NEW NOISE-REDUCING ANTENNAS

RADIO NEWS and The SHORT-WAVE

NRA U.S. CODE

SEPTEMBER 25¢

The SECRET of SUCCESS on SHORT WAVES

EACH MONTH!
A Triple-Checked S. W. Time-Table

Three sources triple-check the RADIO NEWS SHORT-WAVE TIME-TABLE:

1. Monthly logs of 130 Official R. N. Listening Posts in 20 strategic countries for world-wide S.W. reception.

2. Daily logs by experts in our Central Listening Post.

3. Monthly Official Schedules from the World's Leading S.W. Stations.

A SCOUT'S "OWN" SET

A Publication Devoted to Progress in Radio

Set Building
Short Waves
DX Reception
Amateur Activity
Service Work
Engineering
Experiments
Measurements
Television
Electronics
Broadcasting
Applications

Vol. XVI
No. 3

RADIO NEWS

September, 1934

THIS MONTH—

Short Waves

Set Building

Five-Meter Work

Antenna Design

Service Units

NEXT MONTH—

The October issue will be the SHOW NUMBER for 1934, in which will be seen the latest radio inventions and applications proposed for the 1935 season. Be sure not to miss this issue!

For the Technician: Radio News' High-Quality Amplifier will be explained in detail. New Service Instruments will be described.

For the DX Fan: The DX Corners are growing and will bring you World Time-Schedules and a New World Distance Chart for South America.

For the Radio Amateur: A new department, exclusively for the radio amateur will make its bow in the October number.

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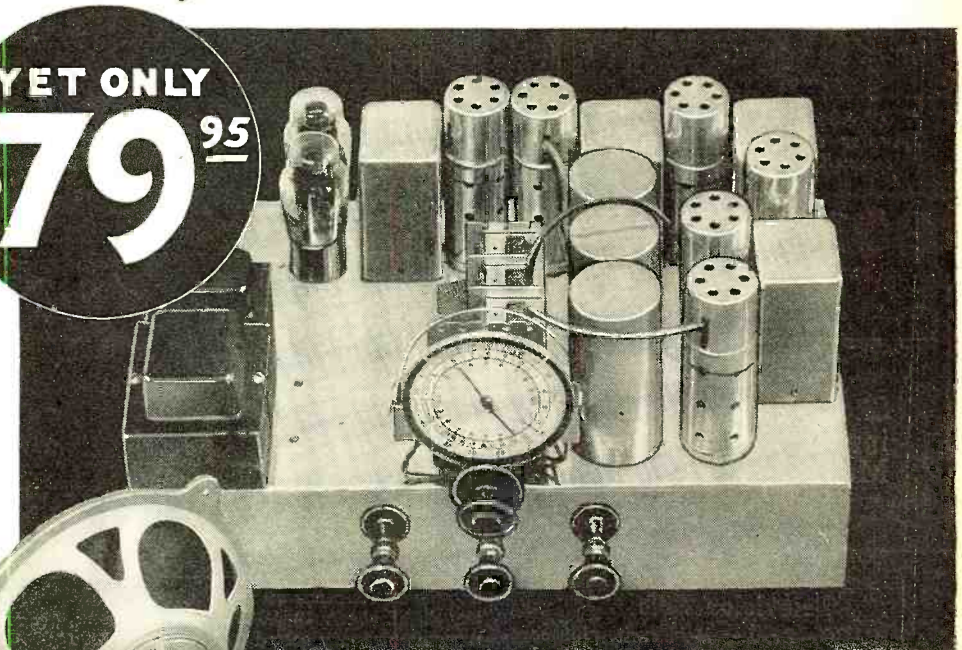
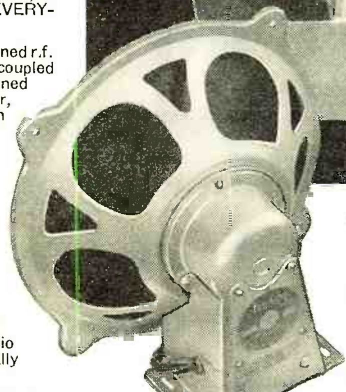
NOW! A FINE ALL-WAVE SUPER

Custom-built by McMURDO SILVER

YET ONLY $79.95





Confidential Praise of Famous Radio Editor

"I am very glad to state that your new receiver is a 'honey.' Mr. Martin and I played with it for several nights and we were highly pleased with its performance. We would like to have had the thing a little longer, but Mr. Kamps seemed to be very anxious to lay his hands on it. What particularly impressed us was the low noise level. I could not believe the set was on until we ran into a signal."—Robert Hertzberg, Editor, Short Wave Radio Magazine. From letter dated June 28, 1934.

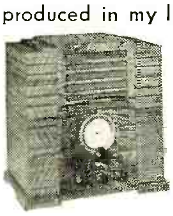
No Other Radio Gives You All These Features at Any Price

- Laboratory precision custom built throughout.
- Range 13 to 560 meters (23,000 to 540 kc.) in four bands with no gaps. GETS EVERYTHING ON SHORT WAVES.
- NINE LATEST TYPE TUBES: '58 tuned r.f. stage on all four bands, 2A7 electron coupled oscillator-first detector, two '58 air tuned i.f. stages, '55 second diode detector, diode A.V.C.—first audio, '58 electron coupled audio beat oscillator, two 2A5 triodes push-pull Class A Prime and 5Z3 rectifier.
- Sensitivity better than 2/5 microvolt per meter.
- Selectivity absolute 10 kc. at all wave lengths.
- Fidelity flat to 6 db. from 30 to 4000 cycles.
- Ten watts undistorted power output.
- Exceptionally low noise-to-signal ratio that makes foreign reception actually possible EVERY day.
- Dual ratio single tuning dial—8:1 ratio for broadcast band and 40:1 for easy tuning and separation of sharp short wave stations. Totally new, smooth, easy and positive tuning.
- Accurately calibrated, 270 degree illuminated full vision airplane dial.
- Automatic volume control that actually eliminates fading.
- Audio beat oscillator for quick finding of SW stations and code reception.
- Positive long life six-section coil switch selecting twelve different low loss coils and sixteen capacities at the turn of a knob.
- Tuned r.f. stage on all four bands.
- Two air tuned high gain i. f. stages, not one as in other sets of even higher price.
- Diode second detector for minimum distortion.
- Nine tuned circuits on all bands.
- Tone control for individual tone taste and noise reduction.
- Two audio stages.
- Push-pull Class A Prime distortionless ten watt power output stage.
- Twelve inch Jensen concert dynamic speaker.
- Fully shielded against outside pickup.
- Polished chromium chassis.
- Oversize transformers and condensers for long trouble-free life.
- Completely sealed and impregnated against tropic or arctic climates.
- Fully A.C. operated with no hum.
- Give the WORLD WIDE NINE a side by side test and watch it out-demonstrate any other set on every count—let it give you every day "stunt" reception you can't get on other sets.

THE WORLD WIDE NINE

Twice as Much Radio for Your Money

The World Wide Nine is the first really custom-built all-wave receiver offered at a low price. It is the first precision instrument ever made available at no greater cost than factory production jobs. Look at its features listed at the left. Then consider that every World Wide Nine produced in my laboratory is built to actual laboratory standards and checked on transoceanic reception by myself, prior to shipment. If you want volume to fill a cathedral . . . if you want a hundred stations on the broadcast band . . . if you want solid enjoyment of foreign short wave stations, minus the usual sputter and noise . . . order a World Wide Nine on



10 DAY TRIAL

Try the World Wide Nine in your own home under your own reception conditions. If after 10 days you think it possible for some other receiver to beat its performance, you can have every cent of your money back instantly without argument or question. Simply send the World Wide Nine back to me, and I'll send your check immediately. Please use the coupon order form from this page.

McMURDO SILVER, INC., 3352 N. Paulina Street, Chicago, Ill.

McMURDO SILVER, INC., 3352 N. Paulina Street, Chicago, Ill.

