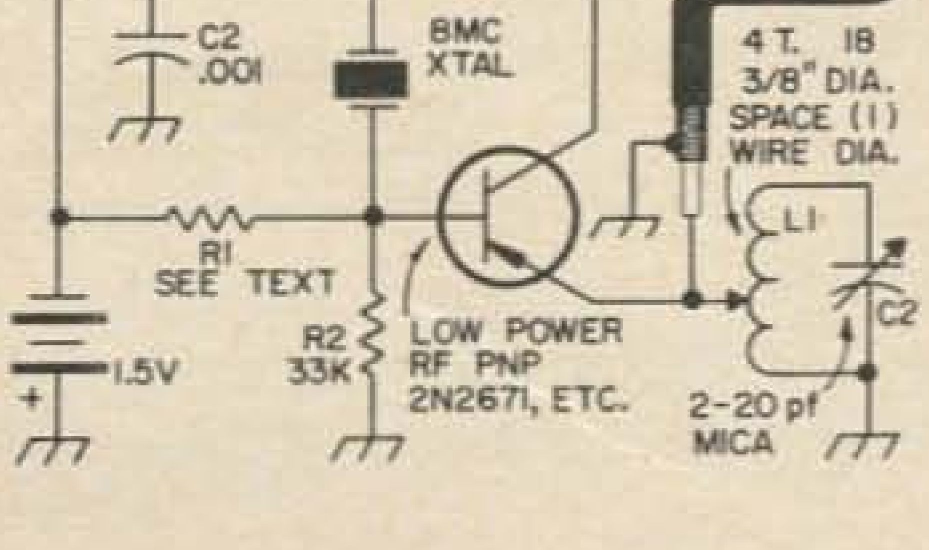
The entire unit can be built with one octal socket and a small terminal strip. The socket will hold the FT 243 crystal, the transistor can be placed in the hole and the unused terminals can be used as tie points. Make the RF leads short.

R1 will be from 50 k to 250 k depending on the transistor you use. Adjust R1 for 0.2 to 1 ma collector current. Most low leakage transistors that will oscillate above 8 mc will work. The emitter tap should be at ½ to ¼ turn above ground.

When you've finished building the beacon, monitor the collector current and pull out the crystal. If there is a change in current, the circuit is oscillating properly. Then look for the 18th harmonic of the crystal on two meters. It should be quite strong. Adjust C1 for maximum signal.

I even tried the beacon at 9 volts and 10 ma connected to my beam. I worked three stations on CW! But if operated at 1.5 volts with less than 0.3 ma, battery life should be virtually the shelf life.

. . . WA6PHR



Bill Hoisington K1CLL

A heterodyne-VFO storage-battery portable transmitter for six meters.

Slippery Six

Right off I would like to point out that I'm not in a war *against* Handbooks, far from it. They are my favorite literature. It's just that they seem to miss the boat on some important items for amateurs. So they want to "Swim with the crowd"; so, "what is it sold last year?", etc. No thanks. There are new things sometimes, improvements and new uses for older ideas. For example, the heterodyne vfo. As far as I know (may not be too far) there have not been many articles on this item for the amateur. In the military, yes. I first met this system soon after the war, using "quad diodes" for mixers.

There seems to be a wide gulf, much too wide, between the Military (Government) and amateur requirements. This doesn't really have to exist at all. The gulf, I mean. It just needs someone to "translate down" a little. Granted, amateurs do not need 100 G vibration tests, 300 C temperature tests (will that fry eggs good?), and 5 different kinds of fungus bugs (available in stock numbers from the U. S. Navy) for mildew tests. But certain basic principles and circuits that are good for the military can be used to advantage by the amateur. The heterodyne vfo is one of these.

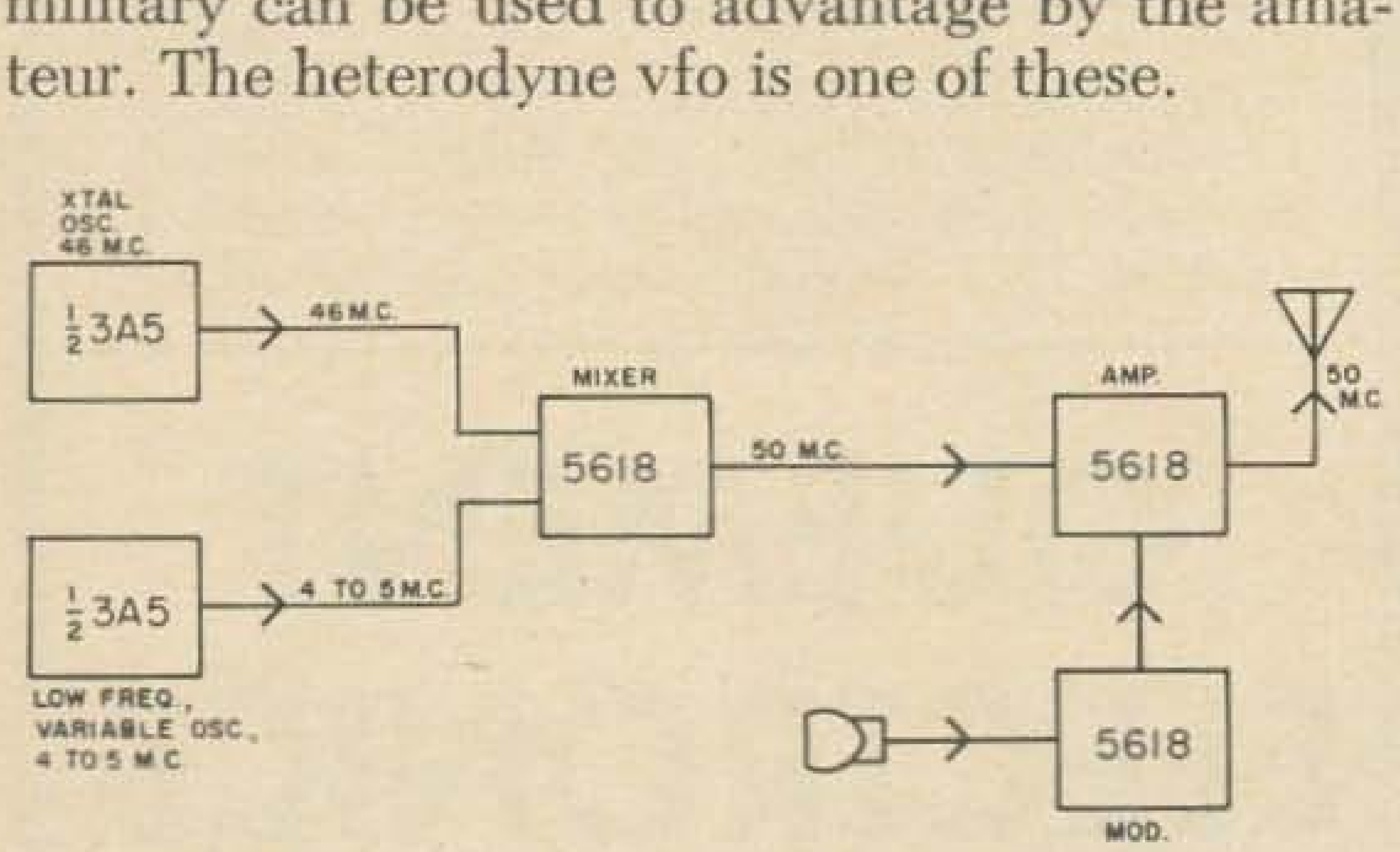


Fig. 1. Block diagrams of heterodyne rig.

Plenty of real good engineers who have been working for the government know about this. A lot of them are amateurs too, friends of yours, friends of mine, on the air, etc. But their daily stress of work sometimes impedes their possible translation of new items into amateur rigs. This one, the heterodyne vfo can be particularly important. Because, you can move around the band, spot in on local operating portable sets. This of course is caused mainly by the variation in dielectric of said capacitors, and can be avoided by the use of air dielectric. It is also divided by twelve in this rig, and by 18 on two meters. I know! One of my old battery rigs had one such capacitor in it. Every time I got out of the warm car in the fall and spring and started up the mountain to a fire tower, the frequency walked also. Right out of the other fellows *if* pass-band. So if you have only air capacitors you will be better off. This rig does have a mica compression trimmer in it but so far that has not bothered at all. Again, it just doesn't really seem fair to make comparisons between this vfo and others. 4. Heating of oscillator components caused by other tubes in the rig. There are only three of these other tubes, including the modultor tubes. Mixer, final, and modulator. And they are also quick heating filament types. Same 5618 of course, with not much heat in them. If you push the final to its full 7½ watts dc input you will get a little more, but not much. If you use the flat "open" type of construction these last tubes will be a little distance away from the oscillator. That is good for other reasons too. Like rf feedback. 5. "Leaving the oscillator running." Along with all the other evils found in

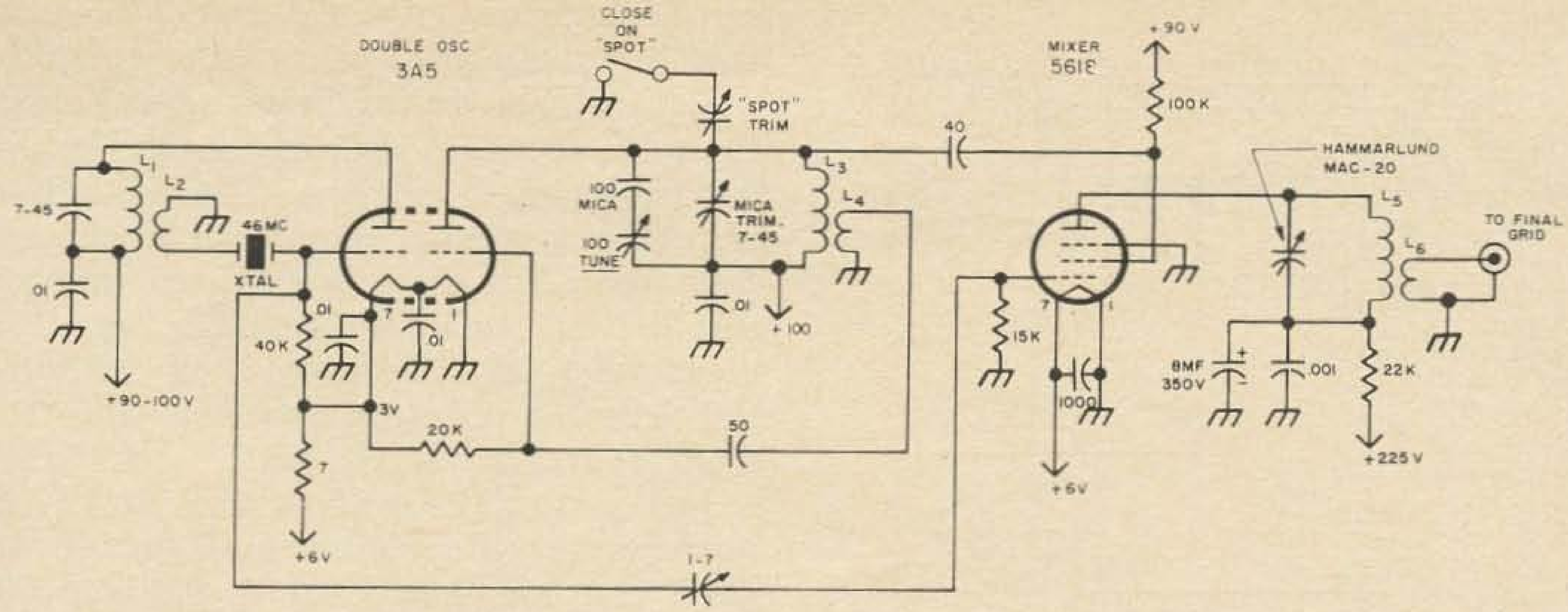


Fig. 2A. Double oscillators and heterodyne mixer.

the "usual" vfo, this is a rather nasty one and has led people to heterodyne mixing of oscillators at low frequencies simply to get the transmitter off your own frequency where you rag chews when mountain-topping or mobile, without the usual work involved in setting up a "stable vfo". Proof? Yours truly had been operating a storage battery walkie-talkie using this arrangement for a long time. See Fig. 1, block diagram.

One half of a 3A5, 55c double triode is used as the high frequency crystal oscillator, the other half as the low frequency variable oscillator. The crystal oscillator 46 megacycle output is fed into the control grid of the 5618 quick heating pentode mixer, and the low frequency variable oscillator, 4 to 5 megacycles, is fed into the screen grid of the same tube.

On the plate of such a mixer can almost always be found *four* frequencies. The fundamentals, 4 and 6 megacycles, and the sum and difference of those two. We will use the sum in this rig.

The reason, for these last two frequencies, is a fascinating subject. Several eminent scientists have written large, good, and costly books about just that one subject. A good number of special tubes have been created just for this service. They are also known as converters in receivers, and as modulators in transmitters. However, we are not going into the theory of mixing here, intriguing though it is. We will have enough to do to make up a good practical rig for battery-portable use, with the main emphasis on why such a design can be made very stable "without hardly trying at all".

The Principle

The principle involved is very simple. Instead of a vfo on low frequency which has to be *multiplied up*, a vfo on low frequency is *added* on. That's all there is to it. A drift, or shift, in the low frequency is *not* multiplied. Example: With an 8 megacycle vfo to take the place of an 8 mc crystal, the 8 mc must be multiplied by 18 to reach 144 mc. Any drift, shift, hum, or what-have-you is also multiplied 18 times. With the heterodyne vfo, no multiplication!

The Circuit

The crystal oscillator circuit I took from the 73 article "Storage-Battery Portable". Just note in passing that these 40 to 60 megacycle crystals work. Look at the thousands of receiving converters using them very successfully, but don't go over 100 volts on the plate. They begin to get fidgety if you do.

The 3A5 triode, each section, does not have much gain so regeneration is used in the crystal feedback circuit. It is not too critical, when used as shown. It just helps to start an otherwise sluggish crystal, keep it going, and provide more output with less critical tuning. Enough reasons?

The low frequency oscillator is also very simple in design. The only thing borrowed from the "conventional" vfo is the use of a fairly high C. A lot of other things often found in vfo's can be thrown away. But, don't forget, there are basic reasons why you can do this here, and *not* do it in the usual vfo. Most of these reasons go back to the main principle of *adding* instead of *multiplying*. 1. Mechanical stability. Not requiring high Q, as the oscillator is a "regulator" type, with plenty of feedback, the inductance L1 can be small and light and does not vibrate mechanically, even when you're walking around with it. 2. Heat. The 3A5 is a quick heating filament type tube that does not heat up enough to cause any noticeable drifting, or heat up any of the other components either. In fact, it is turned on and off every time you transmit and receive, as are all the others. 3. Absence of temperature sensitive capacitors. When you use a lot of capacitors across an oscillator coil

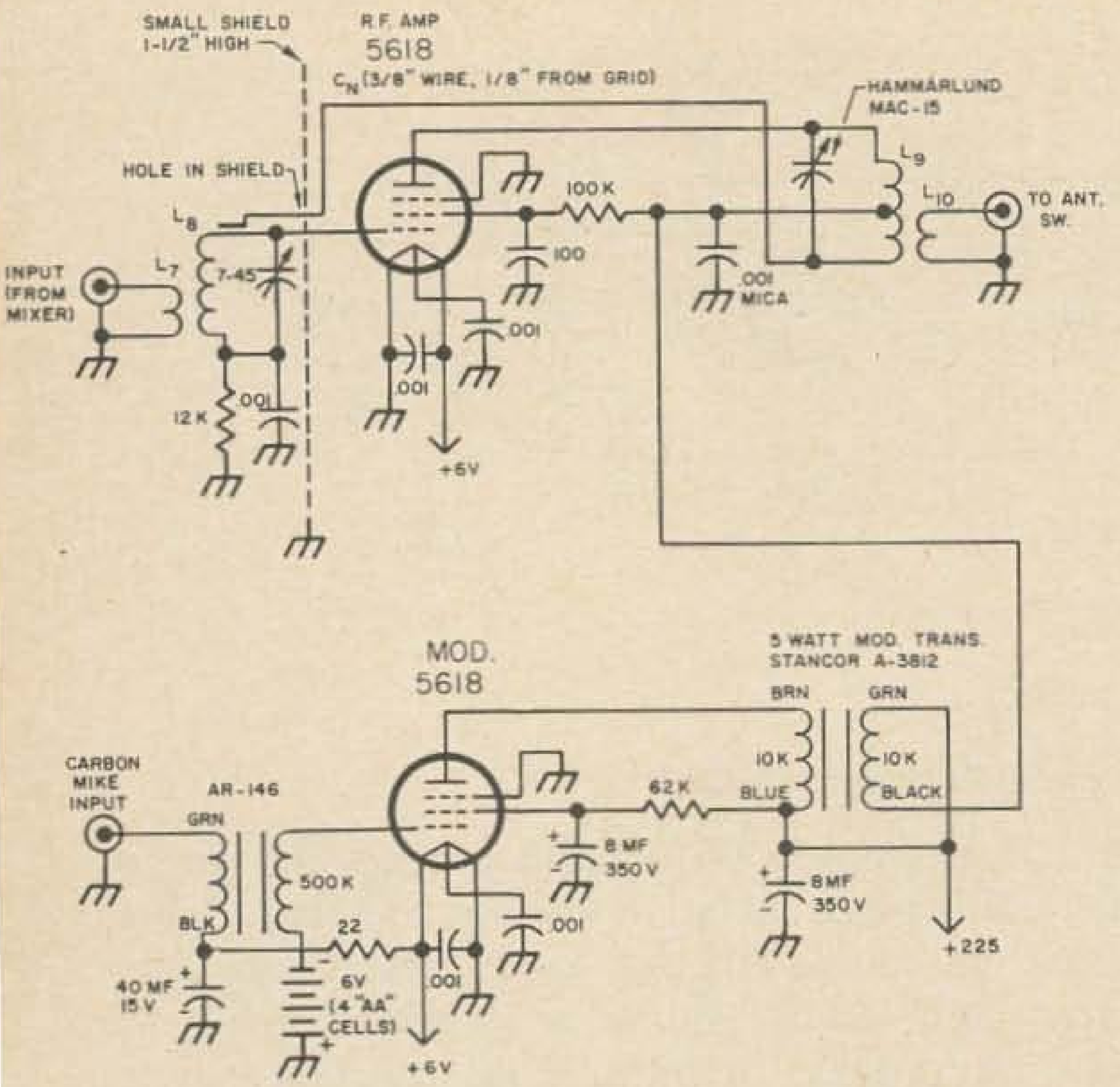


Fig. 2B. RF final and modulator.

you often find yourself with frequency drift, especially when getting in and out of cars and may be listening. And generally are today. The quick heating tubes obviate that one.

So, seems like enough reasons to me. Granted that the remedies for all of these troubles are made easier by the non-multiplication of the variable oscillator frequency. But that's just the point of this entire rig!

The Transmitting Mixer

Now that we have two stable frequencies, one fixed and the other variable, what do we do with them? The crystal oscillator 46 megacycle output goes to the 5618 pentode mixer grid because, being in the VHF region, it does not have much output, for a transmitter, and needs the grid-plate conversion transconductance of the pentode mixer.

The low frequency variable oscillator can have more power (but don't exaggerate on this idea!) and be used to modulate the screen grid. Be sure and keep in mind the meanings of the words mixer, converter, and modulator. The principle and processes are the same but the useage can be different. Note that with the rise of SSB to favor in many quarters we now have people on the air every day talking about converters. They don't mean receiver converters either, they're talking about transmitter converters.

Note the high value of the screen resistor in the mixer, and the dropping resistor in the plate supply. Mixers are particularly fussy about these values, and the bias on the grid or grids. This does *not* mean that they are critical. I do not go for critical circuits, if they can be humanely avoided, but these voltages, that is, control grid bias and screen grid voltage, should be varied under operating conditions for optimum desired results. In this rig it has already been done. The desired results were the maximum output at 50 megacycles from the 5618 mixer with given inputs from the 3A5 and the *least* possible output at 46 megacycles. Also the least at 42 mc, although this latter is no great problem, since it is 8 megacycles away from 50 mc.

Just a word here about the choice of frequencies for the double oscillator. It is obvious that one should not go too near 50 mc, because it would be too difficult to filter out the fundamental crystal frequency (46 mc). Also, the lower you go with the crystal, the higher you must go with the variable low frequency oscillator. It then becomes more and more fussy. In this case, I just happened to have a 46 mc rock, and everything worked out fine. I imagine that you could go a few megacycles lower with the crystal and run the variable oscillator a little higher. But not much! Of course you can get away from this bind by using double conversion, just like in receivers! More on that later, especially on 2 meters and 432.

Tuning the plate circuit of the mixer, which of course should be of the highest possible Q (use airwound coils), you will find both the crystal fundamental at 46 mc and the sum frequency at 50 mc. Be very sure about which is which! I used both a tuned power detector and absorption frequency meters on this job. A grid-dipper in the diode mode is also OK. Use a number of checks on this point! Do not use your high gain sensitive receiver! It helps to have some kind of a marker or small dial on the mixer plate tuning capacitor. Once you get the mixer and the two rf final tuning capcitors on 50 mc you will have no trouble at all from then on.