Ship me for trial with guarantee that if I am dissatisfied I may reship it to you within 10 days after receipt for full refund:

Check Items Desired	List Price	Your Net Price
☐ WORLD WIDE NINE receiver and 12-inch speaker	$133.25	$79.95
☐ Kit 9 Matched Raytheon tubes	15.20	9.12
PRICE FOR RECEIVER, LOUD SPEAKER AND TUBES		**$89.07 net**
☐ Walnut front panel 10 x 9 inches	3.50	2.10 net

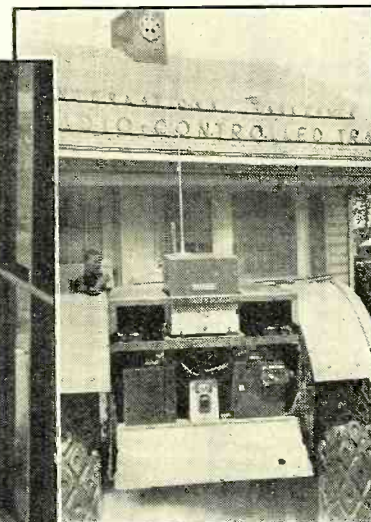
Enclosed find $15.00 deposit ☐ check ☐ money order (or full remittance to save C. O. D. collection charges). Ship balance C.O.D. express.

WRITE NAME AND ADDRESS IN MARGIN

MASTERPIECE II — The Official All-Wave Receiver of the Second Byrd Antarctic Expedition

RADIO FARM ROBOTS

THE ROBOT TRANSMITTER
Operator throwing switch for controlling radio tractor



RADIO FEATURED—
At left is the radio-controlled tractor with the robot farmer seated in rocking chair supposedly reading and watching tractor work. Above: Rear view of tractor, showing receiver and batteries with relay switch and rod antenna. Rear compartment is normally closed

DOTS • • • • • and — — — DASHES

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

De Forest Promises $200 Television Sets

CHICAGO—Dr. Lee De Forest, pioneer radio inventor of Los Angeles, declared recently that television receivers will be on the market at $200 to $250 next year.

Byrd Rings Liberty Bell

PHILADELPHIA—Admiral Richard E. Byrd, at Antarctica, tapped out (on a radio-telegraph key) eight dashes that were transmitted by radio to Philadelphia, where they caused a tiny hammer to tap out eight dull metallic notes on the cracked Liberty Bell, to commemorate American liberty on July 4th.

Radio from a Glider

ELMIRA, N. Y.—W. E. Eaton recently broadcast to a crowd on the ground, by radio, from a soaring glider in which he was flying.

New Kind of Sound?

NORTHFIELD, MINN.—Evidence that meteors give off some sort of a wave in air producing "sounds" that travel with a speed of light, was outlined recently by H. H. Nininger of Denver, secretary of the Society of Research on Meteorites. (Light travels at about 186,000 miles per second, whereas ordinary sound travels about 1000 feet per second.—*Editor's Note.*)

Latest Stratosphere Attempt

RAPID CITY, S. D.—In the preparations for the stratosphere flight of Major William E. Kepner and Captain A. W. Stevens, radio was a most important consideration. The National Broadcasting Company, at great expense, designed special transmission and reception equipment to assure constant two-way communication between the gondola and land stations. The flight, jointly sponsored by the United States Army Air Corps and the National Geographic Society, was considered the most important stratospheric venture to date.

Station W1OXCW, in the gondola, was equipped with an 8-watt compact transmitter utilizing a tourmaline-crystal frequency stabilizer instead of the usual quartz variety. This was essential because it dispensed with the multipliers that would be needed with the quartz type and the additional weight was prohibited. In advance of the take-off, NBC engineers decided to utilize the 13,050-kilocycle channel during the entire flight. It was essential to pre-set and lock the controls before the ascent. The receiver, also a very compact affair, was equipped with a variety of coils to assure tuning in signals on all wavelengths. All of the equipment utilized dry batteries for power supply. The antenna was placed in the rigging between the gas-bag and the gondola.

The entire transmitting and receiving apparatus, including batteries, weighed 192.8 pounds. NBC engineers were forced to design the equipment within specific weight-and-size limitations.

NEW RADIO-RELAY CAR
Station CKLW, C. B. S. outlet at Detroit-Windsor, has a new radio-equipped Ford as a remote-control pick-up

WAY UP IN THE AIR!
"Where there isn't much air," that is where this equipment was designed for. At left: Major W. E. Kepner and Capt. A. W. Stevens inside their stratosphere gondola testing their special transmitter and receiver. Below: "Skeets" Miller, the N. B. C. director of special event broadcasts on the ground. He supervised broadcasts

—AT WORLD FAIR

Officials holding relay that opened Fair. Admiral Byrd sent radio impulse from Antarctica to operate relay. At right: Singing over a beam of light

LIGHT-BEAM MUSIC

BLACK SHIRTS, BLUE SHIRTS, GRAY SHIRTS, OR WHAT HAVE YOU?

No matter what color shirts they are wearing nowadays, they all use public-address systems. At a monster U. I. P. (Blue Shirts) meeting at Drogheda, County Louth, Ireland, a modern public address system was used when 5000 were addressed by Gen. O'Duffy

With receiving and transmitting stations located at vantage points throughout the nation, to contact the balloon on its hazardous flight, constant two-way communication was reasonably assured. Plans were made to broadcast certain portions of the two-way conversation over the NBC coast-to-coast hook-up. The bulk of the communications, however, were planned to be private messages between the balloonists and Government officials and other scientific groups. (*Editor's Note:* Next month's issue will contain an exclusive and official article on the radio angles of this adventure to the world's "jumping off" place.)

Droitwich Is to Be Opened in September

LONDON, ENGLAND—A new English station, at Droitwich, which will replace the long-wave station, 5XX, will be officially inaugurated in September.

New Marine Radio Service

CAMDEN, N. J.—People aboard ship may now send messages, at economical rates, to any point in the United States by a new service of the Radiomarine Corporation of America by means of which radio messages are transmitted to land stations and are then mailed from there to the receiving address. The service is known as the "Sea Letter Telegram" service.

American Sponsored International Broadcasts

NEW YORK—The first commercially sponsored series of international broadcasts from Europe, on American broadcast bands, was heard over the NBC networks in July. These broadcasts, which are sponsored by an American firm, originate in England in the studios of the British Broadcasting Company under the direction of Christopher Stone and in Germany from the German short-wave broadcasting system under the direction of Kurt V. Boeckmann. In Paris they originate from the studios of Radio Coloniale (FYA), under the direction of the Minister of Posts and Telegraphs, and in Vienna at the studios of the Austrian governmental system, Ravag. The first four programs in these series were variety shows with such artists as Gertrude Lawrence, John Tilley, Danny Malone, Carrol Gibbons, Lucienne Boyer and the Welsh Guards. The Philco Company has been broadcasting to world listeners on short waves for almost a year, however.

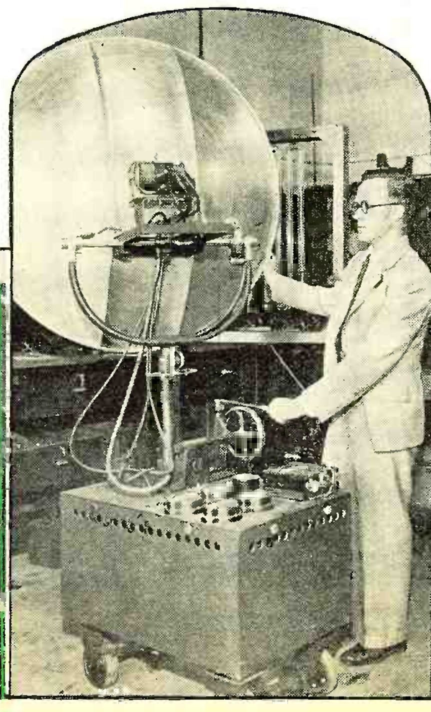
Some broadcasting authorities see in this latest attempt a method for keeping up the interest of American listeners on *broadcast-band* reception while letting them hear broadcasts from foreign countries. It has been felt, in certain circles, that the ever-growing interest in *short waves* might damage the regular local broadcasting facilities in America. The new plan brings international programs direct to listeners on the *broadcast* waves.

Four-Inch Radio Waves

PHILADELPHIA—With the aid of a miniature "synthetic ionosphere" or Heaviside layer produced by laboratory methods, radio engineers of RCA have recently succeeded in generating and receiving radio waves of only four inches in length. The waves are transmitted between points in Camden and Philadelphia, about two miles apart. (*Continued on next page*)

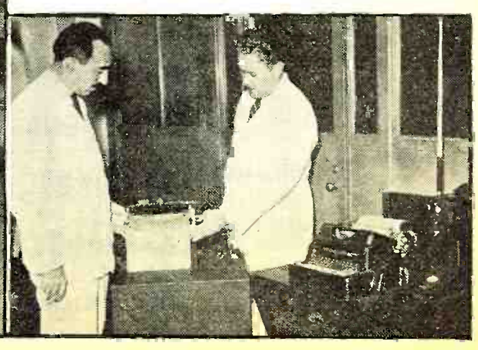
NEW STATION AT DENVER

This is the control room of the new 50-kilowatt radio station KOA of the General Electric Company



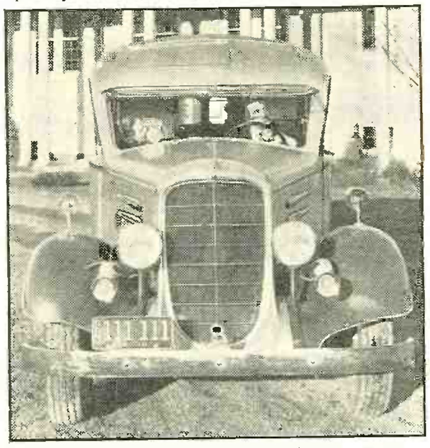
TWO NEW INVENTIONS

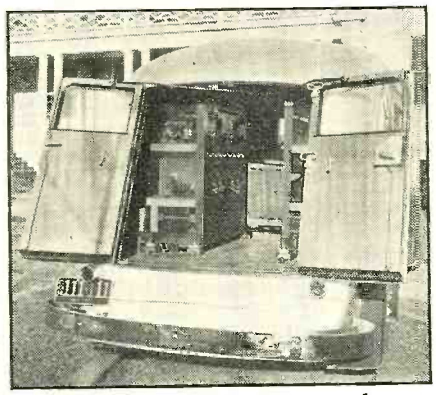
At left is the new 4-meter radio wave generator developed by RCA engineers. Below: Testing new radio "teletype" which is operated by radio signals on a wavelength of 8 meters. Photo shows Rex Martin, assistant director of Air Commerce and Walter S. Lemmon (who developed the device)



Super-Audible Sounds Kill Germs

BERKELEY, CALIF.—Killing germs with sounds which are too high-pitched to be heard is a new method of fighting disease announced at the University of California here. A "silent whistle" is produced by a quartz crystal vibrating at a frequency of 450,000 cycles per second.





N. B. C. REMOTE-CONTROL CAR
A front view and an inside rear view of the completed mobile s.w. relay broadcast transmitter car

New American Network

NEW YORK—A new network, the American Broadcasting System, has been formed here by George B. Storer, director of Station WMCA. Seven Eastern stations were in the new chain's roster at the time of the first program, but it was predicted that the list would be lengthened in the Fall. WMCA, which had previously operated under the name of the Federal Broadcasting System, is the key station. Stations in the hook-up at the beginning of the enterprise included WOL, Washington; WPEN, Philadelphia; WRPO, Providence; WTNJ, Trenton; WDEL, Wilmington, and WCBM, Baltimore. The chain is frequently referred to as "ABS" and the initials may sometimes be confused with those of the old Ed Wynn chain—the Amalgamated Broadcasting System.

Radio Earnings Increase

WASHINGTON—Gross revenue of the two large American radio broadcast networks was greater by 38.5%, from December, 1933, to May, 1934, and a year ago, according to testimony given recently at a N.R.A. hearing on proposed amendments to the Code for the Industry.

WNYC "On Probation"

NEW YORK—Mayor LaGuardia recently put the municipal broadcasting station WNYC "on probation" until the end of the year, while announcing a radical change in program policy.

ANN ARBOR, MICH.—The University of Michigan offers a new course in broadcasting technique, starting in September.

Radio News
September, 1934

The SECRET OF SUCCESS on SHORT WAVES

(The Editor—To You)

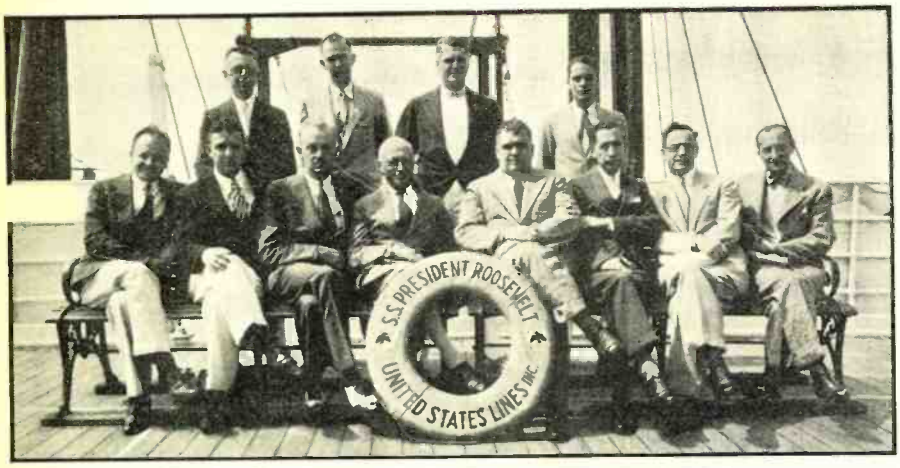
Everyone is asking about short-wave reception. Is it possible to hear this station in Europe, that station in Japan? How does one go about finding the stations? Read this editorial and find out for yourself. It tells you how-and-why you can succeed

WHAT good is the finest short-wave set if you cannot find any short-wave stations to tune in? The obvious answer to this question also indicates the first problem facing the prospective short-wave listener, whether he is just "breaking into" the short-wave game or whether he is an old-timer. Differences in time, at various longitudes on earth, form one of the greatest "hazards" to the uninitiated short-wave user. And then the mere fact that international short-wave stations operate on frequencies from about 21,000 kc. to 1,500 kc. indicates that there are about 2,000 "channels" for broadcasting stations. What chance has the short-wave listener got in finding a station that may be broadcasting on *one channel among 2,000,* over a period of *an hour or two out of each 24 hours?* Just as much chance as finding a needle in a haystack!

These are the main reasons why RADIO NEWS, almost two years ago, *pioneered* the idea of a Short-Wave DX Corner and a World Short-Wave Time-Table, listing hour by hour (in world and local time) the short-wave stations that were *on* during that period, giving their wavelengths, their frequencies and their location, as well as call letters. These are also why RADIO NEWS *pioneered* in setting up its own well-equipped reception laboratory (at the Westchester Listening Post) with a competent observer to log stations heard during these hours so that the results could form the basis of the World Short-Wave Time-Table. These are also (*Continued on page* 179)

RADIO NEWS DX STAFF ANALYZING AND CHECKING OFFICIAL LOGS

This tedious but worthwhile task is completed each month just before going to press. The information it contains is used to check the data used in preparing the World Short-Wave Time-Table



AMERICAN DELEGATION TO MADRID CONFERENCE

Seated: Dr. J. H. Dellinger, Mr. Gerald C. Gross, Lt. W. T. Guest, Dr. Lichtenstein, Dr. Jolliffe, Judge Sykes, Dr. Stewart, Major Friedman. Standing: Lt. Comdr. Webster, Mr. Walls, Lt. Comdr. Redman, Mr. Haden

THE WORLD'S FIRST TELECOMMUNICATION CONVENTION

Gerald C. Gross

A NEW communication treaty has become effective for the nations of the world. After several months of laborious work in Madrid, Spain, government delegates, representing every important nation, settled their major differences in radio, telegraphy and telephony and adopted the world's First Telecommunication Convention. This Convention, which is supplemented by three separate sets of Regulations Covering Radio, Telegraphy and Telephony, replaces not only the Washington Convention and Regulations of 1927 and the Brussels telegraph regulations of 1928, but also the time-worn and tradition-bound Telegraph Convention of St. Petersburg, 1875.

The word "Telecommunication" is now officially adopted for the first time by all the nations of the world to cover "Any telegraph or telephone communication of signs, signals, writings, images, and sounds of any nature, by wire, radio, or other systems or processes of electric or visual (semaphore) signaling."