The RF Final

This operates quite conventionally with the 5618 neutralized. I used a piece of heavy wire, with good flexible tubing over it through the shield wall, brought over near the grid. See Fig. 2b. Works fine. A bakelite screwdriver bending the wire nearer or further away from the grid without rf excitation (watch those plate mils!) shows oscillation or neutralization immediately. Remember, the .24 mmf Cgp isn't much of a capacity but it is enough to make a high-gain unloaded pontode oscillate. You can do an even more precise job using a power diode detector on the rf final output with excitation but no plate or screen voltage. I neutralized this particular rig about a year ago and it has not budged since.

Again, air-wound coils are used in grid and plate circuits with coax link coupling. Be very sure you are on 50 mc! The rest is straight-forward rf circuitry and works OK. Once all three major tuning capacitors are on 50 mc you will have no trouble.

The Modulator

This is actually the same unit used in the "Storage Battery Portable" rig, described in 73. It is high level modulation and quite uncritical. Be sure to use fixed bias on the grid return and just remember that the 5618 likes class A audio. There is not much current upswing when talking. At the 5 watt level this class A type is still very good. You could make up a class B stage, but why? The storage battery driving the 225 volt hv transistor power supply might hold its charge a few minutes longer, so what? And you would have more and different tubes to buy and use.

Again, for the microphone, don't use anything but a Western Electric F1 button. I worked for the Bell Telephone Laboratories, Member Technical Staff, but that was over 20 years ago. I don't own any ATT stock either. In fact, I don't own. If anyone knows of another carbon mike that fully drives a single tube modulator, sounds like a crystal mike, and can be bought for $1, please let me know.

The Spotting Circuit

Let's face it, the 6 meter band today, especially evenings and weekends resembles the ten meter band in those vintage sunspot years, '39, '48, and so on. This situation settles the rock-bound versus moveable question. That is the main reason for this article. On top of that, the rig is fine in the car, real quick like, with a rain-gutter antenna, UHF connector, cable through the little vent window, and possibly a jumper over to the car battery to keep the portable one charged ready for

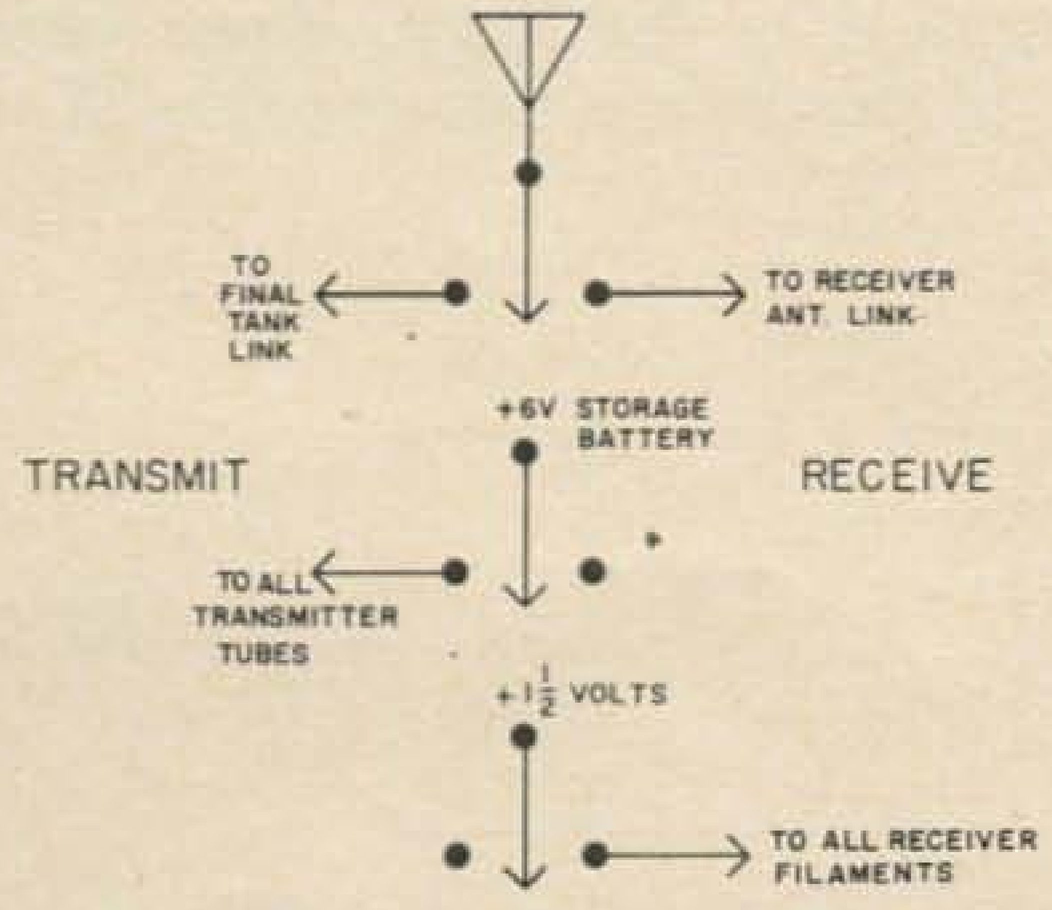


Fig. 3. Switching connections.

hiking up on top of the hill away from other mobileers! I have found that the whip up from the rain-gutter at some 45 degrees is very good. Kind of takes care of both beams and other whips. Incidentally, my whip has a stiff gooseneck at the bottom which is very handy for fixing in position and still allow for those low-hanging branches which you will find on those high country roads.

When you arrive at that hill-top and get on the air, you will hear all kinds of local (5, 10, to 15 miles) rag chews going on. If you are rock-bound you might as well have stayed in bed. With the circuit shown you flip the spot switch, zero beat, and you are ready to cut in at the proper moment. No comments, please, on just what moment that is, "Joe, do you know a Mr. Break in this group?" Hah! Spoofing aside, try giving up the spotting gimmick once you've used it!

There is a little deal on the power used for spotting. As shown, the 3A5 alone gives just about the right amount of power for the job. The 3A5 filament should be connected to the spotting switch for this business. I have not shown a complete organization of the switch, because many different possibilities are feasible. I actually use a 45 volt B battery for the receiver section, and add another making 90 volts for the 3A5 supply. You might want to drop down from the hv supply for this. Watch out for modulation on the supply though, if you do.

Notice the "spotting trimmer". This turned out to be quite important and a great help. It is needed to avoid the following trouble. If you want to be able to hear the station that you are zeroing in on, you cannot turn on the full rig. If you do not turn on the full rig you will not be on frequency. So the little trimmer takes care of that real neat like. To adjust it, tune in the transmitter full power on another receiver, shut off the transmitter and turn on the spotter, without touching the receiver. Adjust the trimmer till the spotting frequency is the same as the transmitter. That's all. Just do it once and forget about it.

Send Receive Switch

This also comes out of the Storage Battery Portable rig. Simple deal, using short connections on the transmitter, receiver, and antenna cables. For cables I have used both RG-58/U and the small ⅛ inch miniature 50 ohm cable. Both are ok. See Fig. 3.

For Antennas. Don't forget the gooseneck whip, the telescoping folding dipole, and the 4 element beam that folds up into a golfbag.

. . . K1CLL

Carl Henry
202 Dellwood Pl.
Chattanooga 11, Tenn.

Build Yourself a Light Wattmeter

Every week brings something new in the hectic field (or pasture) of electronics. Attempting to solve old problems with new components is an interesting pastime for electronics enthusiasts, but they must be careful not to put their foot in the wrong thing. One of the new components is the cadmium sulphide/selenide photocell. A semiconductor sensitive to light is not an entirely new concept, since selenium cells have been around for some time, but the degree of sensitivity makes the cadmium cell stand out.

In measurements especially, there are many possible applications for cadmium photocells. One measurement in particular is usually difficult for the amateur, and this is power measurement. There is a way of using cadmium photocells to measure power, and I call this circuit a "light wattmeter". Operation is just as the name implies, that is, the power is used to generate light which is measured by the photocell.

You have probably realized by now that we are going to use a light bulb as a load. Now this is frequently done in amateur circles, but no one will go out on a limb as to its accuracy. Except me. We know that the ordinary lamp filament has a positive temperature coefficient. Fig. 5 illustrates the variation of a typical lamp filament resistance with input power. By keeping this in mind, fairly good accuracy can be had. Of course, if you use a different lamp, the curve will still apply, but the resistance will be different.

You can run your own graph, however, by using the setup shown in Fig. 2. Either dc or ac can be used, and since the lamp has little inductive or capacitive effect, the readings taken will be good to better than 100 mc. After you have a graph on the lamp you are using, you can effect any kind of impedance match you wish.

Using a lamp as a load simplifies the problem of power measurements because loads for this service are hard to come by. Power resistors are too inductive, and when they approach 1000 watts, they become downright expensive. However, even a 1000 watt lamp is not too expensive.

Fig. 1 shows the circuit that I used as the basis of this article. A standard 150 watt lamp was used here as a load. The photocell is mounted about five inches from the bulb. A wooden box houses the wattmeter, completely sealed internally against extraneous light. Figs. 3 and 4 illustrate the variation of resistance of the photocell with variation of power applied to the lamp. Even very small amounts of power are measureable, if the cell

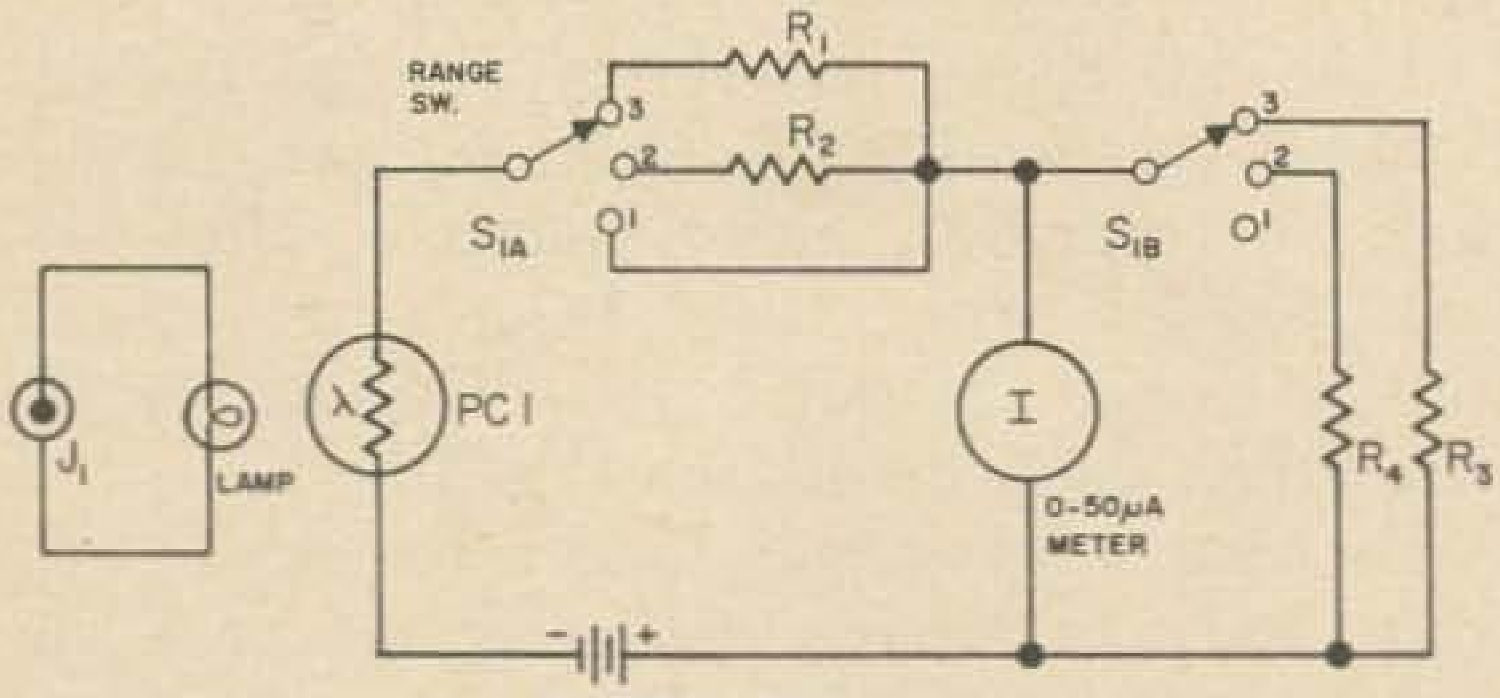


Fig. 1. Circuit of Light Wattmeter.

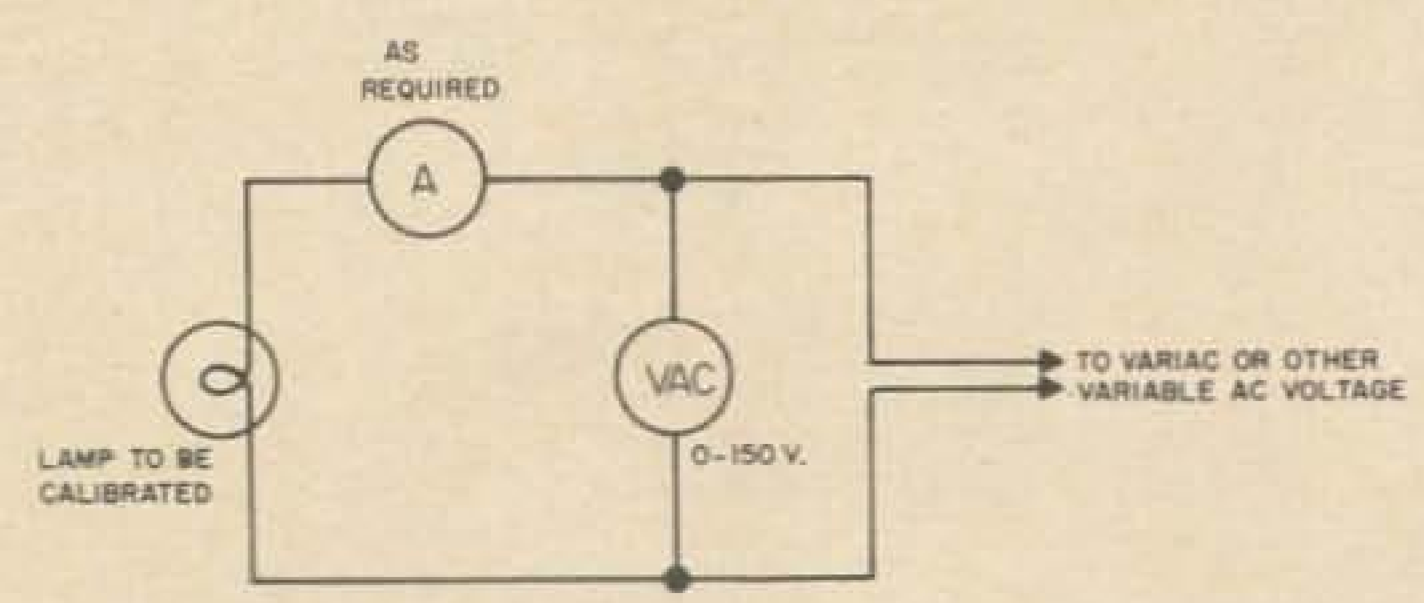


Fig. 2. Method of calibrating lamp and determining resistance.

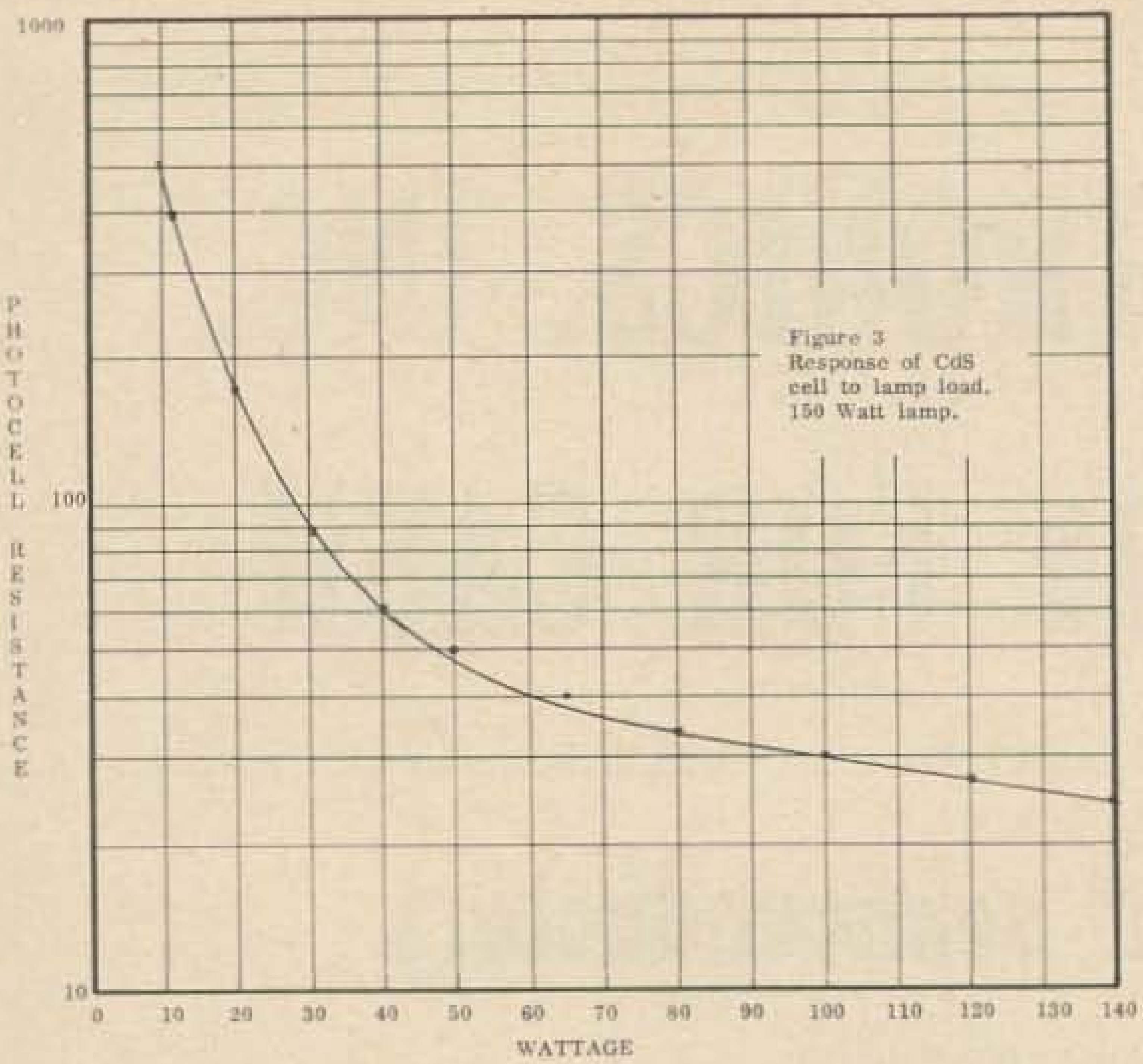


Fig. 3. Response of CdS cell to 150 watt lamp.

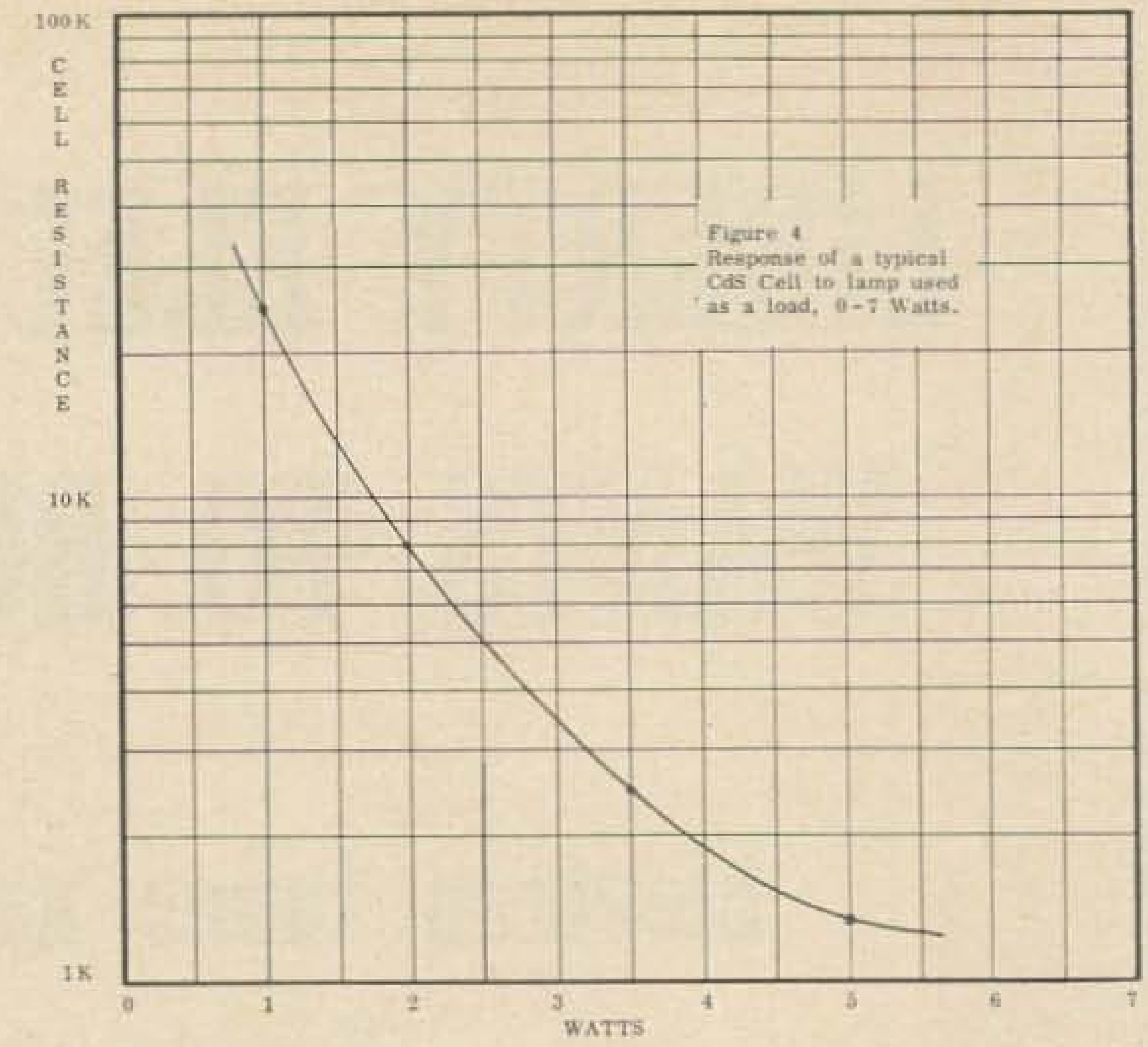


Fig. 4. Response of cell to 7 watt lamp.

is shielded from external light.

The wires from the input connector to the lamp are kept as short as possible by removing the lamp base and soldering the lamp wires directly to the coaxial connector. Switch S1 selects three ranges, which can be set by the builder to anything he desires. In my case I used three ranges which cover from 0.5 watt full scale to 250 watts full scale. With some photocells a 1.35 volt mercury battery can be used instead of the 4 volt battery shown. Also, I used a 50 microamp meter, because of convenience (mine), but even a 10 ma meter will work. Don't exceed the rated power dissipation of the photocell, and remember this may derate with increasing ambient temperature. One thousand watts in a box can be a lot of ambient temperature.

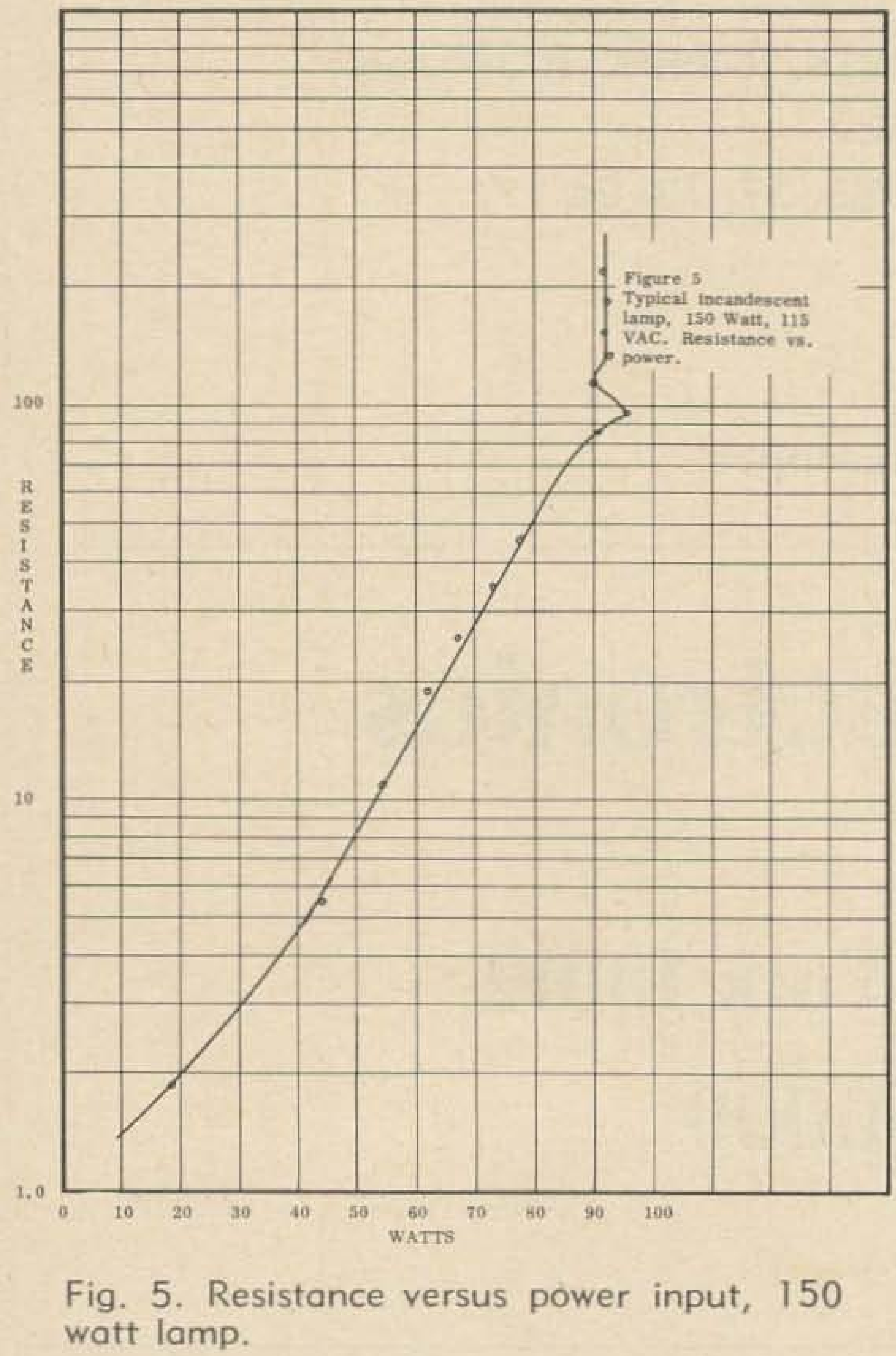


Fig. 5. Resistance versus power input, 150 watt lamp.

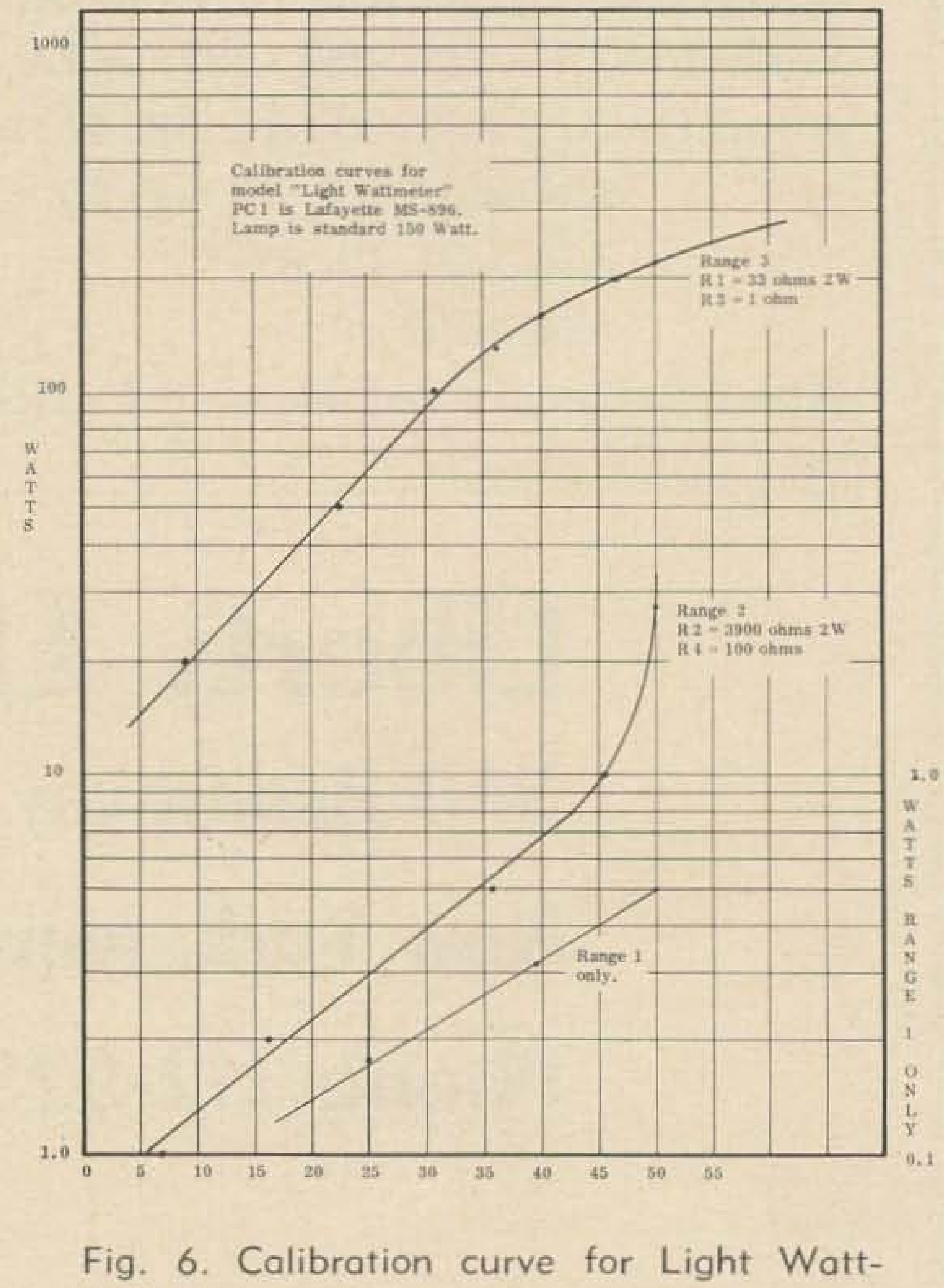


Fig. 6. Calibration curve for Light Wattmeter.

Getting back to the accuracy, if I were to tell you what the meter would read with such and such a lamp, and a given power input, your calibration would be off ten to twenty per cent when the construction was finished. The best way of getting a good calibration is something you've heard before; "if you want a job done right around here you've got to do it yourself".

Now obviously you can't calibrate the wattmeter at 14 mc, because this is what you are trying to measure to start with. Luckily the light from the lamp filament is primarily a power function, and it doesn't matter whether this is dc power, or 100 mc power.

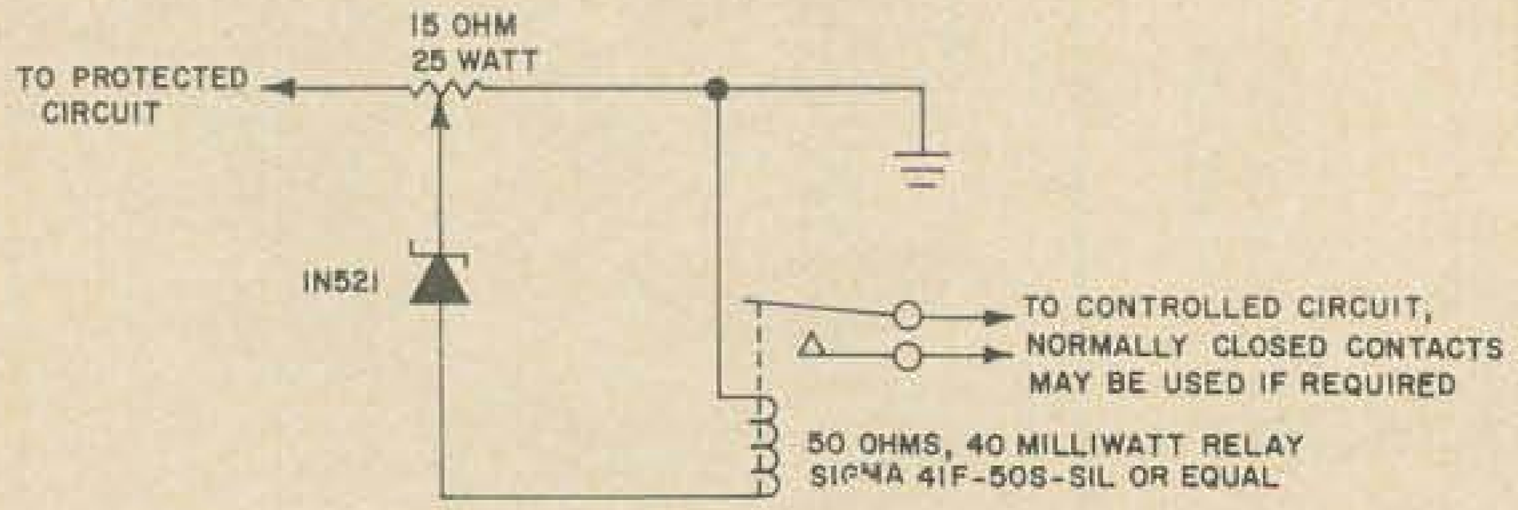
So, to calibrate the wattmeter, apply ac or dc as you wish. Measure the input voltage and current, and read the meter. Make a graph of input power vs. meter reading, and there you have it. Fig. 6 is the graph that I use with the circuit in Fig. 1. Keep the impedance variation in mind, and select a lamp with the power impedance so that standing waves won't eat up lots of your power. As a dummy load and approximate power indictor this is not too critical, of course. But if you wish accurate power measurements, your impedance should be approximately matched.

. . . Henry

Roy Pafenberg W4WKM

Zener Diode Improves Overload Relay

Electronics is a fascinating field. Startling new components are regularly introduced and dramatic applications advanced. Then, as these components become generally available and drop in cost, more and more applications are found. Old reliable circuits are reexamined in the light of the new components and, quite often, great improvements in performance are gained at little increase in cost and complexity. The zener diode is one such component that has updated the performance of many time-proven circuits.



The diagram shows an example of the improvement a zener diode can make in a conventional circuit. The usual transmitter overload relay circuit consists of a relay, shunted by a variable or adjustable resistor, connected either in the cathode circuit of the protected stage or in the high voltage power supply negative return. The resistor serves as an adjustment of the trip point of the relay. The relay contacts are connected in some portion of the control circuit to remove power when the relay is actuated.

While the conventional overload relay circuit is effective, it suffers several disadvantages. Selection of the relay is usually rather critical since the relay coil current, in normal operation, is just short of the trip point. This static current results in relay heating and often causes failure of the relay coil or erratic operation. Also, in 'phone transmitters, the overload relay often "talks back" as a result of the modulating current variations.

The circuit shown eliminates most of the usual problems. A low voltage zener diode is connected in series with the relay coil. The adjustable resistor is set so as to result in a voltage below the conduction point of the diode so that, in normal operation, no current flows through the relay coil. When the drop across the resistor exceeds the zener voltage of the diode, it conducts, and the current trips the relay. Since the current through the relay is momentary, almost any low voltage relay may be used.

In the circuit shown, the 1N1521 is a 1 watt, 6.8 volt zener diode unit. The relay is a low cost, current operated unit. With the constants shown, the relay is adjustable over a range of from a trifle over a quarter of an ampere to almost two amperes. In the circuit shown, the diode is polarized for use in the cathode circuit of the protected tube. For use in the negative return of the high voltage power supply, reverse the diode in the circuit.

. . . W4WKM

Handy Plug and Socket Adapters

Various handy plug and socket adapters may be made from discarded 35mm film cans. These are made of soft aluminum and will readily accommodate many different types and sizes of plug to socket (and vice versa) arrangements to suit your particular needs. Two configurations which I found valuable in my shack are shown in the photo.

As you can also see, I am well stocked with cans! In fact, I have about 75 more than I need, so if any of you don't happen to have photography as a hobby also, send me a stamp and I'll mail a can back to you. The cans will be in perfect shape when they leave here . . . how they arrive at your QTR is up to the Post Office Department.

. . . W3WTO

Joseph Bialon K2GOI

Modifications to the HE-45

I am sure that many HE45 owners would appreciate a higher percentage of modulation. Well, for the cost of about $1.50 this fine transceiver can put out a signal that can be respected.

Modulation

Turn the set upside down so that the modulation transformer is on the left hand underside. Now look to the rear of the chassis and you will note a terminal strip having six terminals. As received, the brown lead will be on terminal. If just the opposite, reverse so that brown will be on pin #1 and white on pin #2. Now proceed as follows: disconnect brown lead from pin #1; tape this lead and leave it disconnected; place a wire from pin #1 of terminal strip to pin 5 of the 6AQ5 (the plate pin). This change alone will increase modulation to approximately 60%. With the addition of a 12AQ5 connected in parallel (all but the filament, which is connected across the filament transformer, the modulation will increase to approximately 90 to 95 per cent. The 12AQ5 is mounted in front of the 6AQ5 (be very careful, there is just enough room for the 12AQ5 socket).

Since I have made these changes in my HE45 I have had no bad modulation reports. A few of the HE45 transceivers have been converted in this area and they sound very good.

Drift

The drift in some receivers can be greatly reduced by changing the 15 mmfd temperature compensated capacitor located at the rear of the receiver tuning capacitor to a 15 mmfd zero coefficient capacitor.

. . . K2GOI

George Oberto K4GRY

Improving the Twin City RTTY Converter

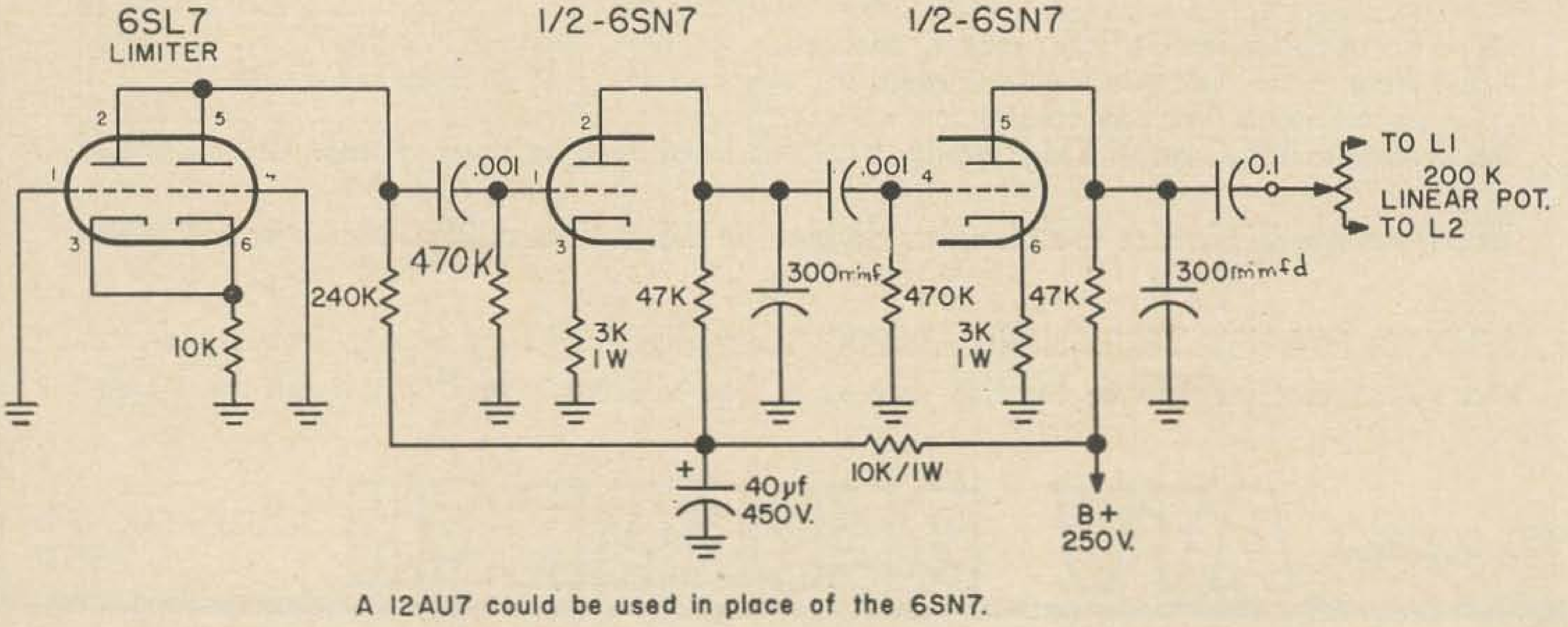
After building the popular Twin City RTTY Converter described in a popular RTTY handbook and magazine the performance of the unit for weak RTTY signals left much to be desired. Finally a 6SN7 was substituted in place of the 6C5 to establish more gain and limiting from the unit. The drawing shows the slight wiring changes including a decoupling network consisting of a 10K 1 watt resistor and a 40 mfd 450 volt electrolytic capacitor.

Surprisingly enough the output voltage of the four 1N64 voltage doubler rectifiers did not increase, but instead the added stage helped by bringing up the weaker signal plus acting as a limiter clipping off unwanted distortion resulting in a worthwhile improvement in the performance of the unit.