The highly efficient International Bureau of the Telegraph Union, on the 1st of January, 1934, became the Bureau of the International Telecommunication Union, Berne, Switzerland, and it, undoubtedly, will continue to function with the same care and accuracy for which it has been noted since its inception.

Because of the close relationship between radio communication, and communication by wire telephone and wire telegraph, it had long been felt that unification in their control from an international standpoint would be desirable and should be achieved. With this in mind, the International Telegraph Conference of Paris, 1925 and the International Radiotelegraph Conference of Washington, 1927, went on record as favoring the fusion of the two Conventions at some future conference. Arrangements were then made by Spain as the host nation to hold the radio and the telegraph conferences simultaneously. Many months before the two conferences met, draft proposals for a joint convention were circulated to all Governments.

Thus, the Telecommunication Convention adopted at Madrid was a result of the fusion of the existing Telegraph Convention of St. Petersburg, 1875, to which the United States was not a party, and the Washington Radiotelegraph Convention of 1927, which was signed and ratified by the United States.

The Convention itself for the most part establishes broad general principles covering all phases of the communication field. From the point of view of the American delegation, it was important to avoid specific commitments concerning telephony and telegraphy, which, while easy to apply in nations which operate their own telephone and telegraph services, might be too much involved in operation and management questions for the United States, where the greater part of the communication business is handled by private companies.

The International Telecommunication Union, replacing the old International Telegraph Union, is created in the first Article of the new Convention. The Union covers radio, telegraphy, and telephony in its unification of these services under a joint Secretariat at Berne.

The next Article sets forth the regulations annexed to the Convention, and is in accord with the precedent established by the International Radio telegraph Conference of Washington. The radio regulations are divided into two parts: The General Radio Regulations covering international rules and regulations applicable to all the nations in common, and the Additional Radio Regulations which deal with more detailed questions of management and charges and are applicable more specifically to nations in which the communication services are operated by the Government.

Since the American delegation signed only the International Telecommunication Convention and the General Radio Regulations, the Government of the United States will have obligations only with respect to radio and will not be bound by provisions dealing with telegraphy and telephony.

The Convention itself is divided into five chapters. Chapter I, "Organization and Functioning of the Union" contains the first seventeen Articles. For the most part, the material in these Articles

CHAIRMEN AND VICE CHAIRMEN OF COMMITTEES

Left to right: M. Fis, France; Dr. Giess, Germany; Ch. Gneme, Italy; Mr. Phillips, Great Britain; Dr. Hirschfeld, Soviet Russia. In the group standing are: Hon. Duranleau, Minister of Marine, Canada; Mr. Christiansen, Denmark; Judge Sykes, U. S. A.; Mr. Boetje, Netherlands; Mr. Angset, Norway; Mr. Esson, New Zealand; M. Cassagnac, France; Mr. Pasrischa, India; Mr. Studer, Berne Bureau; Dr. Wang, China; Mr. Gross, U. S. A.; Col. Angwyn, Great Britain; Mr. Chamiec, Poland; Mr. Kucera, Czechoslovakia; M. Montefinale, Italy

corresponds to provisions in the Internatonal Radio Telegraph Convention of 1927.

Chapter II, headed "Conferences" contains articles 18, 19, 20, and 21, and covers: "Conferences of Plenipotentiaries and Administrative Conferences," "Change of Date of a Conference," "Internal Regulations of the Conferences," and "Language."

Chapter III, entitled "General Provisions," includes Articles 22 to 23 inclusive. These articles cover "Telecommunication as a Public Service," "Responsibility," "Secrecy of Telecommunications," "Constitution, Operation and Protection of the Telecommunication Installations and Channels," "Stoppage of Telecommunications," "Suspension of Service," "Investigation of Violations," "Charges and Franking Privileges," "Priority of Transmission for Government Telegrams and Radiotelegrams," "Secret Language," "Monetary Unit" and "Rendering of Accounts."

In this Chapter, Article 25, requiring facilities for a rapid and uninterrupted exchange of international communications represents a new principle insofar as the United States is concerned.

Article 26 involves the question of censorship in that it provides for the stoppage or non-interruption of any private telegram, radiotelegram, or telephone conversation by one of the high contracting governments should such a telecommunication appear dangerous to the safety of the state or contrary to the laws of the country, to public order, or to decency.

Chapter IV is headed "Special Provisions for Radio." This chapter contains Articles 34 to 39 inclusive, and deals with "Intercommunication," "Interference," "Distress Calls and Messages," "False or Deceptive Signals—Irregular Use of Call Signals," "Limited Service," and "Installations of National Defense Services." The general matters covered by this chapter correspond very closely to similar articles in the International Radiotelegraph Convention of 1927.

Chapter V, headed "Final Provisions," closes the Convention with Article 40.

An inspection of the General Radio Regulations of Madrid we see that with very few exceptions, the table of allocation of frequencies, which is the heart of the Regulations, follows closely the pattern of the Washington General Regulations.

The American delegation at Madrid made every endeavor to continue with as few changes as possible, the allocation of frequencies made by the Washington Regulations. A very large number of stations have become established throughout the world on the basis of this allocation, and the desire was generally expressed at Madrid to make no arbitrary changes in the existing allocation, or changes which did not appear absolutely necessary. The final allocation table as agreed upon at Madrid, is shown in Figure No. 1. Although this allocation table is no longer merely a guide, but is to be followed by all nations in their assignment of frequencies

(*Continued on page* 167)

MADRID ALLOCATION OF FREQUENCY BANDS BETWEEN 10 AND 60,000 KC. (30,000 AND 5 M)

FREQUENCIES KC.	WAVE-LENGTHS M	SERVICES		
		GENERAL ALLOCATION	REGIONAL AGREEMENTS	
			EUROPEAN REGION	OTHER REGIONS
10-100	30,000-3000	FIXED		
100-110	3,000-2,727	FIXED AND MOBILE		
110-125	2,727-2,400	MOBILE		
125-150	2,400-2,000	MARITIME MOBILE (OPEN TO PUBLIC CORRESPONDENCE EXCLUSIVELY)		
150-160	2,000-1,875	MOBILE		
160-285	1,875-1,053		BROADCASTING. AERONAUTICAL. SERVICES NOT OPEN TO PUBLIC CORRESPONDENCE	FIXED MOBILE AERONAUTICAL
285-290	1,053-1,034		AERONAUTICAL	RADIOBEACON
290-315	1,034-952	RADIOBEACON	MARITIME RADIOBEACON	
315-320	952-938		MARITIME RADIOBEACON	AERONAUTICAL
320-325	938-923		AERONAUTICAL	AERONAUTICAL MOBILE NOT OPEN TO PUBLIC CORRESPONDENCE
325-345	923-870	AERONAUTICAL		
345-365	870-822		AERONAUTICAL	AERONAUTICAL MOBILE NOT OPEN TO PUBLIC CORRESPONDENCE
365-385	822-779	RADIO DIRECTION FINDING AND MOBILE		
385-400	779-750		SERVICES NOT OPEN TO PUBLIC CORRESPONDENCE	MOBILE
400-460	750-652	MOBILE		
460-485	652-619	MOBILE		
485-515	619-583	MOBILE (DISTRESS, CALLING, ETC)		
515-550	583-545	SERVICES NOT OPEN TO PUBLIC CORRESPONDENCE		
550-1500	545-200	BROADCASTING 1364 KC (220 m) FOR MOBILE SERVICES EXCLUSIVELY		
1500-1715	200-174.9		FIXED, MOBILE	FIXED, MOBILE
1715-2000	174.9-150		AMATEUR, FIXED AND MOBILE	AMATEUR, FIXED AND MOBILE
2000-3500	150 -85.71	FIXED AND MOBILE		
3500-4000	85.71-75.0	AMATEUR, FIXED AND MOBILE		
4000-5500	75.0 -54.55	FIXED AND MOBILE		
5500-5700	54.55-52.63	MOBILE		
5700-6000	52.63-50	FIXED		
6000-6150	50 -48.78	BROADCASTING		
6150-6675	48.78-44.94	MOBILE		
6675-7000	44.94-42.86	FIXED		
7000-7300	42.86-41.10	AMATEUR		
7300-8200	41.10-36.59	FIXED		
8200-8550	36.59-35.09	MOBILE		
8550-8900	35.09-33.71	FIXED AND MOBILE		
8900-9500	33.71-31.58	FIXED		
9500-9600	31.58-31.25	BROADCASTING		
9600-11,000	31.25-27.27	FIXED		
11,000-11,400	27.27-26.32	MOBILE		
11,400-11,700	26.32-25.64	FIXED		
11,700-11,900	25.64-25.21	BROADCASTING		
11,900-12,300	25.21-24.39	FIXED		
12,300-12,825	24.39-23.39	MOBILE		
12,825-13,350	23.39-22.47	FIXED AND MOBILE		
13,350-14,000	22.47-21.43	FIXED		
14,000-14,400	21.43-20.83	AMATEUR		
14,400-15,100	20.83-19.87	FIXED		
15,100-15,350	19.87-19.54	BROADCASTING		
15,350-16,400	19.54-18.29	FIXED		
16,400-17,100	18.29-17.54	MOBILE		
17,100-17,750	17.54-16.90	FIXED AND MOBILE		
17,750-17,800	16.90-16.85	BROADCASTING		
17,800-21,450	16.85-13.99	FIXED		
21,450-21,550	13.99-13.92	BROADCASTING		
21,550-22,300	13.92-13.45	MOBILE		
22,300-24,600	13.45-12.20	FIXED AND MOBILE		
24,600-25,600	12.20-11.72	MOBILE		
25,600-26,600	11.72-11.28	BROADCASTING		
26,600-28,000	11.28-10.71	FIXED		
28,000-30,000	10.71-10.00	AMATEUR AND EXPERIMENTAL		
30,000-56,000	10.00-5.357	NOT RESERVED		
56,000-60,000	5.357-5.00	AMATEUR AND EXPERIMENTAL		