The 250 K linear pot shown in the original diagram feeding the discriminator was changed to a 200K linear pot for increase in level to L1 and L2.

Now with a properly adjusted polar relay the simple converter performance is almost as good as a 13 tube TU used for comparison.

. . . K4GRY

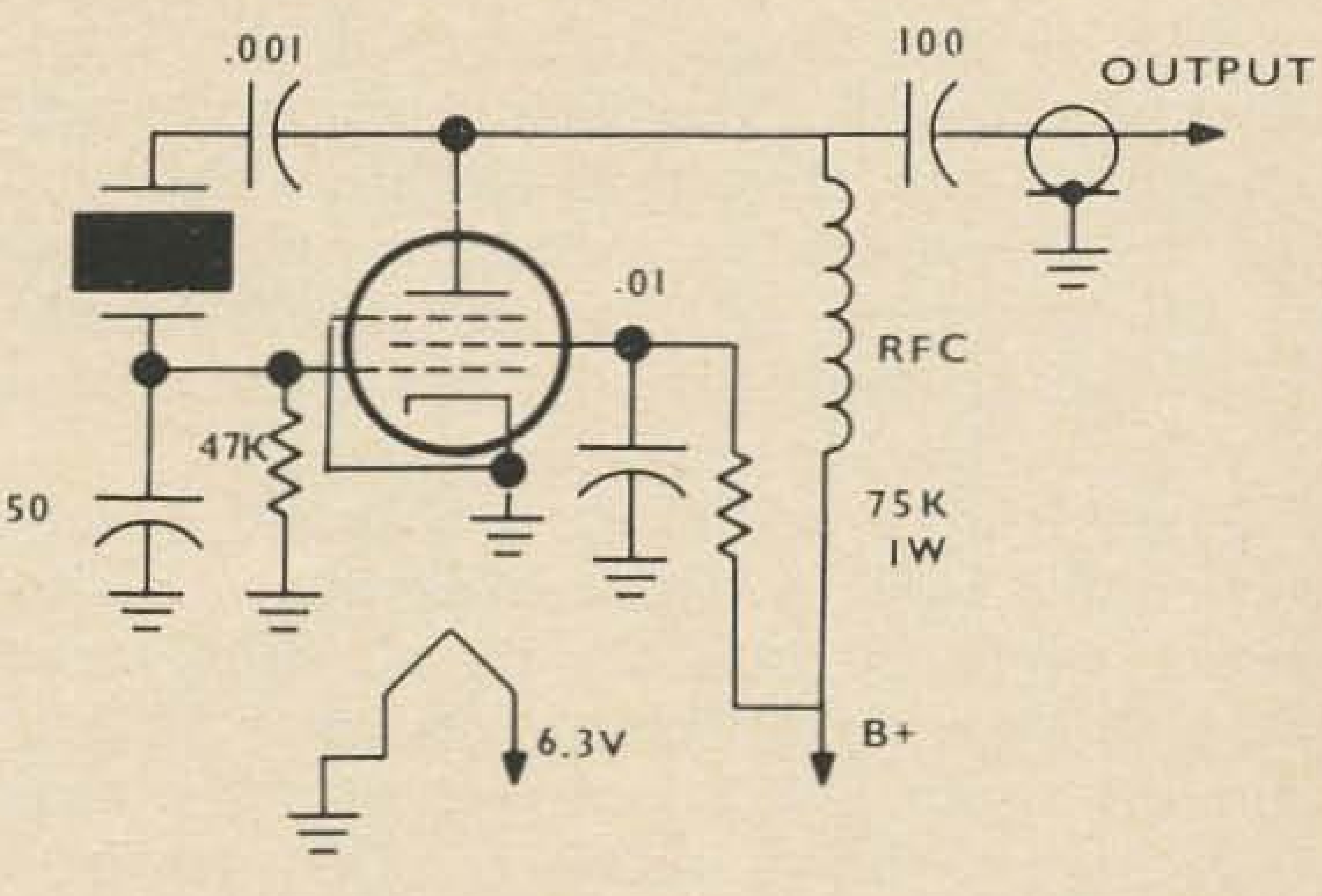


A 12AU7 could be used in place of the 6SN7.

The Novice Note Nullifier

Anyone who has heard DX-35, 40 and 60 series transmitters on the air knows that they sometimes sound a little chirpy when used with crystal control. If you have this problem, the simple gadget described below will solve it. It will give you a good crisp signal with even a sluggish crystal. It is not necessary to modify your rig in any way, so you won't spoil resale value.

As shown by the diagram, the device is a simple Pierce oscillator. A 6AU6 tube was used because we had one and because it will take the voltage available at a DX-40 accessory socket. Another tube type might work better. The oscillator is constructed in a small minibox, which is plugged into the rig's accessory socket. Output is taken via a piece of coax to the vfo input jack. That's all there is to it. As a bonus, you can plug the unit into your receiver accessory socket and use it as a band-edge marker, with a 3.5 mc crystal.

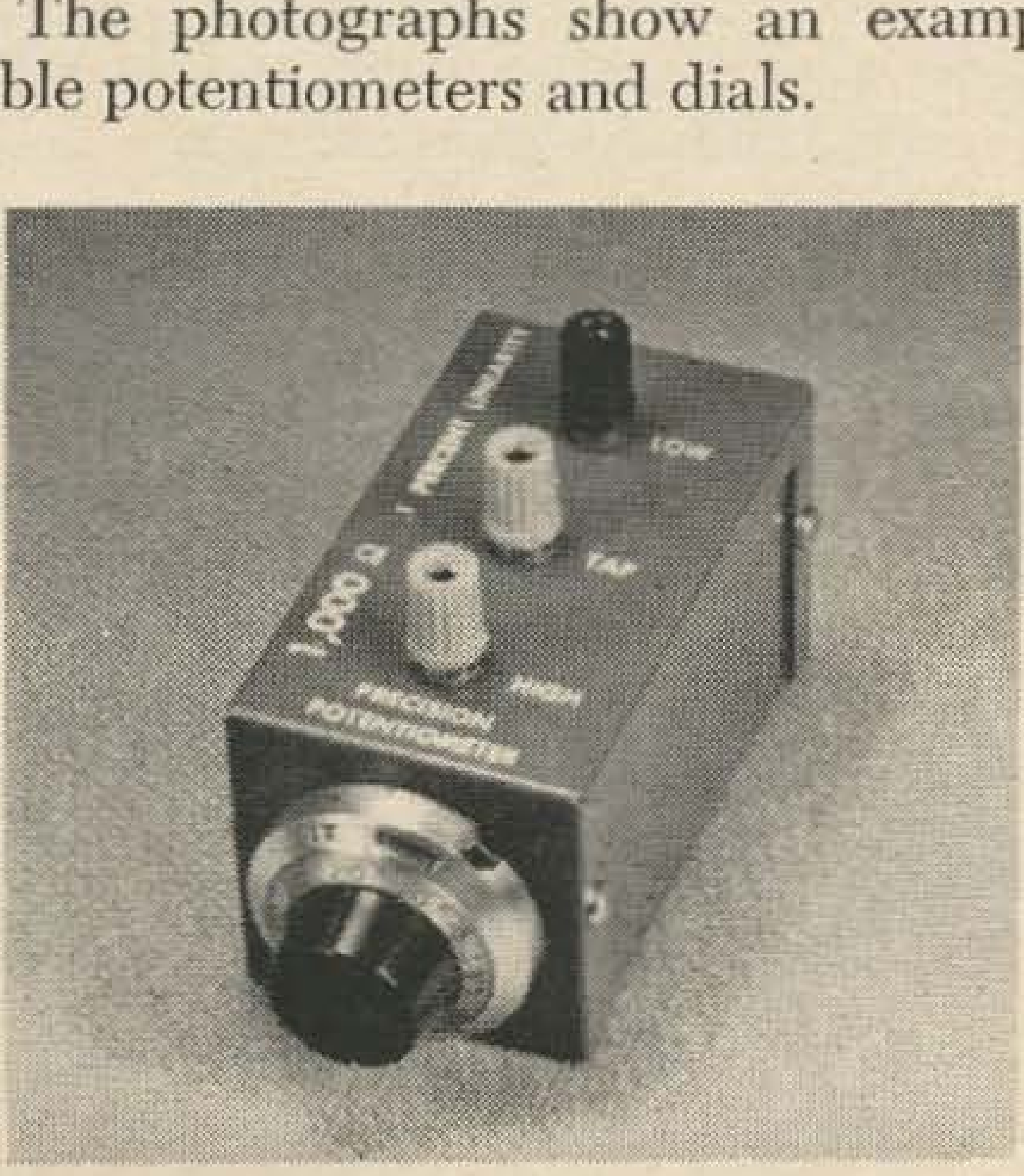


. . . K6TBW

Surplus Servo Pots for Resistance Standards

Ten turn precision potentiometers have been on the market for several years and are beginning to show up on the surplus market at greatly reduced prices. These rugged units were originally developed for servo and other critical applications and have been widely used in military equipment. To add to the utility of these resistors, turns counting dials have been made available. Most of these dials will count turns and read down to 1/100th of a revolution.

Since most of the available potentiometers have extremely good linearity, it is possible to obtain very accurate resistance settings with turns counting dials. While the linearity of the potentiometers is very good, 0.1% being common, resistance tolerances are not so good. The most common resistors being rated at ±3%. The photographs show an example of available potentiometers and dials.



By selecting a potentiometer with a value of 10, 100, 1,000, 10,000 or 100,000 ohms it is possible to construct a direct reading resistance standard. The photos show such a device. Several potentiometers were available and one was selected which was within 1% of the nominal value. A suitable dial, case and binding posts complete the project. The enclosure is a Bud CU-2103-A Minibox measuring 4″ × 2¼″ × 2¼″. The dial is a Beckman Duodial® Model "RB". The binding posts are inexpensive Lafayette Radio MS-566, 5-Way units.

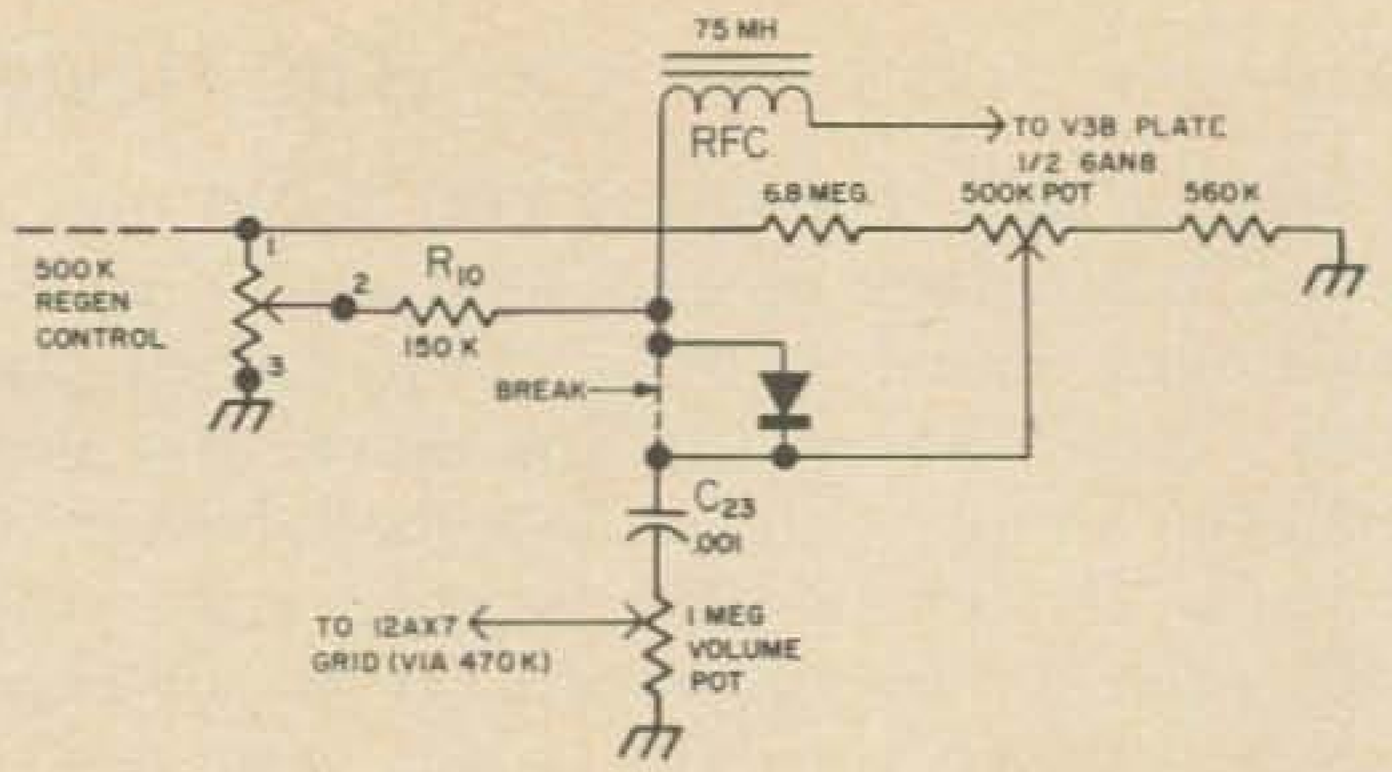
The Borg Model 205 10-turn linear Micropot shown in the photo is typical of available units so a run-down of the specifications is in order. Resistance tolerance is ±3%, linearity tolerance ±0.1%, power dissipation 5 watts at 40° C and rated life is one million revolutions. Mechanical rotation is 3,600° + 15° −0; electrical rotation is 3,600° + 14.4° −0. Physical size is 2⅝″ long and 1¾″ diameter. The shaft is a standard ¼″ and the resistor is fitted with a standard threaded mounting bushing.

These resistance standards are very convenient to have around the shop and you can assemble one in less than an hour. Both the potentiometers and dials have been advertised by surplus dealers in the past. However, your best bet is to visit the surplus dealers and bargain for what you find. Many different types are made and you are almost sure to find something suitable at an attractive price.

. . . W4WKM

Photography by Morgan S. Gassman, Jr.

Squelch for the Sixer



One of the things missing on the Heath Sixer is a squelch. The Sixer regen really kicks up a fuss when there is no signal on the band. To make contacts in a location where there is little six-meter activity you should monitor the band continuously, but the regen hiss of the Sixer is hard to stand for very long.

Here is a "squelch" for a sixer. It is not a true audio squelch but it is device to kill the regen when there is no signal. This means that strong impulse noises do come through but the regen hiss is not present when there is no signal being received. This device is not as good as a audio squelch but it is a great improvement on the basic Sixer.

The diagram shown is for a HW-29A. The squelch should be adaptable to the older Sixer, but the resistors may have to be changed.

The only new parts needed are a 500K linear pot, a 6.9 meg resistor, a 560K resistor, and a 1N537 or 1N67 diode.

. . . WA9BVS

J. Pflaum K8ERZ

Mobiling in Canada

Scratching his head dubiously as he eyed the Gonset Twins under the dash of my VW, the customs inspector startled me with this query: "Can you seal off that transmitter?"

"Seal it!" I expostulated. "But why? I have a permit to operate in Canada. Look."

I showed him the document, all sealed, signed, and delivered in proper order from the Department of Transport at Ottawa.

Apparently unimpressed, he continued to stroke his cranium.

"Are you going to use this equipment commercially?" he finally asked.

"Commercially?" I countered in amazement. "Of course not. This is for amateur use."

The upshot of the whole business was that he finally let me through, but I am still puzzled. Was he testing me, or are there actually so few U. S. mobiles entering Canada at Windsor from Detroit that my case posed a problem. I can't bring myself to believe the latter, because Detroit is a big city and a big port of entry into Canada.

At any rate, I was soon on my way, calling CQ mobile VE3 (after filling out an inventory of my radio gear, which had to be surrendered when I re-entered the States–the inventory, of course, not the gear.)

Operating in the Canadian phone band had a peculiar effect on me: being so accustomed to the boundaries of the U. S. band, I felt illegal! But after a day or so that passed, and I enjoyed the advantage of being free to use a section of the spectrum that had less QRM, a big advantage to a mobile using only 50 watts AM.

Getting a permit to operate in Canada is easy. Simply write to the Director, Telecommunications and Electronics Branch, Department of Transport, Ottawa, Ontario, Canada. It's best to apply a month ahead of your expected trip, but I received my forms within a week. Don't apply unless you have a General class license or better, as the Novice and Technician class have no counterpart in Canada. You will be expected to indicate in which provinces you will operate and for about how long. They are very generous on the time limit, however. I indicated a stay of only a week but my permit was good for about three months.

At the Canadian exit station at Rousses Point (Quebec, N.Y.) I surrendered my duplicate inventory of radio gear and was passed on to the U. S. immigration officials.

The U. S. man asked me two questions: "Where were you born?" and "Did you have that radio stuff with you when you entered Canada?"

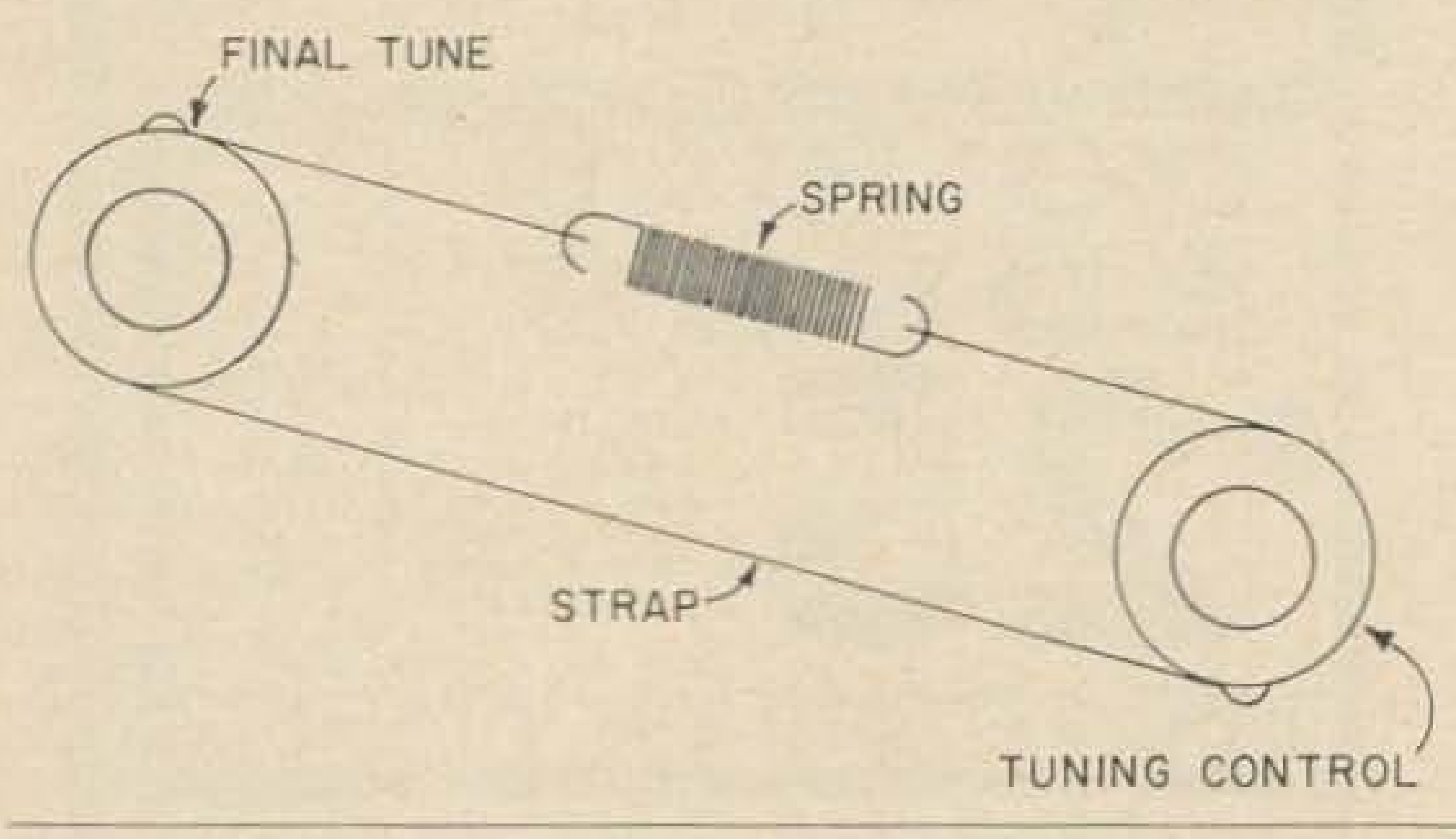
I gave him the answer to the first and said "yes" to the second. With a wave of the hand I was passed on. That was all.

It was great fun mobiling in Canada, and I was successful in making good radio contacts back home to Ohio from Quebec on 20 meters. In fact I talked with my son, via phone patch.

Try it some time. You'll like it, whether you have a son in Ohio or not. . . . K8ERZ

Thomas Rousseau K7PJT

Improve the Tuning on the Heath Apache



The Heath Apache, a very fine rig, has one undesirable feature: backlash in the "Final" tuning control.

I was able to cure this by securing a high tension spring in series with the copper tuning strap. First, a chunk of the strap slightly longer than the spring should be cut about half way between two of the three holes. Next punch a hole about ¼" from the end of the cut ends. Then reassemble as before. It is very important that the spring have a fair amount of tension, otherwise this change will make tuning worse.

. . . K7PJT

Roy Pafenberg W4WKM

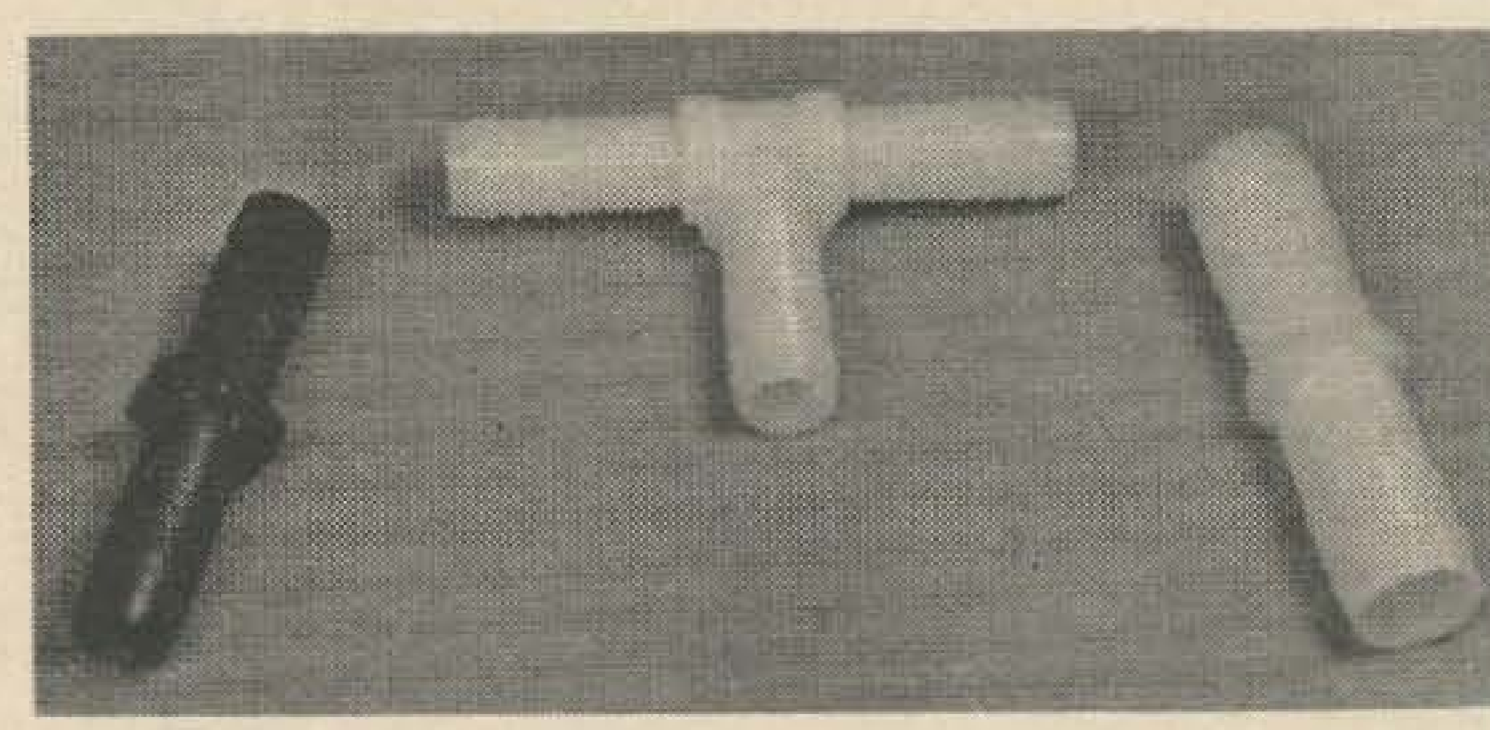
Plastic Pipe Fittings for Antenna Insulators

Flexible plastic tubing is being widely used in certain low cost plumbing applications. To ease the installation task, a line of nylon fittings has been standardized and are now widely available. All of the available shapes, couplings, "T's" and "L's", have potential applications in amateur antenna construction. The excellent insulating, weathering and strength qualities of these solid, thick wall fittings make them ideal for such use.

Although these fittings are in general use, possibly the most dependable source of supply is through the multitude of Sears Roebuck and Company retail and mail-order outlets. The Sears catalog numbers provide a positive identification from local source of supply. In addition, unless you have friends in the plumbing business, prices run a bit lower than in other retail outlets. The following tabulation gives the Sears catalog numbers of the various types, available sizes and prices from their last mail order catalog. Note that the catalog number plus the size makes up the complete ordering description.

Catalog Number	Size and Price					
	½"	¾"	1"	1¼"	1½"	2"
Coupling						
W42K2308	15c	17c	22c	30c	45c	80c
"T"						
W42K2364	28c	38c	50c	80c	$1.20	$2.00
"L"						
W42K2309	22c	25c	35c	55c	85c	$1.50

As shown in the photograph, the outer surface of the fittings is grooved and these serrations have a slight taper with the outer ridges having a greater diameter than those toward the center of the fitting. In the original application, the plastic pipe is forced over the serrations and secured in place with stainless steel hose clamps.



The smallest diameter of these fittings, at the bottom of the grooves, is approximately the nominal size shown in the chart. The largest diameter varies but is roughly 3/32" greater than the pipe size shown. For antenna use, the tops of the ridges should be shaved off to make a force or drive fit into the aluminum tubing used in the antenna elements. This can be easily accomplished by sanding, filing or by simply driving the fitting into the tubing. One or two holes drilled through the assembled junction will allow the use of machine screws for greater strength. Of course if you have access to a lathe, you can turn down the available fittings for use with a greater variety of tubing sizes and wall thicknesses.

Unfortunately, the number of sizes and wall thicknesses of standard aluminum tubing hhat will give a snug, strong fit with the available plastic fittings is limited. However, here are some examples. The ¾" fittings, after slight sizing, will make a good drive fit into ⅞" tubing of the common wall thicknesses. The same is true of the 1¼" fittings when used with 1⅜" tubing. It is suggested that you take a look at these fittings and consider how you can adapt them to your next antenna project.

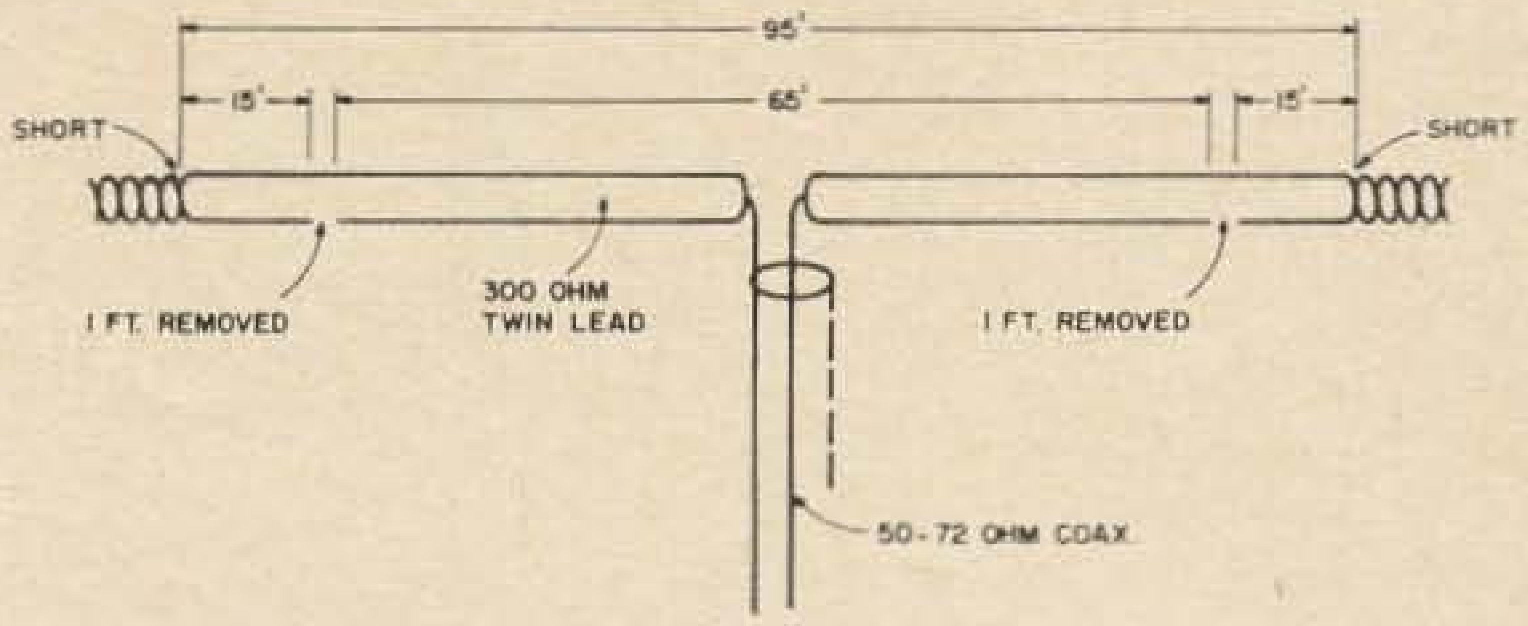
. . . W4WKM

Photo By: Morgan S. Gassman, Jr.

80/40 Antenna on a 100 ft. Lot

Not all amateurs are fortunate enough to live on lots which are at least a half-wavelength on 80 meters long. This is the case of the writer's QTH. There are times when I want to check into the 75 meter state net or keep a sked with a friend across the state, even though the majority of my operation is on higher frequencies. The following is a description of an antenna for 80 and 40 meters that will fit a 100 foot lot.

The antenna is constructed of a 95-foot piece of 300 ohm television twin-lead. The wire is cut into two 47½-foot lengths. An insulator joins the two halves of the antenna and the 50 or 72 ohm coax feed line is connected at this point. A one-foot length of one of the wires of the twin lead is removed fifteen feet from each end of the antenna. This makes one-half of the twin-lead a half wave dipole for 40 meters.



This antenna works surprisingly well on both 80 and 40 meters. The SWR is not as low on 80 meters as found in many full size dipoles, but it does not go over 3:1 at the low end of the band. At 3800 kc, the SWR is about 1.4:1.

This antenna has enabled the writer to have many enjoyable QSO's on 80 and 40 meters on a 100 foot lot.

. . . W8MPD

J. Foy Guin, Jr. W4RLS

Have your 30L1 Cake and Eat It, Too

The 30L1 is an excellent linear amplifier, with many circuit features worth noting (bandswitched pi networks broadly tuning the input on each band, inverse rf feedback, ALC, internal antenna relay, among others). Not the least among its advantages, however, is its light weight (38 pounds) and convenient size (same physical size on KWM-2, including the 30LI's built in ac power supply). This makes it nice for field day, vacation, ham radio demonstration setups at fairs, club meetings, etc.

But it works better on 230 volts! This seems to be the universal experience of those who have tried it both on 115 and 230. I experienced a 12-15% increase in power, while others (W4RHE, for example) have reported as much as 25% improvement. The amount of improvement depends on several local factors, but improvement there will be if the unit is converted to 230 volts. It would be nice to be able easily and quickly to choose either ac supply voltage, since 230 is best for the home station installation, but probably will not be available at remote locations where it is desired to make a temporary station installation.

Collins made provision for operating from either 115 or 230 (covered clearly in the installation manual), but the change is semipermanent. It means going into the 30LI, removing it from its cabinet, and changing two shorting connections on a five termial strip and changing the power cord. This is a lot of trouble just to have the versatility we are searching for, isn't it? Of course there is a simpler solution.

Find a short length (perhaps one foot) of 5-conductor cable (or homebrew one by passing five pieces of heavy insulated wire into a short plastic sleeve—available from your local electric shop, and similar establishments), and connect one wire to each terminal on the five-terminal strip to which Collins connected the line cord, removing all shorts between terminals. Pass the cable through the hole for the line cord and wire an Amphenol or similar five conductor plug to the other end. Wire a matching five conductor jack to the 115 volt cord and plug, shorting inside the jack cover the same connections which the 30LI diagram shows to be shorted on the five-terminal strip for 115 volt operation. Wire another matching five-conductor jack to a 230 volt cord and plug, shorting this time the same connections inside the jack cover as the 30LI diagram shows to be shorted on the terminal strip for 230 volts operation.

Now, all you have to do to operate from either supply voltage is plug in the proper line cord. You can't mistakenly use the wrong supply voltage, for the cords have dissimilar plugs and cannot be plugged into the wrong ac socket. You have all the advantages of either supply voltage without inconvenience of any kind, and for resale you can easily restore the original wiring.

. . . W4RLS

A. K. McLaren WØCGA
213 So. 16th St.
St. Joseph, Mo.

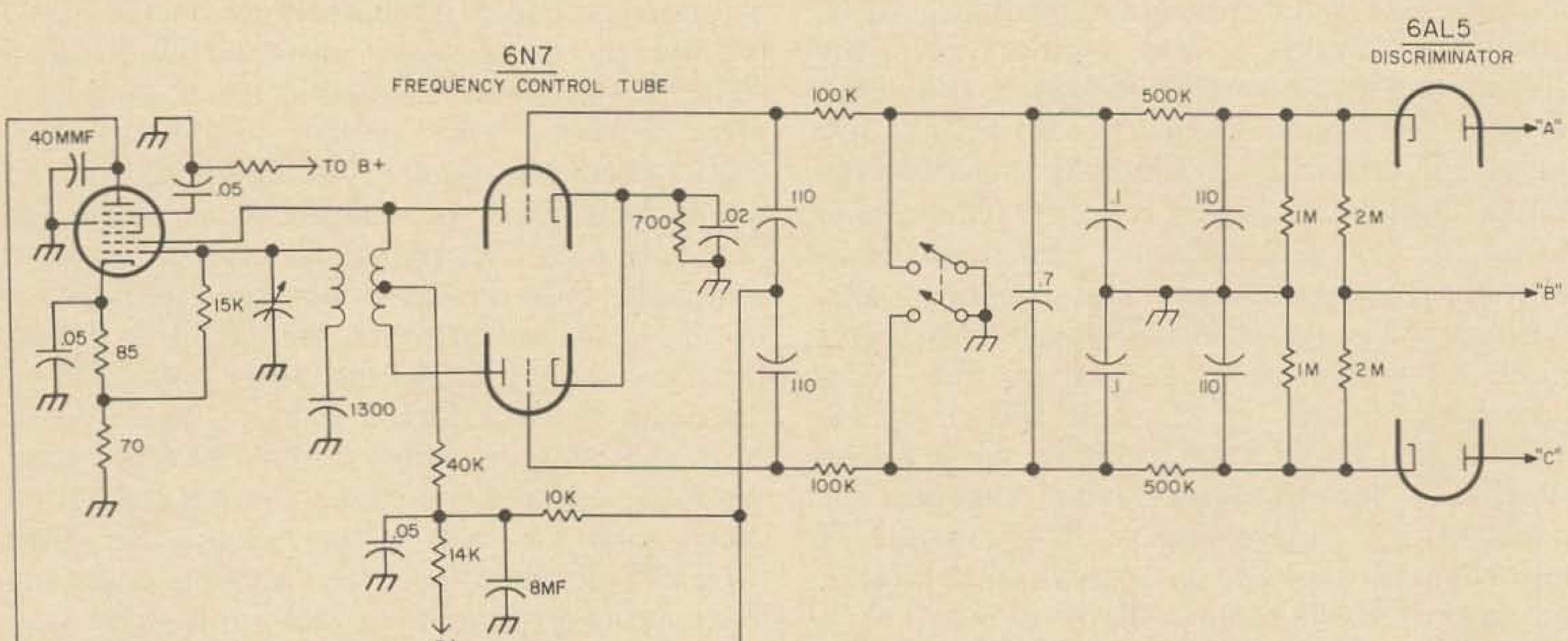
VFO Control of SSB Receivers

Automatic frequency control of SSB receivers is entirely possible and practical. It gives one-hand control of the receiver, and all tuning is done with the vfo. It also solves the problem of zeroing the transmitter, since the same oscillator controls both the transmitter and the receiver.

This system is less tolerant of poorly adjusted transmitters than other systems. Any carrier inserted at the transmitter will cause distortion of the audio signal.

This system can be made to tune the whole seventy five meter band with a fairly strong injected signal. The lock-in range will be less with a weaker injected signal, but the receiver gain will be greater, of course. An adjustable injection signal is advisable.

The receiver can be tuned back and forth within the lock-in range without losing the signal tuned in. Thus any lack of tracking in the rf or mixer stages may be corrected. Only enough front end selectivity to eliminate im-



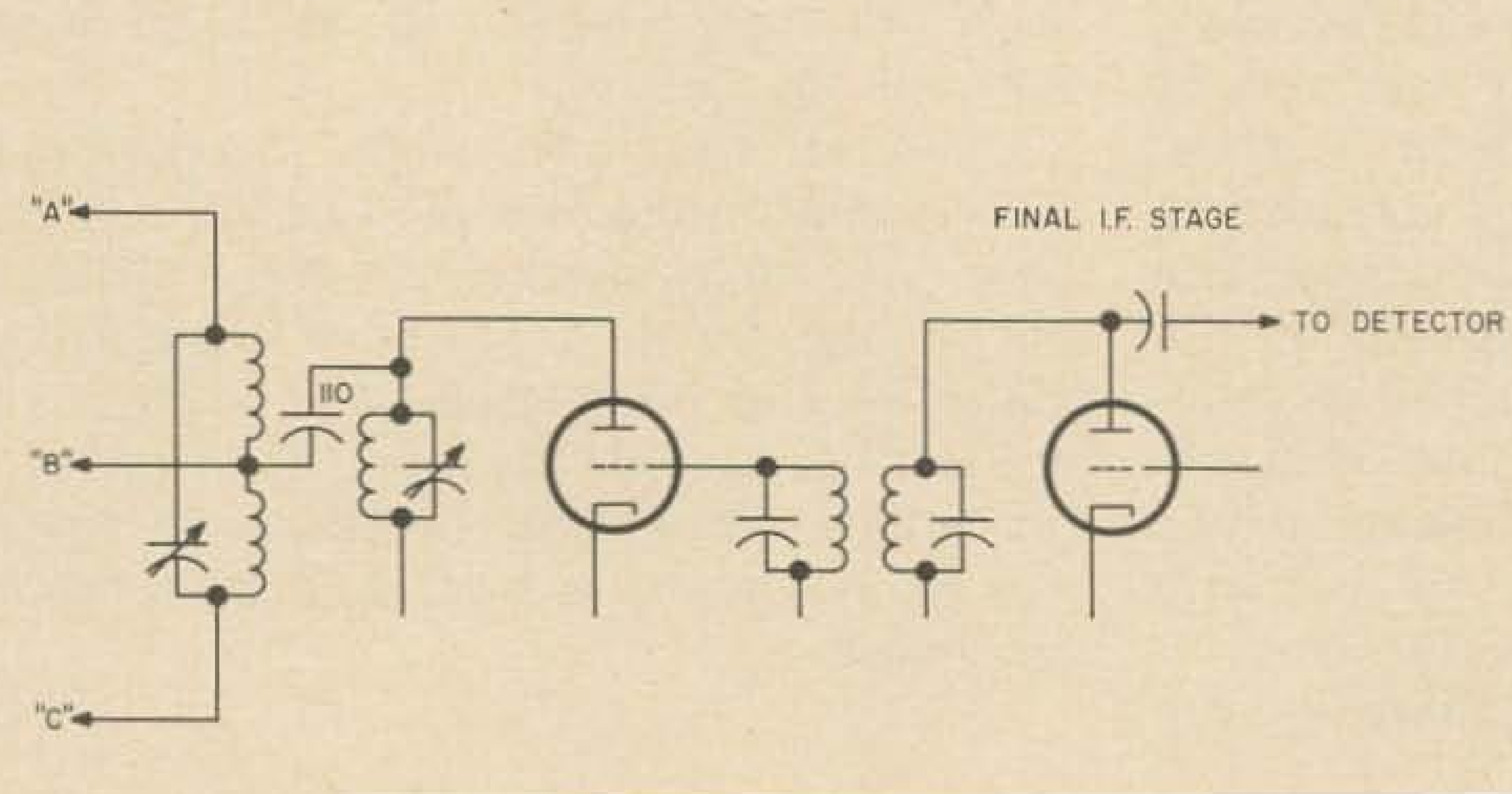


Fig. 1. Schematic of the automatic frequency control, adapter for SSB receivers. There are two errors in the schematic. The resistor going from B+ to ground above the first tube should be connected to the screen grid instead. Also, the center tap of the 6N7 grid coil should be bypassed to ground with a .05 μf capacitor.

ages is necessary; in fact, too much selectivity in the front end will reduce the hold-in range. The selectivity factor must be made up in the *if* amplifier and audio amplifiers. A 3 kc audio filter will eliminate most of the high pitched interference.