FIG. 1

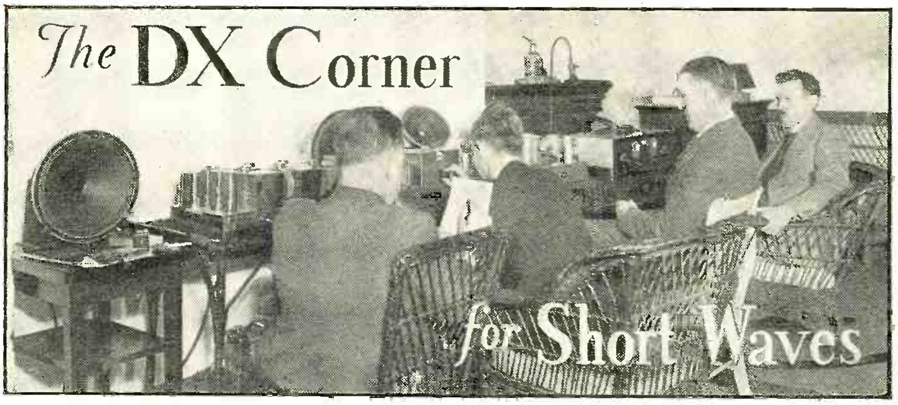
PIONEERS

Official RADIO NEWS Listening Post Observers

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

United States of America:

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



S. W. TIME SCHEDULE

LAURENCE M. COCKADAY

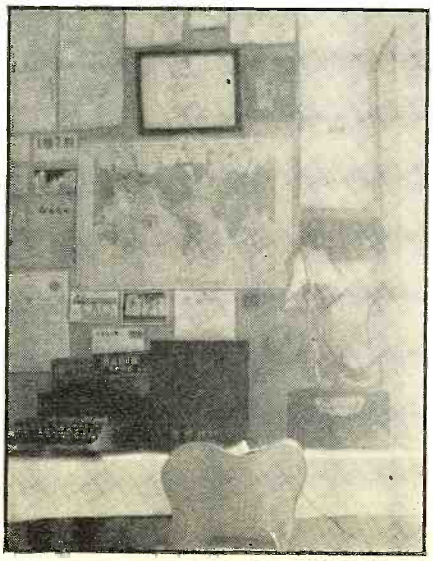
FULL 24-hour coverage in our leading feature entitled "World Short-Wave Time-Table" is now a reality in this 18th installment of the DX Corner for Short Waves. The list starts at 08, G.M.T. which is 3 a.m., E.S.T. and runs through 07, G.M.T. or 2 a.m., E.S.T. *right around the clock.* The Time-Table contains a list of short-wave stations logged during the last month in the RADIO NEWS Westchester Listening Post as well as at other official RADIO NEWS Short-Wave Listening Posts throughout the world. The Time-Table also contains a list of Station Locations, giving wavelength, call letters, frequency and country. The Editor believes this to be the most complete and informative symposium of reception data on Short-Waves ever to be compiled under a monthly heading.

Reception Conditions This Month

O.R.N.S.W.L.P.O.'s report rather interesting conditions for the past month. They report the 25-meter band in America best after dark with the 31-meter band best during the early morning hours. The 40-meter band has been noisy and quite worthless until evening. The 19-meter band, although fine in the early morning hours, sort of "slumped" during the daytime until midafternoon. During the next 30 days we should expect to see the higher wavelength bands increase in signal strength slightly and become less noisy. But it is believed that the 19, 25 and 31-meter bands will still be best.

W. VA. LISTENING POST

The listening post of O. R. N. S. W. L. P. O. Kenneth R. Boord, located in the heart of what Mr. Boord terms "Little Switzerland of America"



Outstanding Short-Wave Reception Features

The outstanding features in America seem to be the way DJD and FYA have been pounding in after dark almost up to midnight. There has also been increasing interest in South American stations as they have been coming in more regularly. Other leading reception features have been the Japanese and other Oriental transmissions.

The German Transmissions

An official communication from Richsfundfungesellschaft states that the German short-wave stations will be on the air as shown in this month's "World Short-Wave Time-Table."

CP5 Transmissions

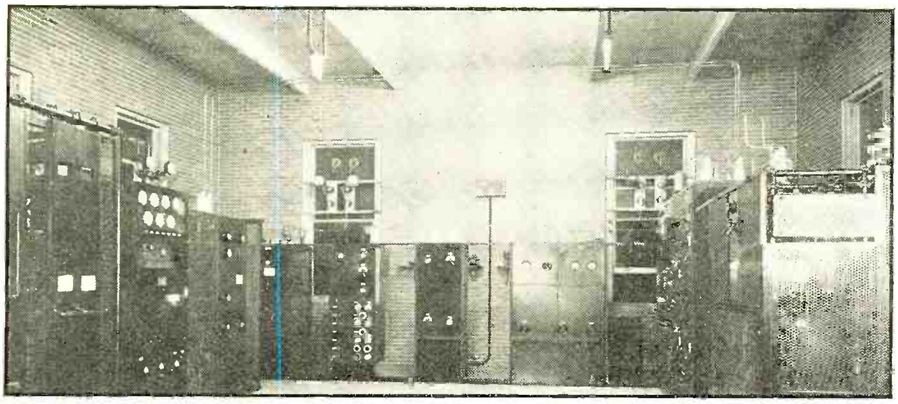
An official communication from Compania Radio Boliviana states that short-wave station CP5 at La Paz, Bolivia, has discarded the idea of transmitting on 9120 kc. and have decided to continue on the lower frequency of 6080 kc. They are broadcasting irregularly on this latter frequency but expect to be on the air regularly shortly.

CR7AA Transmissions

An official communication from Gremio dos Radiofilos da Colonia de Mozambique for station CR7AA at Lourenzo Marques, Portuguese East Africa, states that their station is transmitting on a wavelengh of 84.67 meters at a frequency of 3543 kc. with a power of 150 watts. Their transmissions are on Mondays, Thursdays and Saturdays from 18:30 to 20:30. G.M.T,

The Dutch East Indian Transmissions

An official communication from the engineer in charge of the Java radio stations gives a list of stations broadcasting on short waves as follows: Batavia, Java, 4330 kc., 0.2 kw., on the air 03:30-06:30, 09:30-15:30, G.M.T.; Bandoeng, Java, 6040 kc., 3 kw., on the air 03:30-06:30, 09:30-15:30, G.M.T.; Semarang, Java, 4370 kc., 0.2 kw., on the air 03:30-06:30, 09:30-15:30, G.M.T.; Soerabaja, Java, 6120 kc., 3 kw., on the air 13:30-06:30, 09:30-15:30, G.M.T.; Solo, Java, 0.5 kw., on the air 10:00-16:00, G.M.T.; Bandoeng, Java,



TRANSMITTING ROOM AT FAMOUS PITTSBURGH STATION

Here is shown the short-wave transmitter panels of station W8XK, which has been heard in almost every country of the globe. The station's call letters appear on practically every list of Best Bets sent in to RADIO NEWS *from 76 foreign countries. Its signals are heard on the American continents, clear and loud, on one tube sets*

PMA, 19345 kc., 40 kw.; Bandoeng, Java, PLE, 18830 kc., 40 kw.; Bandoeng, Java, PMC, 18135 kc., 40 kw.; Bandoeng, Java, PLP, 11000 kc., 3 kw.; Bandoeng, Java, PMN, 10260 kc., 3 kw.; Bandoeng, Java, PLV, 9415 kc., 80 kw.; Medan, Sumatra, VBG, 1040 kc.; Makasser, Celebes, PNI, 8775 kc., 3 kw. There are no regular schedules for the last eight stations, which are 'phone stations broadcasting occasionally, using directional aerials towards Europe, America, Australia or Far East.