Diode detection of the signal is not the best method and synchronous detection or other types may be better. The rectified signal can be taken from the output of the discriminator but here care must be taken not to disturb the discriminator action too much or hold will be lost.

Another drawback to the system is that hold may be lost if operation is too close to a strong local AM station. The continuous carrier takes control away from the vfo.

Automatic frequency control of receivers is not new, of course, but the application to reception of SSB signals is different, to say the least. The system has been used here for many months and has proved to make SSB listening more interesting and pleasant than any method previously utilized.

The avc is left on for best holding action and the receiver can be dropped and knocked about without any effect on the signal. The system should work well in mobile operation, since a good stable vfo will hold the signal regardless of receiver instability.

Fig. 1. shows the circuit used. There are other circuits that can be used, but the circuit shown presents fewer problems, as the only actual connections to the oscillator are the plates of the control tube. The oscillator feed-back coils should be somewhat larger than would ordinarily be used due to the extra load on the circuit.

An adapter unit might be constructed for connection to any receiver by substituting the adapter oscillator for the receiver oscillator and connecting the adapter oscillator to the receiver mixer stage. If the discriminator transformer cannot be obtained, a center tapped output transformer could be used, but a unit built for the purpose will be more stable.

Tuning the system is simple. Tune the receiver to the center of the band, turn on the vfo and adjust until the oscillator locks in. This will be heard as a plopping sound in the speaker. After lock-in has been accomplished, tuning is done by adjusting the vfo. If the circuits are properly adjusted, the vfo will swing the receiver oscillator throughout the ham band. As the vfo is adjusted, an incoming SSB signal will sound high pitched if approached from one side and low pitched if tuned in from the other side of zero beat. At zero beat, the signal should be clear.

The discriminator can be adjusted by using a modulated signal generator. Adjust all *if* transformers to resonance, including the discriminator primary; then adjust the discriminator secondary for minimum sound. The discriminator secondary acts as a trap and a small null should be noted.

The greatest advantage of the system is that the two oscillators are locked together, but on different frequencies.

The injected carrier is at the frequency of the incoming signal and the receiver oscillator is locked an intermediate frequency higher. Thus the receiver oscillator will always be locked in so as to center the signal in the *if* pass band. The pilot carrier will automatically heterodyne the incoming signal for decoding the SSB signal.

The system will not receive AM signals or double sideband signals producing only a steady heterodyne note. However, it operates well for CW reception.

These are fundamentals of the system and many variations are possible, but placing this information in the hands of hams will no doubt result in perfecting the method in a short time. (P.S. The switch shown on the diagram is used to disable the control circuit for normal AM reception.)

. . . WØCGA

Bill Smith KØCER
1301 Churchill Ave.
Sioux Falls, S.D.

VHF

If you have participated in any of the three OSCAR programs you've probably cussed and discussed your antenna system. Signals from these satellites exhibit QSB, apparently caused to some extent by polarization shift from the linear. At a given time, and often within a few seconds, the signal will peak up on a horizontal antenna only to be lost on a vertical antenna, and vice-versa.

What can be done about the polarization shift? Well, circular polarization may be one answer. Very little has been written about the topic although circular polarization has been around for a number of years. It has been used mostly in military and commercial circles, seldom by amateurs.

During OSCAR III, contacts were made by fellows using horizontal, vertical and circular polarizations. It is interesting to note the calls of the successful fellows using circular polarization. It reads like a "Who's Who."

As I said, very little has appeared in print but many of the experienced VHF men interested in space communication agree circular polarization is the answer to dealing with polarization shift. I've tried to find all I could to compare with my own experiences before going out on a limb; I know there is at least one well-known 2 meter man that thinks I'm nuts.

If you have a copy of the January 1962 *VHF Amateur*, look on page 19. Or try Jim Kyle's new *VHF Antenna Handbook* published by 73, pages 28 and 29 or Loren Parks' October 1964 *VHF'er* for an article by W6HPH which closely agrees with what I found to be true. And while you're at it, read the article by W6NLZ in August 1965 *VHF'er* on diversity reception.

Circular polarization can best be visualized in terms of a screw twisting through wood, the screw being a radio wave and the wood representing the atmosphere or space. Screws usually have right-hand threads, circular polarization can have either right or left-hand depending on the feed phase. In some of the readings you'll come across clockwise and counter-clockwise, it is the same as right and left-hand respectively. Incidentally, I'm speaking of standing at the rear and sighting forward down the boom.

Some of you are probably asking yourself if there isn't a loss in signal strength during an earth-bound QSO when one fellow is using circular and the other linear polarization? Some say yes, by 3 db. I do not think so. Here's why. I used a yagi for several months, horizontal to horizontal, over a 30 mile path to KØFKJ; Then I switched to a circularly polarized antenna mounted at the same height, same tower, same feedline. Nothing changed at KØFKJ; I had the same exact signal.

During several months of operation with the circular antenna I became a firm believer that over a given path, beyond where there is definite "groundwave" saturation, the signal is so twisted by the troposphere/ionosphere that there is a good chance that it will not arrive at another antenna in the same sense as it was transmitted. Here is where I believe circular polarization pays off; it is seeing vertical, horizontal and everything in between . . . something like diversity reception. This may be the answer to much of the QSB problem from space or on earth.

If you are going to use circular polarization, be sure and have switching system for selecting right or left-hand because if two stations working each other use the same hand of circular polarization they will experience the same thing as if one was horizontal and the other vertical, something in the neighborhood of a 40 db loss in signal because of cross-polarization. Some of these switching and feed systems first appear confusing and complicated. Next month I will give you some information on how to do it.

In the September issue I offered some charts on coaxial cable characteristics compliments of K2SBV/7. Now I know that there are a lot of you reading this, I got swamped with requests. I'll offer the same deal again. The list is yours for a self-addressed, stamped envelope. And while you're at it, how about some comments and information for the column?

About eight years ago a writer introducing KWM-1 said the SSB transceiver might become a "way of life." Indeed it has on the low bands and is rapidly growing on six. The Galaxy Electronics 6 and 2 meter "Duo-Bander" should be out shortly. I'd guess by next summer's six meter skip season there will be quite a change in six meter operating. The $500 price tag should be attractive in view of some of the gear already available or under development. Write WRL for information.

. . . KØCER

Letter from Gus

Beirut, Lebanon
September 3rd

Hello, readers of 73. Here I am back in Beirut. You know, all that's necessary for an airline to be late is for me to be one of the passengers. We were to have departed from Nicosea, Cyprus (ZC4) at 6:10 PM. Well to make a short story long, it took off late. I mean very late. We arrived here at about 10 PM. But I am getting used to this happening. It always does when I am a passenger. The stewardess said they were never late before. Over in Cyprus customs were good to me. I had all my radio gear, antenna, etc. with me down in my hotel room. I now have it all here in my hotel room in Beirut. I have found what to say when customs asks me that $64,000 question, "Do you have anything to declare?" I always answer them, "I declare I am glad to get to Beirut," and let loose a few "ha, ha, harrs," and usually he will say, "Well, I declare we are glad to have you here." Then he puts his little marks on my luggage and away I go. It's a good thing they have strong armed porters at these airports because if one of these customs officials were to pick up one of those suitcases with the equipment in it some examining would be done pronto! You know, if you go into Israel they won't allow you to enter any of the Arabic countries around here. Well so much for that!

Radio conditions have not been up to par for the past month or two. The W6's and W7's have almost faded out of the picture and all the east coast stations have been weak. But the band has been open for quite a number of hours, even with the weak signal conditions; so this I guess is better than the short openings that I had while in Nepal, Bhutan, Afghanistan, etc. The European QRM is very rough to overcome. But I have found a little trick that helps to partly solve this trouble. I say up 6, up 9, up 12, up 19 and then down so many and tuning exactly to that frequency and tune on away from my frequency. QLM, QHM, etc., don't seem to work as well anymore. I guess there are too many newcomers that don't know what they mean. I use them once in a while just in case someone does know what I mean. I usually have a few QSO's and then my customers run out, and back to the rat race I go. You know I promised the XYL Peggy, I would be home no later than Christmas. Well, I have started counting the days now. Even if I don't get home before the 24th, I've only got 113 days left. The outlook for operation in YK and YI land doesn't look good at the moment. So far JY looks OK and I have a few ideas I want to try when I arrive over in YK and YI. I don't know if they will work but I am going to both Damascus and Baghdad and make a strong effort anyway to see what happens. I am of the opinion it won't do much good though. I will tell you all the story next month. Let's see what happens, eh?

Now about the bands. 15 meters is for the birds. It doesn't even open to Europe, much less the states. I described 20 above. 40 has been pretty doggone good for many Europeans and I have had many QSO's with stations east of the Mississippi. It's still W1EVT for the most consistent signal. W3CRA is just another W3 the past month or so, and I have not heard W5VA at all. The W5's are as scarce as hens' teeth. Parts of South America come through with a bang, especially CP, PY, LU, and CX. Africa is weak, both evenings and mornings. JA comes through in the early evenings and very early mornings with pretty fair signal strength. JA1BRK is always the best. Even the UM8's, UJ8's, UL7's, UA9's UAØ's are weak. BUT those UB5's, UD6's, UA6's, UG6's, and UF6's, boy, they come through like a house afire, practically S9+ all the time. The last W fades out here usually a few minutes before 2 AM local time (2400 GMT). The earliest the W1's come through is about 1430 GMT. But they are weak at that time. They seem to be at their peak about 11, local time (2100 GMT), 4 PM EST. Things are going good with me. My health is at its best and I have not lost one pound since I left home, so I can't complain at all. Boys, that's it until next month.

. . . Gus W4BPD

SEMICONDUCTORS

After a short break, here we are back again. One of the most interesting developments this month is in one of transistors' weak points. Manufacturers have had trouble with cross modulation in transistor receivers, especially low noise ones. The solutions up to now have not been too satisfactory in some respects. A number of hi fi FM sets have used Nuvistors in the rf section to avoid overloading and crossmodulation. Communications receivers have used attenuators in the antenna circuits. Now designers have taken another tack that will probably prove fortunate. It involves the field effect transistor, or FET. This device has been used in low frequency and high cost applications where its tube-like high impedance, resistance to overloading and low noise were important. But FET's have been either expensive or limited in frequency or both until recently. Now FET's have become available that overcome both of these problems (but not at one time.) For instance, the inexpensive (less than a dollar in production quantities) Texas Instruments Silect line 2N3819 and 2N3820 are ideal for AM/FM tuners, mixers, amplifiers, etc. However, they do not offer the ultimate in low noise VHF amplification even though they are perfectly adequate for many applications. Another TI FET, the 2N3823, is used in an experimental H. H. Scott FM tuner and offers exceptional performance. This transistor is capable of a noise figure of less than 3 db up through the 220 mc band, and only 4.5 db at 500 mc with 11 db gain. On top of this, the cross modulation in the Scoot tuner at 100 mc as good as the best tube type tuners, and at least 20 db better than the best "ordinary" transistors. It's not for $19.95 FM sets, though, at over $12 apiece in single lots. The first consumer application I know of for the FET front end is in the Davco receiver. They have modified the front end for FET's to eliminate any cross modulation you're likely to run into. They seem to be determined to beat everybody to all the punches! If you're serious about wanting more information about TI FET's, write TI Technical Literature, P.O. Box 5012, Dallas, Texas.

W6ORG took me to task a bit for overlooking the Sprague 2N2398 as a low noise rf transistor. It costs $3.55 and can give you 17 db gain with a 5 db noise figure. In fact, he's making up a very nice little preamp for 432 using a 2N2398. I received one for trial and it's excellent. At $12.50 complete, or 2 for $23, there's hardly any sense in making your own.

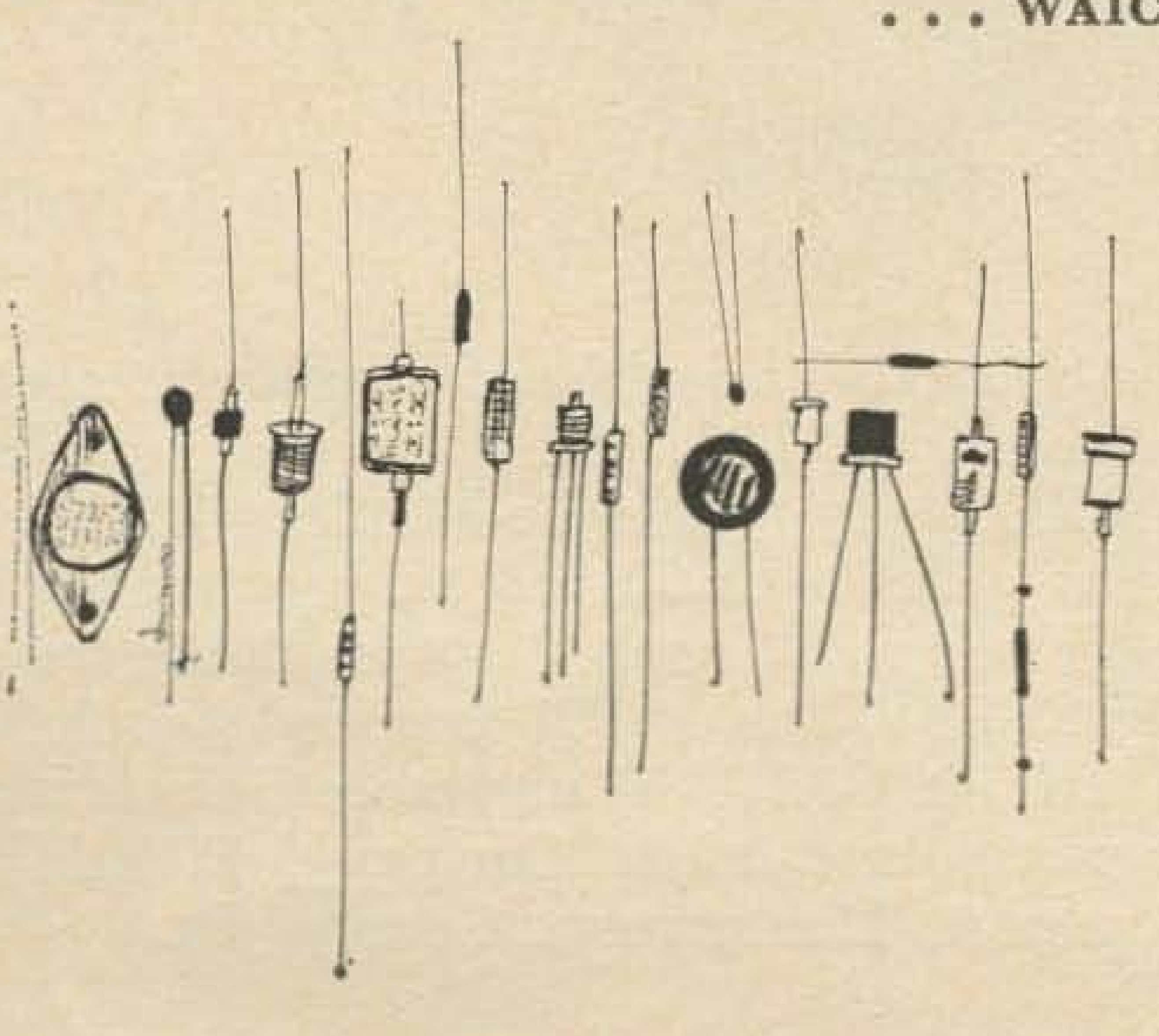
Speaking of low noise rf transistors, K7AAD of Parks Labs and *VHF'er* fame swears by the Amperex 2N3399. There are a number of other new ones that look mighty good. We'd be interested in construction and performance tests on all of these transistors.

New Bendix transistors designed for use in transmitter are the B-3465 and B-3466. The 65 is in a TO-5 case, the 66 in a stud mount package. Price is around $6 and either will put out 4.5 w on 6 meters in class C or 2 w in class A. The high collector-to-base voltage of 100, low output capacitance of 18 pf and other specs make them ideal for this use. More specs? Bendix Semiconductors, c/o Adv Dept 73, Holmdel, N.J.

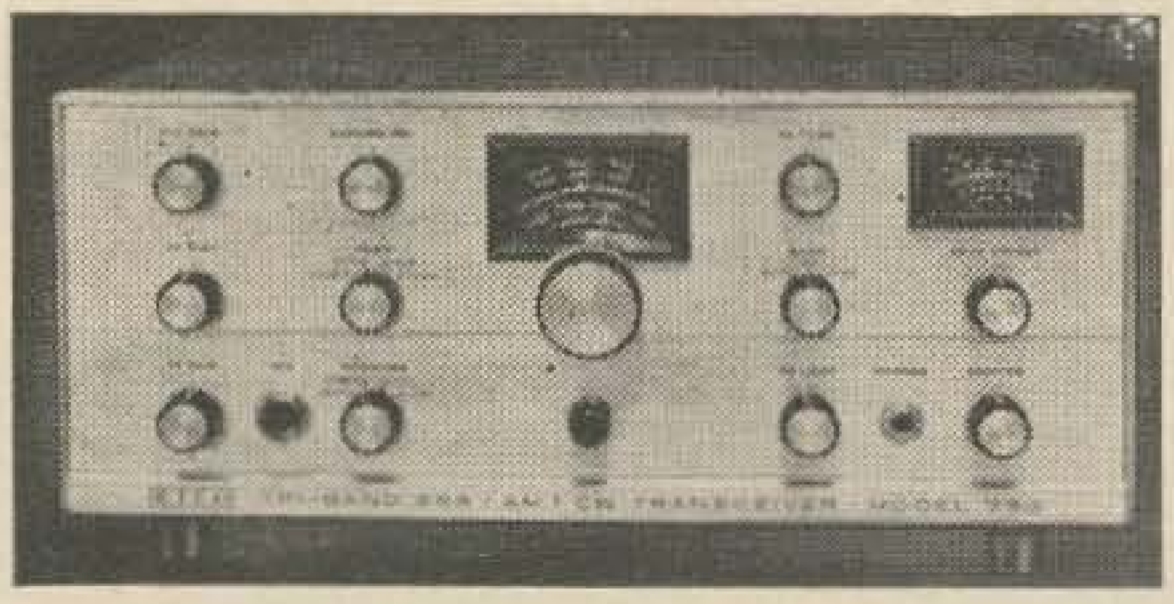
The new ITT 3TE440 can put out 20 watts at 400 mc. It's made for SSB, too. Price? Never mind.

Looks like that's all for this month. Write if you have any pet transistors and circuits.

. . . WA1CCH



NEW PRODUCTS



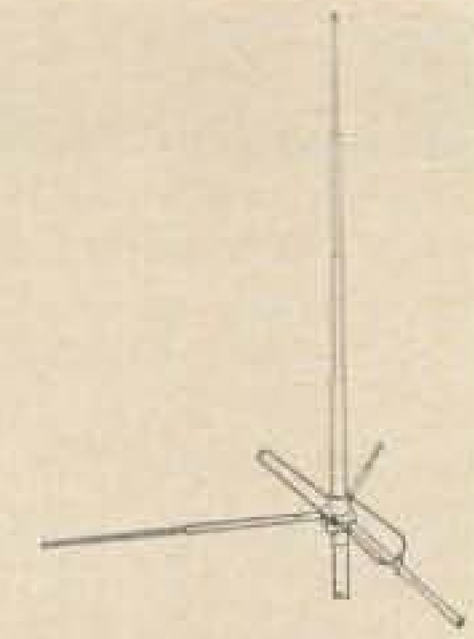
Eico Triband SSB Transceiver

If you've been hemming and hawing about buying an SSB transceiver because the prices on the multiband rigs were a bit too high for you, it's time to act. Eico's new three band (80, 40, 20) gives you 200 watts PEP input for only $179.95 in kit form. It's easy to build with printed circuit boards. Among the features are 1 μv sensitivity, 2.7 kc selectivity, dual speed vernier tuning, receiver offset control, ALC, and many others. You can also get it wired for $299.95. More information is available from Eico, 131-01 39th Avenue, Flushing, N.Y. 11352.

PTTS and the Amperex 8637

Hams have always taken tube ratings with a grain of salt. For instance, it's well known that you can overload most tubes (in terms of CCS and even ICAS ratings) quite badly for short periods and still get very long and excellent service from them. This makes it possible to obtain high power without exorbitant expense. Now Amperex has developed a new rating, Push-to-Talk-Service (PTTS) that takes into account the very short messages normally used in mobile operation. It's figured on a 1 minute on, 4 off basis. The first tube developed for this rating is the 8637. It can deliver 72 watts, yet costs less than half as much as any ICAS of CCS rated tube with similar output. It's a twin beam power tetrode for use up to 200 mc. You can get more information from Amperex Power Tubes, Hicksville, N.Y. 11802.

Mosley Vertical Antennas



Vertically polarized antennas have many advantages for mobile and net operation. Since six and ten are the most popular emergency mobile bands, Mosley has introduced two ⅝ wave antennas for use on these two bands. They are made of high tensile strength aluminum and offer easy mounting, fast adjustment and about 3 db gain over ground planes. The antennas are the Diplomat DI-6 and DI-10. Mosley will be happy to send you a brochure on the antennas: Mosley Electronics, 4610 N. Lindbergh Blvd., Bridgeton, Missouri 63044.

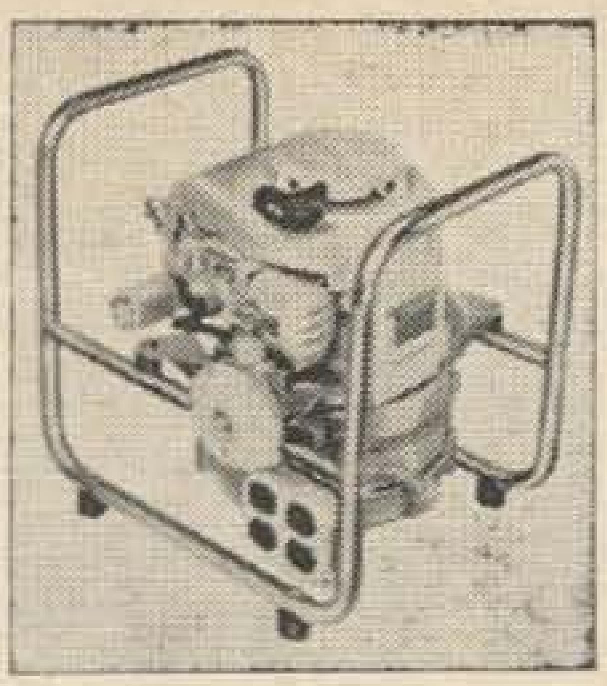
GE Hobby Manual

Most of the projects in the General Electric Electronic Components Division's Hobby Manual are not strictly for hams, but who cares. They are fascinating. All use GE's readily available experimenters' semiconductors and other common components. Theory, construction, specifications and circuits are all included in the 200 page book. Among the projects are light dimmers, musical instruments, automobile accessories, receivers, thermometers, etc. You can buy it for $1.50 from your local distributor or from GE, 3800 North Milwaukee Ave., Chicago, Illinois.

PIC Polyswitch

An attractive new line of coaxial switches is available from PIC. They are compact, handle 2000 watts PEP, take standard UHF connectors and are furnished with attractive indicator plate and knob. Now available are the PS750 SP5T, the PS751 transfer switch and the PS752 SP2T. Want more information? Polyphase Instrument Company, E. 4th St., Bridgeport, Montgomery County, Pa.

Zeus Propane-Fueled Alternators



Zeus has two new propane-fueled alternators available: one of 3000 watts, the other, 1250. Propane offers a number of advantages over gasoline for alternator motors. It is cleaner, easier to store, more stable, causes fewer engine deposits, does not evaporate, and doesn't have gum deposits to settle. In addition, all of the excellent features of Zeus generators are included. Write to Tom Creighton, Zeus Portable Generator Co., 12345 Euclid Avenue, Cleveland, Ohio 44106 for more information.

The Joystick

Quite a lot of discussion has been heard on the bands about the little "Joystick" antenna which is being made in England by Partridge Electronics . . . you may remember this company for their superlative hi-fi transformers.

Well, we've got one of these units right here at the 73 HQ and we've looked it over pretty carefully. I have to hand it to Partridge for the unit is certainly well made. They spared no effort to make it sturdy and permanent. The tubing is heavy guage copper and the center loading coil is well gunked and weather protected. The whole works comes apart for ease of carrying or shipping, the longest single part being about 33".

The Joystick can be used as a portable antenna just by leaning it against the wall or it can be used as a vertical mounted up on a post . . . or even fastened on top of a car for a mobile antenna. The loading coil permits operation on 160M, 80M, 40M, 20M, 15M, and 10M. Versatile.

How does it work? Well, here is what one of our well known 73 writers, W70E has to say: "I now have my Joystick roof-top mounted, about 22 feet above ground level (base) and have had an opportunity to try it on all bands from 15 meters through 160. I am glad to say that its performance is excellent all the way. It equals half wave dipoles and similar conventional antennas on 160, 80 and 40 and has proven superior to them in the 20 and 15 meter bands. I would most certainly recommend it to anyone looking for an effective 'all band' antenna system and particularly to those who have limited antenna space."

1966 Allied Catalog

Well, here it is catalog time again. If you don't already have Allied's huge 508 page 1966 catalog, send for it today. It's a necessity. You can drool and drool over page after page of new amateur equipment, old ham equipment, industrial and service supplies, hi-fi equipment, Knight kits, books, tools, and everything else a ham needs. Request your copy now from Dept. 7311, Allied Radio Corp., 100 N. Western Avenue, Chicago, Illinois 60680.

1966 Newark Catalog

Newark's 1966 catalog is out too. It's fat and crammed with all sorts of everything electronic. It has all of the ham gear in it, of course, plus a complete listing of all of the industrial components that any ham builder needs. For instance, the catalog contains a listing of over 10,000 semiconductors! Why horse around. You want the catalog. You'll need it a thousand times. Send for it today. Tell them 73 sent you. Dept. 73, Newark Electronics, 223 West Madison Street, Chicago, Illinois 60606.

Lafayette 66 Catalog

I defy any ham to read the new Lafayette Catalog and not get pangs of acquisition. Lafayette has a tremendous amount of ham gear for sale. They also sell boodles of other consumer electronics. Send today to Lafayette Radio, 111 Jericho Turnpike, Syosset, N.Y. Tell them 73 sent you so they'll feel bad about not advertising.

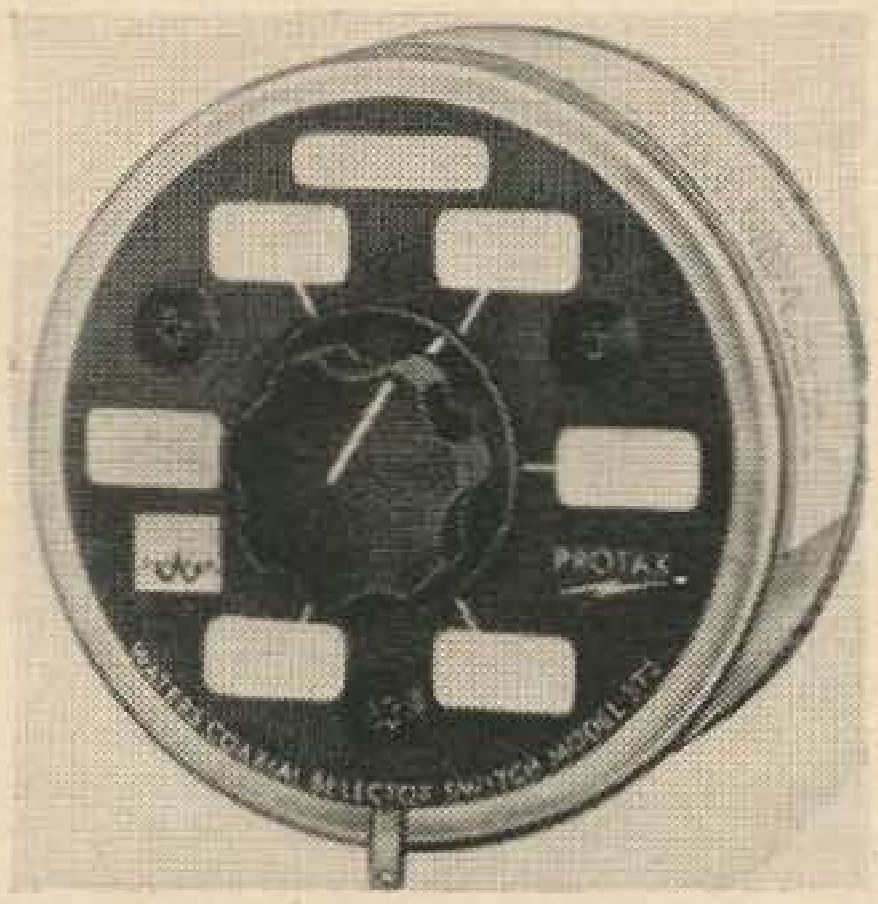
WRL Catalog

The 1966 World Radio Laboratories' catalog just arrived and you'll find plenty of goodies in it. It contains a number of interesting new pieces of gear that we'll be hearing a lot about. Some are from WRL (like a two meter Techceiver), others are from other manufacturers, such as a 80-40 SSB transceiver *wired* for $189 and a 6-2 meter transistorized SSB transceiver from Galaxy, a Hammarlund SSB transceiver that covers 160, the Swan 6 meter SSB transceiver, etc. And the nicest thing is that WRL puts the ham gear right up in front, not hidden behind the CB gear and hi-fi equipment. Just about all the ham gear is listed. Write WRL, 3415 West Broadway, Council Bluffs, Iowa 52504.

Radio Shack Catalog

It's a long way from the WRL catalog, since these don't list any ham gear, but the Radio Shack Industrial and #150 catalog list a number of things that would interest most hams. You can get copies from Radio Shack, 730 Commonwealth Avenue, Boston, Mass. 02117.

Waters Protax Coax Switches



Waters has just announced grounding coax switches that help protect your equipment from lightning and voltage surges. Each unused contact is grounded automatically. The switches are provided with a matching escutcheon, knob and all hardware. There are two models, the 375 SP6T axial terminal switch for panel mounting $13.95) and the 376 SP5T radial terminal switch for table or wall mounting ($12.50.) Each is rated at 1000 watts up to 150 mc. Contact Bob Waters at Waters Mfg. Co. in Wayland, Mass. for more information.

Rotary QSL Card Filer

Looking for a nice Christmas present for a ham? The new model S Rotary QSL Card Filer from Nordlund Radio Products may be just the thing. It holds up to 600 QSL's in protective mylar flaps for easy viewing. The unit has an attractive walnut-finished base and comes with holders for 160 QSL's. It costs $10.95. Extra binders provide space for 32 cards for only $1. It's a fine way to protect those valuable QSL's. Nordlung Radio Products, 7635 West Irving Park, Chicago, Illinois 60634.

Letters

Dear Wayne:
A poll of the Flamigo Net on the ARRL proposal added up to about 90% against and this includes two letter calls, Extras and log time hams. Keep up the great work.

Melvin Page WA4NHT
Miami, Florida

Dear Wayne Green,
Thanks for speaking out for us amateurs. My occupation is being a Roman Catholic priest and I am in no way in the field of electronics. I know enough to understand all of my equipment, but there is no way for me to get any practical knowledge of the other parts of the electronic field. I can improve my code speed to pass a more difficult test, but the theory will probably be beyond me. My $90 a month salary doesn't go very far and it is difficult to eat three times a day, much less buy parts and equipment to get more practical knowledge. I guess I will end up a second class ham if I don't quit entirely. I was proud of my ham license, but I don't feel wanted any more. I am a member of the ARRL because I want to read QST magazine and they count the subscription as a membership. I would rather pay $5 for QST and $10 *not* to be a member of ARRL, if that were possible.

(Rev.) Claude Donndelinger WAØFES
Georgetown, Minnesota

Dear Wayne:
In complete contrast to CQ magazine you paid me $20 for an article back in March '65 and the thing never appeared.

John Schmid WA6PGA

Our prompt and generous payments for articles has resulted in our being almost a year ahead. Now that we've expanded 73 from 96 pages to 128 we will be publishing more articles every month so yours may appear soon.

Dear Wayne:
Referring to your editorial in the August 73 issue, amen! And welcome to the Old-Timer Club.
I see no reason to set anyone on a pedestal—sure, there are glory-grabbers in all walks of life—but in my opinion the system of licensing that has been in use for years gave everyone a chance. There are certainly may other things that the ARRL could have done for Amateur Radio besides instigate this RM-499. I am surprised that Mr. Hoover, who is an older timer than I, should become a party to an act that may do untold damage to our hobby.
I feel that you are sincere in your efforts on behalf of Amateur Radio and wish you continued success with your publication.

Herbert Heath, Sr. DJØKK, ex-W4UE
Pirmasens, Germany

Sir:
A writer of no note, I heartily agree with your needling of CQ. They sat on a story of mine for three years and then waited another full year after publication before payment. Pretty hard to beat that in any publishing house!

Bob Kuehn WØHKF
West St. Paul, Minnesota

Dear Wayne:
I would like to tell you how much K3LNZ and myself enjoyed the hamfest at Peterbourgh on 4 July. It was run as a hamfest should be run. It was refreshing not to have to stand around while one or two in the crowd won a prize or two. Hope to have the opportunity to come up there next summer.

Thom Gooding K4LHB/K3FEP
Chantilly, Virginia

Dear Wayne:

I hope you will print this in your letters column. I would like to vouch for what W8VVD had to say about the two meter band.

From my experience in the past two years on the two meter band I have found it to be a band of many surprises. I use a Heath Two-er transmitter and sometimes I use its receiver. Topside I have a 5 element homebrew beam up 30 feet. Just to give you an idea of where I am located, I am 6 miles southeast of Philadelphia. With the Two-er receiver I have heard from New Hampshire (guess who) to southeast Virginia. I know many more fellows who have heard much further. I have worked with 5 watts in the Two-er transmitter, and 1.0 microvolt sensitivity of the receiver, contacting Virginia, Maryland, Delaward, New Jersey, New York, and Pennsylvania. No station, to the best of my knowledge, ran more than 90 watts in their transmitters. Also, I have worked all these states more than once. This I know is no great feat, because I know of fellows with the same hookup who have worked up into Massachusetts. So I hope you print this for those fellows who are from 40, 80, 20, and 75, who think that two meters are for the birds.

Also, keep up the good work at 73, and don't ever turn into a magazine as full of nothing as QST.

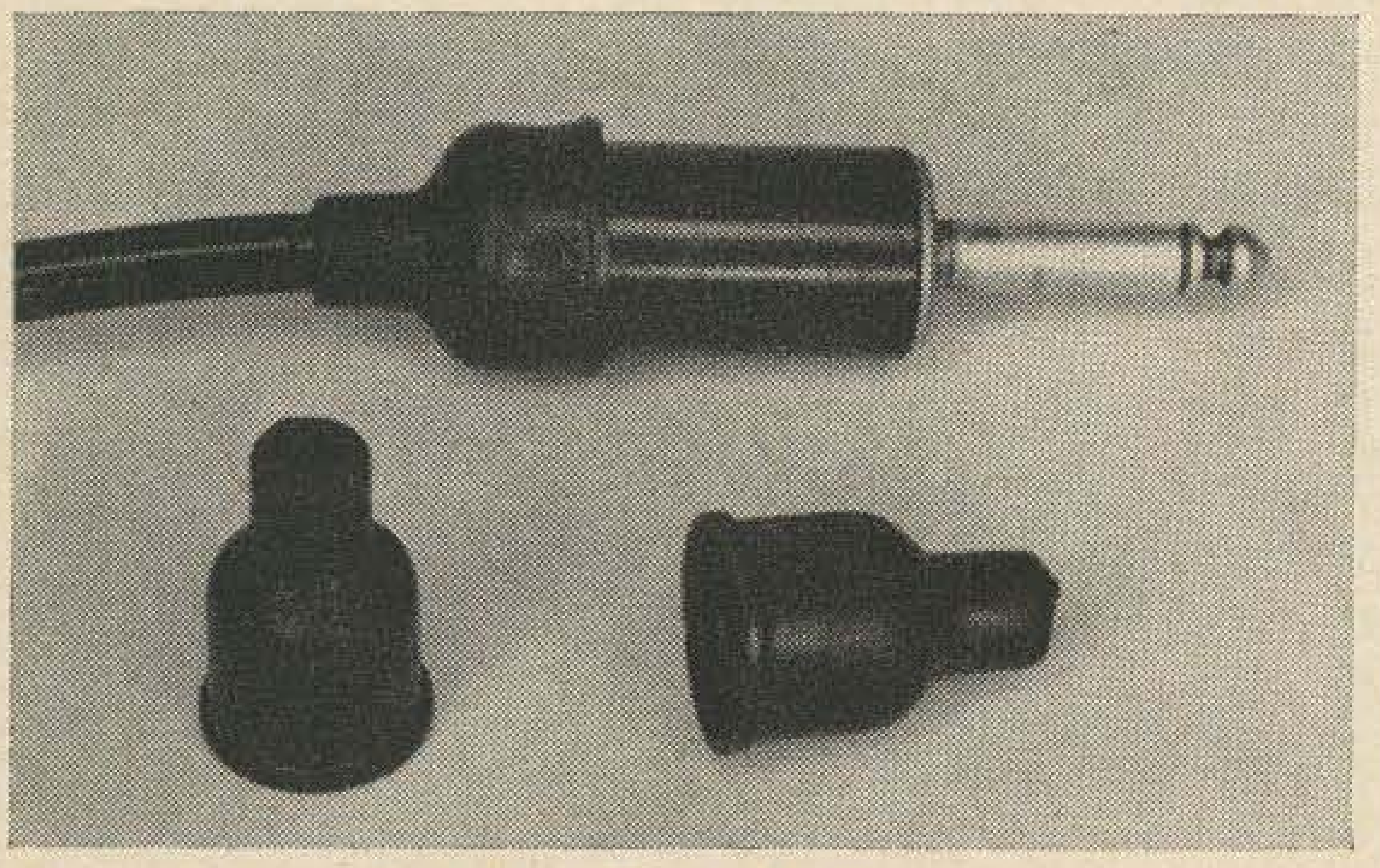
Alan Realey WB2JEP
Audubon, New Jersey

Dear Wayne:

In reading your August editorial of 73 there is one statement you make that I am inclined to disagree with. I think there are two places where you call your self an old timer. I don't feel you can call your self an old timer unless you were licensed and on the air in the twenties. I feel you owe us who can call our selves old timers an apology.

Ted Haas W0BLI
Junction City, Kansas

Alas, apparently I shall never be able to be an old timer. My apology to all old timers whose tender egos have been bruised by my presumption that 30 years hanging around ham radio qualified me as an old timer . . . Wayne.



Auto Insulators

The automotive and hardware counters have always been a prolific source of electronic equipment construction materials. The technique shown in the photograph proves the point.

Rubber spark plug wire insulators are widely available at negligible cost. These insulators are easily applied and perform the dual function of weatherproofing the assembly and providing strain relief for the cable connections. Where outdoor use is anticipated, a small amount of silicone compound will improve the resistance to moisture penetration.

. . . W4WKM

statement shows that QST subscriptions dropped precipitously in 1964 from their poor showing in 1963. Advertising revenues are way down . . . one has to look back about 15 years to find as few pages of ads in QST as today. Sales are down on all QST publications.

With this drop in income we might expect to find some tightening of the QST belt. But no, we find salaries and commissions are up almost $10,000 over 1963 and legal and professional expenses are up from $9,000 to $36,500, an astronomical $27,500 increase over 1963 . . . could this be the cost of the rumored "million dollar" libel suit which we are all waiting to hear about? The employees' pension and insurance expense went from $26,500 up to $42,000, an increase of $15,500 in one year . . . does this tell us how much of a raise Budlong got on his already munificent retirement pay last year? Awfully good raise, if it is. They spent $93.01 for the modernization of W1AW . . . whee!

They lost about $25,000 in 1964 . . . about the same as their increase in legal fees.

False Hope

Apparently several League officials have been telling clubs that we really have nothing to worry about as far as our frequencies are concerned since we have the military behind us 100% and they will make sure that our bands are protected so they will be available to them in case of crisis. Fellows, if anyone tries to snow you with this old chestnut just laugh loudly. Those of you who have been around for a generation or two remember when Colonel Foster became concerned over the possible loss of frequencies at the 1927 Washington Conference. K. B. Warner assured the Colonel that we had nothing to worry about for "the Army would take care of us." This was the conference when we lost 7300-8000 kc and 14,400-15,000 kc, and more, I believe. What would our ham bands be like today if the League had seriously tried to save them for us back in 1927?

I heard the same story about the military protecting our bands for us before the 1959 Geneva ITU conference. While participating as an official representative of amateur radio at that conference I made it my business to seek out and talk candidly with the representatives of our military on the U.S. Delegation. In each case I found that their instructions did not include the protection of our ham bands.

The only alternative that I see to our going into the next Geneva Conference with the same lack of support is for us to spend the next couple of years getting Congress behind amateur radio so that these delegates will have instructions to preserve our frequencies. The ARRL has flatly refused to lobby for amateur radio in Washington to tell Congress our story. This is why the Institute of Amateur Radio was formed and the job it has to do for us if the ARRL remains adamant in its refusal to try to protect us.

A letter from W6FBW to Huntoon points out the 1927 situation and calls our attention to the feeling of complacency exhibited in the minutes of the Board of Directors as published in the July QST. It is an interesting and distressing parallel.

Author, Author

Now that 73 is 1/3 larger we are publishing more articles than ever. This means that we need more articles. I'd hate to have to go back to a smaller magazine just because I refused to fill in half the magazine with monthly columns of trivia to make the magazine look fat when it actually contained very little. Write up that gadget . . . perhaps we could use a test report on a new piece of gear, or what have you that will be of interest to everyone? See the article on writing for 73 in September for some hints. We can also use some good cartoons and covers.

Mohawk Tip

Mohawk owners wishing to calibrate the internal 100 kc oscillator against WWV, will find that they have to unscrew 18 screws—not to mention rear panel connections—in order to get at the adjustment which is *underneath* the chassis.