LSX-LSY Transmissions

An official communication from Transradio Internacional states that stations LSX-LSY are point-to-point commercial stations and not broadcasting stations, and therefore the company cannot supply any time-schedule material.

Russian Transmissions

An official communication from Radio Centre, Moscow, states that the two stations, RV59 and RNE, will be on the air at times as shown on our Time-Schedule during the remainder of the summer.

British Empire Transmissions

An official communication from the British Broadcasting Company states that the Empire transmissions will be as shown in this month's "World Short-Wave Time-Table," with the following alternatives: GSE may be substituted for GSD or vice versa. GSC or GSA may be substituted for GSB. The frequency of station GSE has been changed to 11860 or a wavelength of 25.29.

Two Stations Off the Air Temporarily

Mr. C. H. Armstrong, O.R.N.S.W.L.P.O. for Georgia, sends us in official word that station I2RO is off the air for a short time making improvements. He also has official word that station COC is off the air on account of improvements. (*We have had word that there was a fire at station COC and that they were partly destroyed. We are keeping both of these stations on this month's log in the hope that they will shortly be back with us again. Editor's note.*)

Vatican's Radio Director Dies

VATICAN CITY: Father Giuseppe Gianfranceschi, director of the Vatican's short-wave radio station, HVJ, and an eminent scientific figure in Rome, died recently after a long illness. He was former director of the Gregorian Academy of Scientists and president of the Newlintee Scientific Academy. With Guglielmo Marconi he helped design and install the broadcasting apparatus of the Vatican radio station and directed it until his death.

Listening Post Observers and Other Fans, Please Note!

Listed below is this month's partial information regarding short-wave stations heard and reported by our World-Wide Listening Posts. Can you supply actual Time-Schedules, actual Wavelengths, correct Frequencies and any other information regarding them? There are some hard ones to pull in here, so get busy and try your skill in logging these stations and getting correct information about them. When you are satisfied you are correct, send this information in to the Editor. The list follows:

HJ3AVF reported on 48 meters, 7 to 11 p.m., E.S.T.

HJ4ABB reported on 42 meters, 7 to 10 p.m., E.S.T.

CR6AA reported heard on 41.6 meters.

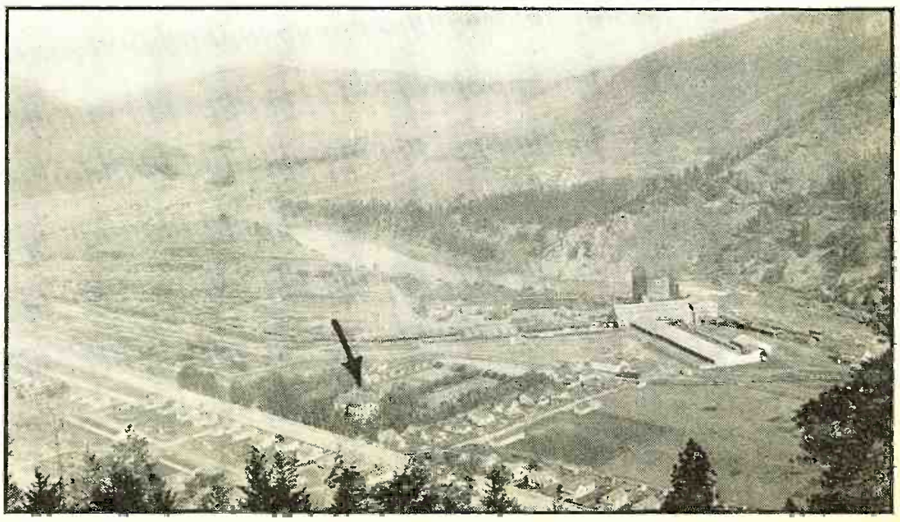
EA8CF reported on 4.6 meters, 7:15 to 11:30 p.m., E.S.T.

JES reported irregularly evenings on 15620 kc., testing with KWU. This is believed to be Osaka, Japan, reported heard at 19, G.M.T.

Who knows who JET, JBT, JVT are? (If any.) (*Continued on page* 143)

APPOINTED FOR MONTANA

Mr. Henry Dobrovolny has just been appointed Listening Post Observer for Montana. His Post is shown below (with arrow pointing to it). His name appears in next month's list



PIONEERS

Official RADIO NEWS Listening Post Observers

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

Australia, C. N. R. Richardson, C. Arthur Matthews, A. H. Garth.

Brazil, W. W. Enete.

British Guiana, E. S. Christiani, Jr.

British West Indies, E. G. Derrick, Edela Rosa.

Canada, Douglas Wood, Jack Bews, W. H. Fraser, Robert Edkins, Charles Eugene Roy, J. T. Atkinson.

Chile, Jorge Izquierdo.

China, Baron P. D. N. von Hoyningen-Huene.

Cuba, Frank H. Kydd.

England, Kenneth Judd, C. L. Wright, John J. Maling, Alan Barber, Donald Burns, L. H. Plunkett-Checkemian, L. H. Colburn, Norman C. Smith and John Parkinson, Norman Nuttall, L. C. Styles, Frederick W. Gunn, R. Lawton, R. Stevens, W. P. Kempster, R. S. Houghton.

France, J. C. Meillon, Jr.

Honduras, R. Wilder Tatum.

Hawaii, O. F. Sternemann.

India, D. R. D. Wadia.

Mexico, Felipe L. Saldana.

New Zealand, Dr. G. Campbell MacDiarmid, Kenneth H. Moffatt.

Philippine Islands, Victorino Leonen.

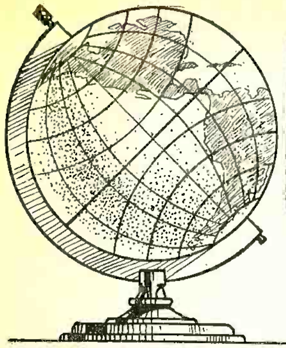
Scotland, Duncan T. Donaldson.

South Africa, C. McCormick, Mike Kruger.

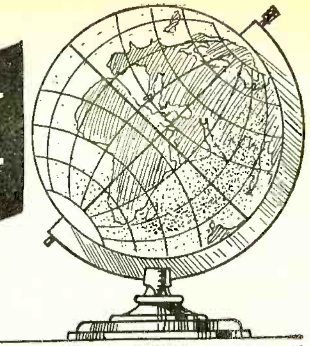
Switzerland, E. J. de Lopez, Dr. Max Hausdorff

Venezuela, Francisco Fossa Anderson.

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



WORLD SHORT WAVE TIME-TABLE



THE WORLD SHORT

The schedule of short-wave broadcasting stations listed below includes only those that are received best in RADIO NEWS LISTENING POSTS. This new schedule is from 8 G. M. T. right around the clock. Both wavelength and frequency are noted for each station. Station locations are found on page 142.

International Short-Wave "Best Bets"

08 G. M. T. 3 A. M. E. S. T.

Wavelengths in Meters	*Call Letters*	*Frequency in k.c.*
27.9+	JVM	10740
30.4 Irregular	JYS	9840
31.3 Except Sun.	VK3LR	9580
31.4+ Sun.	LKJ1	9540
31.5 Wed., Sat.	VK3ME	9510
38.0+	JYR	7880
48.9+ Except Sun.	ZTJ	6122
49.4+ Tues.	VQ7LO	6060
70.2 Except Sun.	RV15	4273

09 G. M. T. 4 A. M. E. S. T.

19.7 Sun.	DJB	15200
27.9+	JVM	10740
28.1	CEC	10670
30.4+	JYS	9840
31.3 Except Sun.	VK3LR	9580
31.3 Wed., Sat.	VK3ME	9510
31.3+ Sun.	DJA	9560
31.4+ Sun.	LKJ1	9540
38.0+	JYR	7880
48.9+ Except Sun.	ZTJ	6122
49.9+ Ex. Tu., Th., Sat.	RV59	6000
70.2 Except Sun.	RV15	4273

10 G. M. T. 5 A. M. E. S. T.

19.7 Sun	DJB	15200
19.8+ Except Sun.	HVJ	1512
27.9+	JVM	10740
28.1	CEC	10670
30.4+	JYS	9840
31.2+Sun.	VK2ME	9590
31.3 Except Sun.	VK3LR	9580
31.3+	DJA	9560
31.4+	LKJ1	9540
31.5 Wed., Sat.	VK3ME	9510
38.0+	JYR	7880
48.9+ Except Sun.	ZTJ	6122
49.4+ Mon., Wed., Fri.	VQ7LO	6060
49.8+ Mon., Wed., Thur	ZHI	6012
50.2 Sun.	HVJ	5969
52.9+	XQAJ	5660
70.2 Except Sun.	RV15	4273

11 G. M. T. 6 A. M. E. S. T.

13.9+	GSH	21470
14.2+	LSN	21020
16.8+	GSG	17790
25.1+ Sun.	RNE	11924
30.4+	JYS	9840
31.2+ Sun.	VK2ME	9590
31.3 Except Sun.	VK3LR	9580
31.4+ Irregular	LKJ1	9540
31.2+ Sun.	VK2ME	9590
31.3 Except Sun.	VK3LR	9580
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.4+ Irregular	LKJ1	9540
31.8 Except Sat., Sun.	PLV	9415
48.9+	ZTJ	6122
49.0+	YV2RC	6112
49.0+	VE9HX	6110
49.2 Thurs., Fri., Sat.	VE9GW	6095
49.3+ Tues.,Thurs.,Irreg.	OER2	6072
49.4+ Irregular	W8XAL	6060
70.2	RV15	4273
80.0 Sun.	CT1CT	3750

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

13.9+	W8XK	21540
14.2+	LSN	21020
15.2+	IRW	19700
16.8+	GSG	17790
16.8+	W3XAL	17780
16.8+ Ex. Tues., Wed.	PHI	17775
19.6+	W2XE	15270
19.6+	FYA	15243
19.7	W8XK	15210
19.7	DJB	15200
19.8	GSF	15140
19.8	VE9DN	15130
19.8+ Irregular	HVJ	15123
25.1+ Sun.	RNE	11924
25.2+	GSE	11860
25.4+ Sun.	W1XAL	11790
26.8 Sun.	CT3AQ	11180
30.0+	KAZ	9990
30.5+ Irregular	IRM	982
31.2 Sun.	VK2ME	9590
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.4+ Irregular	LKJ1	9540
31.8 Irregular	PLV	9410
48.9+	ZTJ	6122
49.0+	YV2RC	6112
49.0+ Except Sat., Sun.	VE9HX	6110
49.2 Ex. Mon., Tu., Wed.	VE9GW	6095
49.3+ Tues., Thurs. Ir.	OER2	6072
49.4+ Sun.	VQ7LO	6060
49.4+	W8XAL	6060
49.8+ Sun.	ZHI	6012

16 G. M. T. 11 A. M. E. S. T.

13.9+	W8XK	21540
14.2+	LSN	21020
16.8+	W3XAL	17780
17.3+ Fri.	W3XL	17300
19.6+	W2XE	15270
19.7	W8XK	15210
19.8	GSF	15140
25.2	FYA	11900
49.0+ Except Sat., Sun.	VE9HX	6110
49.2 Ex. M., T., Wed.	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.3+ Tues., Thurs. Ir.	OER2	6072
49.3+ Sun.	VE9CS	6070
49.4+ Sat. Sun.	VQ7LO	6060
49.4+	W8XAL	6060
49.4+ Temporary	OXY	6060
49.8	DJC	6020
73.0+ Except Mon.	HCJB	4107
84.6+ Mon.,Wed.,Sat.	CR7AA	3543

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

16.8+	W3XAL	17780
17.3+ Fri.	W3XL	17300
19.5 Ex. Tu., Th., Sat.	W2XAD	15330
19.7	W8XK	15210
19.8	GSF	15140
25.2	FYA	11900
25.3+	W2XE	11830
25.4	I2RO	11810
25.5	DJD	11760
29.0+	ZFD	10335
29.0+	ORK	10330
30.5+ Irregular	IRM	9820
30.6 Irregular	GCW	9790
31.2+	XETE	9600
31.2+	W3XAU	9590
31.3+	W1XAZ	9570
31.4+ Irregular	LKJ1	9540
31.5	GSB	9510
32.2+ Sun.	CNR	9300
36.2+	CM6XJ	8265
43.8+ Irregular	HAS	6840
47.5 Sun.	HIZ	6315
47.8	HI1A	6272
48.9+	ZTJ	6122
49.0+ Sun.	YV2RC	6112
49.0+ Except Sat., Sun.	VE9HX	6110
49.2 Except M., T., W.	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.3+ Tues., Thurs. Ir.	OER2	6270
49.3+ Sun.	VE9CS	6070
49.4+ Sat.	VQ7LO	6060
49.4+	W8XAL	6060
49.4+ Temporary	OXY	6060
49.8	DJC	6020
49.9+	RV59	6000
50.2+	HVJ	5969
73.0+ Except Mon.	HCJB	4107
84.6+ Mon., Thur., Sat.	CR7AA	3543

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

16.8+	W3XAL	17780
17.3+ Fri.	W3XL	17300
19.5+ Ex. Tu., Th., Sat.	W2XAD	15330
19.7	W8XK	15210
19.8	GSF	15140
25.1+ Sun.	RNE	11924
25.4+ Except Sat.	W1XAL	11790
25.5	DJD	11760
26.8	CT3AQ	11180
30.4	EAQ	9860
30.5+ Irregular	IRM	9820
31.2+ Tues., Fri.	CT1AA	9600
31.2+	XETE	9600
31.2+	W3XAU	9590
31.3	HBL	9580
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.5	GSB	9510
38.4+ Sat.	HBP	7790
43.8+ Irregular	HAS	6840
45.0+ Sun.	HC2RL	6668
46.1	HJ5ABD	6504
46.5 Sun.	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
47.5	HIZ	6315
47.8 Sun.	HI1A	6272
48.7+	YV3RC	6150
48.8+	W8XK	6140
49.0	W2XE	6120
49.0+	YV2RC	6112
49.0+ Sat.	VE9HX	6110
49.1+ Mon., Wed., Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.2 Sun.	VE9GW	6095
49.3+	CP5	6080
49.3+	W9XAA	6080
49.3+ Sun.	VE9CS	6070
49.3+ Temporary	YV5RMO	6070
49.4	W8XAL	6060
49.4+ Temporary	OXY	6060
49.8+	COC	6010
49.9+	HIX	6000
49.9+ Irregular	RV59	6000
50.4	HJ2ABA	5880
50.6 Irregular	HJ4ABE	5860

23 G. M. T. 6 P. M. E. S. T.

15.9+ Except Sat., Sun.	PLE	18864
19. ? Sun.	PRADO	?
25.2	W8XK	11870
25.4+ Sun.	W1XAL	11790
25.5	DJD	11760
25.5	GSD	11750
25.6	FYA	11720
26.8 Tues., Thurs.	CT3AQ	11180
30.4	EAQ	9860
30.5+ Irregular	IRM	9820
31.2+	XETE	9600
31.3	GSC	9585
31.3	HBL	9580
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.4+	W2XAF	9530
38.4+ Sat.	HBP	7790