The following tells how this trimmer can be mounted topside where it can be reached easily. Carefully disconnect and remove the trimmer, and using the same screws, temporarily mount the trimmer topside in the same relative position. With a pencil place a mark directly under the slot in each tab that sticks out from the trimmer. You will find that there is room enough between the shields of the 6BA6 (crystal oscillator tube and 100 kc) to drill a ¼" hole for a rubber grommet. Do the same for the other trimmer tab. After putting in two rubber grommets, the trimmer can be mounted and using number 16 bare wire, to connect each tab to its original connection.

. . . Gino Giannotti

Caveat Emptor?

★ **Price—$2 per 25 words for non-commercial ads; $5 per 25 words for business ventures. No display ads or agency discount. Include your check with order.**

★ **Type copy. Phrase and punctuate exactly as you wish it to appear. No all-capital ads.**

★ **We will be the judge of suitability of ads. Our responsibility for errors extends only to printing a correct ad in a later issue.**

★ **For $1 extra we can maintain a reply box for you.**

★ **We cannot check into each advertiser, so Caveat Emptor . . .**

WANTED TO BUY: a used correspondence course or electronics books in good condition. E. Calvin, 1446 Eighth Avenue, New Brighton, Pa. 15066.

QSL CARDS? Samples 25¢ (refunded.) Sakkers, W8DED, Holland, Michigan.

HT37, P and H LA400C, Telrex TC33B beam. Excellent condition, best offer over $400. Marvin Axt W2ITE, 42 Herrick Ave., Spring Valley, N.Y. 10977.

FROM THE ELI NOTEBOOK: Sine Sweep Generator. A driving circuit for sweep-frequency generators, especially designed for sharp RF and audio filter work. Clear schematic and three pages of notes explain the circuit and how to use it. Complete engineering description. $1 postpaid. Eli Scientific Co., Freeville, N.Y. 13068.

SUPER-TWO'ER. Heath Two'er with factory aligned Lawrence Superhet receiver conversion. $69.00 including mobile rack, Cush Craft halo and Telrex 2M3C beam. All excellent condition. John Ayres K3JZH, 325 Washington, Jermyn, Pa.

COLLINS 51J-3/R388UR. Perfect $400. National NCL-2000 perfect, 5 hours time, $550. Prefer local pick-up. W7WRS, 4200 Lorna Place, Las Vegas, Nevada.

GOING MOBILE—Sell unmarked HQ170C with clock and speaker. $180 or reasonable offer. Also have VF-1 and all band xmtr with 2 6146's, homegrew with 807 modulator. Xmtr needs tuning. No parts needed. Works for $275 or best offer. Art Linehan K1ZCP, 124 A Street, Manchester, N.H.

AERO MOBILE? Benson Gyro Glider. Sell before Winter for $175 or best offer. Art Linehan K1ZCP, 124 A St., Manchester, N.H.

MICROPHONES—While they last EV 664, $44. EV 676, $52. Some used three nights Jazz Festival. Full warranty. Norman Gertz W1KYK, 15 Elmway St., Providence, R.I.

JOIN our Amateur Thrift Club. Pay cash and save. Write for details. Joe Dimare, Box 20672, Dallas, Texas 75220.

HW-22 SSB Transceiver, Hp-23 power supply, GH-12 microphone, xtal calibrator, $125. PE-162-B gas-engine-generator, tool kit, manual, spare parts, $50. K1PSS, 121 Marble St., Athol, Mass.

WANTED: All types Military, Commercial, Airborne, Ground, Electronic items . . . Testsets, GRC, PRC, Collins, Bendix, others. We pay freight . . . RITCO, POB 156, Annandale, Virginia.

WANTED: Motorola HB FM receiver (Sensicon style), Collins adapter 354A-1 (Mechanical filter module for 51J-4, less filters). K8AUH/8, 1208 Richland Ave., Maumee, Ohio 43537.

RTTY CHANNEL FILTERS. Octal mounted, specify frequency, $3 each. Toroids, 88 mh, like new, uncased, 5 for $2.50. WA6JGI, 3232 Selby Avenue, Los Angeles, California.

WANT TO SELL SOMETHING? A want ad in Caveat Emptor costs only $2 for 25 words. 73 Magazine, Peterborough, N.H. 03458.

LR-1 FREQUENCY METER owners: I would like to compare notes on operation and problems. J. S. Hill W6IVW, 26107 Basswood, Palos Verdes Peninsula, California.

RECEIVER R-45/ARR-7. 0.55 to 43 mc. Speaker, power supply. Excellent condition. $150 or trade for ham band receiver WA4DJF, 815 College St., Pulaski, Tenn.

TOO MUCH HAM GEAR, must clean shack. 75A4-$350, NCX-3 with AC supply-$325, SX100 with speaker-$140, Ranger I and 6 and 2 transmitter-$175, Viking 2 with VFo-#90, T-60-$30, Globe Scout-$25, Harvey Wells R9-$50, ART-13 with power supply-$50. K6LVD, 3619 Purdue Drive, Bakersville, Calif.

COLLINS KWM-1, 516F-1 AC power supply, MP-1 12 v DC supply, 351D-1 mobile mount, manuals and cables, $450 cash or consider swap for 75A-4 with vernier dial and filters. Don Droge, 523 Coolidge St., New Cumberland, Pa. 17070.

VANGUARD 6 AND 2 Converters mounted in attractive case with switching, battery holders, batteries. $25. WA1CCH, 20 Pine St., Peterborough, N.H.

TEST EQUIPMENT AND TUBES excess to my needs. BC221AH with book-$75, BC221M with book-$60, TS 175/U-$125, Hickok 288X-$50, RCA Master Voltohmyst-$60, 12-304TL's @ $12.50, 4CX1000 with socket (used) $75, 833A's-$15, many others, write for list. Old tubes, audions, etc., make offer. K6LVD, 3619 Purdue Drive, Bakersville, Calif.

SWAN 350 and 117-C supply. Used very little, in excellent condition $395. Also DX-40 in good condition $29. Jerry Kaczorowski WA8IXN, 3011 U.S. 23 South, Alpena, Mich.

GOING OVERSEAS. Must sell NCX-5 and NCX-A. $515 for both. Also Adcom 250 mobile power supply. Like new $55. WA7BCL, 1757 Gregory Drive, Layton, Utah.

R. F. TOROID KIT. 2 cores, HF and VHF, wire and complete information. Better than coils. Average Q 160. $1.50 plus 10¢ postage. Ami-Tron, 12033 Orsego St., North Hollywood, Cal.

GIANT 20th ANNIVERSARY CATALOG: Increase your product category. TV cameras, electronic equipment, kits, hi-fi, components. FREE copy. Denson Electronics, Rockville, Conn.

SALE TO RAISE TUITION: National NCX-3 ($225). NCXA ($75.) Heath Six'er ($40) and 6/12 vdc ($40.) All excellent. Tony Curtis, P.O. Box 102, Centre Hall, Pennsylvania.

CONVERTERS $10 and up. World's largest selection of frequencies. Ham TV vidicon cameras and parts at low factory-direct prices. See them all now in our full page ad in this issue. Vanguard Labs, 190-48 99th Avenue, Hollis, N.Y. 11423.

DUMMY LOAD. 50 ohm. All bands up to legal limit. Size 3 x 4 x 7. Coax connector. Kit $7.75. Wired $9.95 pp. Ham Kits. Box 175, Cranford, N.J.

ART'S QSLS. Samples 10¢. Art Bliss, 1829 N. Catalina St., Burbank, California 91505.

PRINTED CIRCUIT MATERIALS. Three sample pieces and details. One dollar. Betty Lou Nolin. 35 Arbor Drive, New Hartford, N.Y. 13413

QSL, SWL, WPE CARDS. Sample catalog 10¢. Nicholas and Son Printery, P.O. Box 11184, Phoenix, Arizona 85017. 12 pt. kromkote cards, some originals.

TV CAMERAS. Model 400 complete with good vidicon and lens. Used as demonstrators. Only $200 FOB Vanguard Labs, 190-48 99th Ave., Hollis, N.Y. 11423.

HAM'S DELIGHT! Make strong, lightweight 2 element 15 meter beam for $5.00. New type stands hurricane winds. Locally obtainable materials. Plans for all size beams $1.00. L & M Products, Box 319, Opa Locka, Fla. 33054.

GONSET G 50 Transceiver. 6 meter. Fine condition. $210 or offer. Hawkins WB6CGY, PY 77161, Yucaipa, Calif.

CANADIANS: RME 4300 receiver in good condition, $125. Swap good used 4-1000 for two good used 4-400's. VE6AKU, Innisfail, Alberta.

PICTORIAL STUDY in electrical theory and basic radio communication for the amateur. Understanding through visualization. Free details. Dwight Cross, 1212A Lynch Street, St. Louis, Mo. 63118.

10% DISCOUNT from WRL's Blue Book prices on quality used gear without trade in HT-37-$275; Communicator III (2 or 6)-$169; Communicator IV (2 or 6)-$219; SX101A-$219; SX117-$269; PSA63 250 watt universal PS-$19; Mosely CMI-$95; NC300-$175; NC303-$269; SBE33-$249; Galaxy 300-$219; CE200V-$429; Valiant-$199. Free catalog. We buy for cash. Inquire. Write: Leo WØGFQ, Box 919, Council Bluffs, Iowa.

FAMOUS 572B Hi Power Triodes. Replaces those old worn out 811's $10.95 plus postage. Lorell Distributing Co., 52 Houston St., Newark, N.J. 201-624-5338.

TOROID BALUN KIT. 2" core and #14 Formvar. 4:1 or 1:1. Bandsspreads SWR. 2 KW PEP. $5.00 plus 25¢ postage. Ami-Tron Associates, 12033 Otsego St, North Hollywood, Calif.

NC300 with crystal calibrator, speaker, 6 meter converter. All for just $275. Equipment in excellent condition. Dan VanLoo K8KCX, 5824 Downing, Kalamazoo, Michigan 49001.

WANTED: B & W No. 850A 1 kw Pi-Network assembly, B & W No. 800 RF plate choke, B & W No. FC-30 filament choke. State condition and price. WAØIYR, 1123 W. 35th St. So. Wichita, Kansas.

SRT-14 Synthesizer Modules. Unit 11C now available, also units 6, 8, 9, 10, 11A, 11B. All new, less tubes with schematic $8.00 each or any three $6.50 each. Also schematics any unit, one through twelve, 50¢ or set of fourteen, $3.00. RITCO, POB 156, Annandale, Virginia.

CLEAN EQUIPMENT works better, sells for more. Vacuum Cleaner Hose Nozzles, stem 8" x ⅜", $1.50 postpaid. Spitz, Box 4095, Arlington, Virginia 22204.

IBM EXECUTIVE, 17", bold face #1. Cost new $800 one year ago. IBM maintained, like new $595. 73 Magazine, Peterborough, N.H. 03458.

VHF GEAR. Sell Parks 144-1 (26-30 mc *if*) $42.50 pp; Latest model Parks 432-2 (28-30 mc) $50 pp; perfect 75A-1 with matching speaker $150; Gain, Inc. 432 mc 40 element J- slot array and Hy Gain model 215. 432 gear used only 3 hours for KP4BPZ and then stored. KØCER.

INSTRUCTORGRAPH with 10 reels code tape for learning radiotelegraph code. Like new, $25. Also Eico Grid-Dip meter with coils, like new. $25. Both factory wired. Shipped postpaid in the U.S. Send money order to C R. Carvajal, 600 West End Avenue, New York, N.Y. 10024.

HERE! COMPLETE STATION. 75A-3 0.8 kc filter, speaker, p.d., $305; 20A, Deluxe VFO. Late model, little use, $160. BC-221M, AC supply, $60; new Heath HP-23 AC supply, $36; spare parts, tubes, many new, $35; capacitor checker $4. $575 takes all. Write for details. Ken K8VKC, 790 E. 254, Euclid, Ohio 44132.

TOOBES: 6CW4-$1.40, 6146B-$4.75, 6360-$2.45, 5894-$14.95, 417A-$3.95. New, boxed, guaranteed. No pulls, seconds, or Jan. Free catalog of hundreds more. Vanbar dist. Box 444 x, Stirling, N.J. 07980.

The Amateur Radio Handbook

This fabulous hardbound 540 page handbook completely and thoroughly covers every aspect of amateur radio: tubes, transistors, receivers, transmitters, VHF gear, antennas, sideband, FM, mobile gear, noise, power supplies and much, much more. This handbook is a necessity of the building ham. Published by the RSGB. $5.50

Radio Data Reference Book

Have you noticed a basic lack in your ARRL handbook? The RSGB Radio Data Reference Book supplies everything left out and far more. It contains all of the formulae you'll ever need in one hardbound book. Also contains complete design information on RF power amplifiers, pi nets, tanks, filters, antenna design charts, coil data, math, and a tremendous amount more. You need this one. $2.25

Order 73 Magazine Peterborough, N. H.

SURPLUS BARGAINS SURPLUS BARGAINS

ENLARGER LENS f3.5 to f16, govt. cost $53.00	$3.50
LAPEL MIKE, xtl, w/cord & plug	1.35
PHONE, hearing aid type, w/cord & plug	.60
GEIGER COUNTER tube w/schem.	1.25
THROAT MIKE, from Air Force	.50
MIKE BUTTONS carbon, min. size	4/1.00
SOLAR CELL KIT, 5 cells with book	1.50
IBM FERRITE toroidal cores (memory)	200/1.00
MAT TRANSISTORS, hi-freq	5/1.00
POLARIZING FILTER (Polaroid) 6x6 inch	2/1.00
2N174 POWER TRANSISTOR 15 amp 80 volt	1.50
88 MH TOROIDS good for RTTY, etc.	2/1.00
RADIOSONDE xmtr w/tubes, new	1.25
MINE DETECTOR PRS-3, military, unused, w/book, & btrys, finds treasure	45.00
SCOPE TUBE (CRT) 3AP1, new	1.00
SOUND FOWER PHONE (2) w/100 ft wire	2.00
MINIATURE MOTOR 1.5 volt operation	.50
CADMIUM PHOTO CELL, make counter, nite liter	1.00
COMPUTER plug-in boards, good for parts source. Each w/transistors, resistors, etc.	6/1.00
REED SWITCH w/magnet, make burglar alarm	1.00
SNIPERSCOPE TUBE 6032 w/specs, see in dark	6.50
OPTICAL PRISM— pocket rainbow, new	.60
TOGGLE SWITCHES	4/1.00
RG 58/U COAX 52 ohm. 1000 feet.	35.00
SILICON DIODES 750 ma, 500 PIV	5/1.00
INFRA-RED DETECTOR	1.25
USA PERISCOPE PRISM 5 inch long	1.00
IR FILTER 5½ in. dia.	1.75
RDZ Military receiver. 200-400 mc, channel, 115 volt. Cost $2,500 NEW	125.00
SILICON DIODES 2 amp 1,000 PIV	1.00
M-3 SNIPERSCOPE INFRA-RED see in dark	225.00

ALL MATERIAL FOB LYNN, MASS.

Above is a small selection of choice surplus from our large 72 page illustrated catalog. Send 20¢ production & handling cost for catalog.

JOHN MESHNA JR.
19 Allerton St., Lynn, Mass.

INDEX TO ADVERTISERS

Propagation Chart

November 1965

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	7	7	7	7	7	7	7	14	14	14*	14
ARGENTINA	14	7*	7	7	7#	7#	14	21	21	21*	21*	14
AUSTRALIA	14	7#	7#	7#	7	7	7#	14	14	14	14*	21
CANAL ZONE	7	7	7	7	7	7	14	21*	21*	21	21	14
ENGLAND	7	7	7	7	7	7#	14	21	21	14	14	7
HAWAII	14	7#	7	7	7	7	7	7#	14	21	21	21
INDIA	7	7	7#	7#	7#	7#	14	14	14	7#	7#	7
JAPAN	14	7#	7#	7#	7	7	7	7	7#	7#	7#	14
MEXICO	7	7	7	7	7	7	7	14	21	21	21	14
PHILIPPINES	14	7#	7#	7#	7#	7	7	7	7#	7#	7#	7*
PUERTO RICO	7	7	7	7	7	7	14	14	14	14	14	14
SOUTH AFRICA	7#	7	7	7#	7#	14	21	21*	21*	21	14	7#
U. S. S. R.	7	7	3	3	7	7#	14	14	14	7#	7#	7
WEST COAST	14	7	7	7	7	7	7	14	21	21	21	14*

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	7	7	7	7	7	7	7	14	14	14*	14*
ARGENTINA	14	7	7	7	7#	7#	14	21	21	21*	21*	21
AUSTRALIA	14	7#	7#	7#	7	7	7#	14	14	14	14*	21
CANAL ZONE	14	7	7	7	7	7	14	21	21*	21	21	21
ENGLAND	7	7	7	7	7	7#	14	14*	21	14	7#	7
HAWAII	14	7#	7	7	7	7	7	7#	14	21	21	21
INDIA	7	7	7#	7#	7#	7#	7#	14	7*	7#	7#	7
JAPAN	14	7#	7#	7#	7	7	7	7	7	7#	7#	14
MEXICO	7*	7	7	7	7	7	7	14	14	14	14	14
PHILIPPINES	14	7#	7#	7#	7#	7	7	7	7	7#	7#	14
PUERTO RICO	7	7	7	7	7	7	14	21	21	21	21	14
SOUTH AFRICA	7#	7	7	7#	7#	7#	14	21	21	21	14	14
U. S. S. R.	7	7	3	3	7	7#	7#	14	14	7#	7#	7

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7	7	7	7	7	7	14	14	14*	14*
ARGENTINA	14	7*	7	7	7	7#	7#	14	21	21*	28	21*
AUSTRALIA	28	21	14	7#	7	7	7	7#	14	14	21	21
CANAL ZONE	14	7	7	7	7	7	7	14	21	21*	21*	21
ENGLAND	7#	7	7	7	7	7#	7#	14	14	14	7#	7#
HAWAII	21	14	7	7	7	7	7	7	14	21	21	21*
INDIA	7*	14	7*	7#	7#	7#	7	7	7	7#	7#	7#
JAPAN	21	14	7#	7	7	7	7	7	7	7#	14	21
MEXICO	14	7	7	7	7	7	7	14	14	14	14	14
PHILIPPINES	21	14	14	7#	7#	7	7	7	7	7#	7#	14
PUERTO RICO	14	7	7	7	7	7	7	14	21	21	21	21
SOUTH AFRICA	14	7#	7	7#	7#	7#	7#	14	21	21	21	14
U. S. S. R.	7#	7	3	7	7	7	7	7*	7#	7#	7#	7#
EAST COAST	14	7	7	7	7	7	7	14	21	21	21	14

Very difficult circuit this hour.
* Next higher frequency may be useful this hour.

Good: 1-9, 13-15, 20, 21, 26-28
Fair: 10, 12, 16, 18, 22, 24, 25, 29, 30
Poor: 11, 17, 19, 23
VHF DX: 2, 8, 18, 24, 29

a steal

Feel like a little larceny? Go ahead. Take advantage of us. At only $685.00, National's NCX-5 transceiver is a steal. Here's a total station transceiver for the 80 through 10 meter bands which gives you more features and performance than any other transceiver at any price. Judge the NCX-5 by any criterion: **Dial Calibration** using a digital counter with accuracy to one Kc and read-out to 100 cps — ten times better than any other amateur equipment available. **Stability** from a cold start with a linear solid-state VFO which eliminates tube-type warm-up drift due to electrode structure change with temperature. Each VFO individually temperature compensated and double-regulated against input voltage variation. Long-term stability from a cold start superior to most tube-type VFO's after warm-up. **Selectivity** with an 8-pole crystal lattice filter substantially superior to any filter of any type ever used in commercial amateur gear. 6-60 db shape factor of 1.7:1 and 2.7 Kc bandwidth assures superb sideband suppression and adjacent-channel receive selectivity with pleasing, natural voice quality. **Sensitivity** of 0.5 μv for 10 db S/N, using **two** RF stages on all bands. **Split-frequency operation** with built-in **Transceive Vernier** for $\pm$5 Kc independent receiver tuning. Also accessory VX-501 VFO console to provide completely independent control of receiver and transmitter frequencies as well as transceive operation controlled by either NCX-5 or VX-501. Console also provides choice of five crystal-controlled frequencies for net or novice use. **Complete AM and CW facilities** including separate high-quality AM detector and break-in CW with adjustable release time. **Quality and workmanship** you expect from National — one-year guarantee against component failure and the neatest wiring you've seen since the last sun-spot cycle . . . right-angle component dress, with even the resistor color-codes all lined up in the same direction. **And everything else** you want in a transceiver . . . precision styling that complements the NCX-5's performance . . . 200 watts PEP punch on SSB or CW . . . 10 db of ALC for maximum talk-power without flat-topping or splatter . . . front panel choice of VOX, push-to-talk, or manual operation . . . SSB/CW/AM AGC and D'Arsonval S-meter/PA meter . . . mobile mount included . . . even optional deluxe oiled walnut cabinets separately available for the NCX-5, NCX-A AC supply/speaker console, and VX-501 VFO console for custom home installations.

NATIONAL RADIO COMPANY, INC.

37 Washington Street, Melrose, Massachusetts, 02176 World Wide Export Sales: Auriema International Group, 85 Broad Street, New York City, N. Y.