WAVE TIME TABLE

31.5 Wed., Sat.	VK3ME	9510
38.0+	JYR	7880
48.9+	ZGE	6130
48.9+ Except Sun.	ZTJ	6122
49.4+ Mon. Wed., Fri.	VQ7LO	6060
49.4+ Except Sun.	W8XAL	6060
49.8	CQN	6020
49.8+ Mon.,Wed., Thu.	ZHI	6012
52.9+	XQAJ	5660
70.2 Except Sun.	RV15	4273
12 G. M. T. 7 A. M. E. S. T.		
13.9+	W8XK	21540
13.9+	GSH	21470
14.2+	LSN	21020
16.8+	GSG	17790
16.8 Ex. Tues., Wed.	PHI	17775
19.6+	FYA	15243
19.7	DJB	15200
23.3+ Sun.	CNR	12830
24.8+ Sun.	CT1CT	12082
26.0	XGR	11530
31.2+ Sun.	VK2ME	9590
31.3 Except Sun.	VK3LR	9580
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.4+ Irregular	LKJ1	9540
31.8	PLV	9415
38.0+	JYR	7880
48.9+ Except Sun.	ZTJ	6122
49.2 Thurs., Fri., Sat.	VE9GW	6095
49.4+	W8XAL	6060
49.8	CQN	6020
49.8+ Mon., Wed., Thu.	ZHI	6012
52.9+	XQAJ	5660
70.2 Except Sun.	RV15	4273
13 G. M. T. 8 A. M. E. S. T.		
13.9+	W8XK	21540
13.9+	GSH	21470
14.2+	LSN	21020
16.8+	GSG	17790
16.8+	W3XAL	17780
16.8+ Ex. Tues., Wed.	PHI	17775
17.2	J1AA	17380
19.6+	CP5	15308
19.6	FYA	15243
19.7	DJB	15200
19.8	GSF	15140
23.3+ Sun.	CNR	12830
24.8+ Sun.	CT1CT	12082
25.1+ Sun.	RNE	11924
26.0	XGR	11530
31.2+ Sun.	VK2ME	9590
31.3 Except Sun.	VK3LR	9580
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.4+ Irregular	LKJ1	9540
31.8	PLV	9415
48.9+ Sun.	ZTJ	6122
49.2 Thurs., Fri., Sat.	VE9GW	6095
49.3+ Tues.,Thurs.,Irreg.	OER2	6070
49.4+ Thurs.	VQ7LO	6060
49.4+	W8XAL	6060
49.4+ Sun.	OXY	6062
49.8+ Mon., Wed., Thur	ZHI	6010
52.9+ Irregular	XQAJ	5663
70.2	RV15	4272
14 G. M. T. 9 A. M. E. S. T.		
13.9+	W8XK	21540
14.2+	LSN	21020
16.8+	GSG	17790
16.8+	W3XAL	17780
16.8+ Ex. Tues., Wed.	PHI	17775
19.6+	CP5	15308
19.6+	FYA	15243
19.7	DJB	15200
19.8	GSF	15140
26.0	XGR	11530
25.2+	GSE	11860
25.4+ Sun.	W1XAL	11790
26.8 Sun.	CT3AQ	11180
30.0+	KAZ	9990
31.2+ Sun.	VK2ME	9590
31.3+	W1XAZ	9570
31.4+ Irregular	LKJ1	9540
36.2+	CM6XJ	8265
40.5 Except Sun.	HJ3ABD	7402
46.5	HJ1ABB	6450
47.8 Tues., Fri.	HI1A	6272
48.9+ Except Sun.	ZTJ	6122
49.0+ Sun.	YV2RC	6112
49.0+ Except Sat., Sun.	VE9HX	6110
49.2 Exc. M., Tu., W.	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.3+ Tues., Thurs. Ir.	OER2	6072
49.4+ Sat., Sun.	VQ7LO	6060
49.4+	W8XAL	6060
49.8+ Sun.	ZHI	6012
50.2	HJ2ABC	5973
17 G. M. T. 12 Noon E. S. T.		
13.9+	W8XK	21540
14.2+	LSN	21020
16.8+	W3XAL	17780
17.3+ Fri.	W3XL	17300
19.7	W8XK	15210
19.8	GSF	15140
25.2	FYA	11900
25.2+	GSE	11860
25.4	I2RO	11810
25.5	DJD	11760
25.6 Irregular	FYA	11720
26.0 Irregular	XAM	11530
30.4+ Sat.	EAQ	9860
30.6+ Irregular	GCW	9790
31.2+	XETE	9600
31.2+	W3XAU	9590
31.2+ Sun.	VK2ME	9590
31.3+	W1XAZ	9570
31.4+ Irregular	LKJ1	9540
40.5 Except Sun.	HJ3ABD	7402
45.3+	RV72	6611
46.5	HJ1ABB	6450
47.5 Sun.	HIZ	6315
47.8 Tues., Fri.	HI1A	6272
48.9+	ZTJ	6122
49.0+ Ex. Sat., Sun.	VE9HX	6110
49.2 Ex. M., T., Wed.	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.3+ Tues., Thurs. Ir.	OER2	6072
49.4+ Sat. Sun.	VQ7LO	6060
49.4+	W8XAL	6060
49.8	DJC	6020
49.8+ Sat., Sun.	ZHI	6012
18 G. M. T. 1 P. M. E. S. T.		
13.9+	W8XK	21540
14.2+	LSN	21020
15.2 Irregular	IRW	19700
16.5+	LSY	18115
16.8+	W3XAL	17780
17.3+ Fri.	W3XL	17300
19.7	W8XK	15210
19.8	GSF	15140
25.2	FYA	11900
25.4	I2RO	11810
25.5	DJD	11760
29.0+	ORK	10330
30.4 Sat.	EAQ	9860
30.6+ Irregular	GCW	9790
31.2+	XETE	9600
31.2+	W3XAU	9590
31.3+	W1XAZ	9570
31.4+ Irregular	LKJ1	9540
31.5	GSB	9510
47.5 Sun.	HIZ	6315
47.8 Sun.	HI1A	6272
48.9+	ZTJ	6122
25.2	FYA	11900
25.3+	W2XE	11830
25.4	I2RO	11810
25.5	DJD	11760
28.9+	LSX	10350
29.0+	ZFD	10335
29.0+	ORK	10330
30.5+ Irregular	IRM	9820
30.6+ Irregular	GCW	9790
31.2+ Tues., Fri	CT1AA	9600
31.2+	XETE	9600
31.2+	W3XAU	9590
31.3+	W1XAZ	9570
31.4+ Irregular	LKJ1	9540
31.5	GSB	9510
32.2+ Sun.	CNR	9300
43.8+ Sun.	HAS	6840
47.8 Sun.	HI1A	6272
48.9+ Sat.	ZTJ	6122
49.0+ Sun.	YV2RC	6112
49.0+ Except Sat., Sun.	VE9HX	6110
49.2 Ex. Mon., Tues., W	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.3+ Tues., Thurs. Ir.	OER2	6072
49.3+ Sun.	VE9CS	6070
49.4+	W8XAL	6060
49.4+ Temporary	OXY	6060
49.8	DJC	6020
49.8+	COC	6010
49.9+ Irregular	RV59	6000
50.1	TGX	5984
84.6+ Mon., Wed., Sat.	CR7AA	3543
21 G. M. T. 4 P. M. E. S. T.		
15.9+	PLE	18860
17.3+ Fri.	W3XL	17300
19.7	W8XK	15210
19.2 ? Sun.	PRADO	?
19.8	GSF	15140
24.8+ Except Sun.	CT1CT	12082
25.2	FYA	11900
25.2	W8XK	11870
25.4	I2RO	11810
29.0+	ZFD	10335
30.5+ Irregular	IRM	9820
30.6+ Irregular	GCW	9790
31.2+Tues., Fri.	CT1AA	9600
31.2+	XETE	9600
31.2+	W3XAU	9590
31.3+	W1XAZ	9570
31.4+ Irregular	LKJ1	9540
31.5	GSB	9510
31.8+	PLV	9415
32.2+ Sun.	CNR	9300
43.8+ Irregular	HAS	6840
47.5	HIZ	6315
47.8 Sun.	HI1A	6272
48.8+	W8XK	6140
48.9+ Sat.	ZTJ	6122
49.0+ Sun.	YV2RC	6112
49.0+	VE9HX	6110
49.1+ Mon., Wed., Sat.	W3XAL	6100
49.1 Except Sat.	W9XF	6100
49.2 Sun.	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.3+ Sun.	VE9CS	6070
49.4+	W8XAL	6060
49.4+ Temporary	OXY	6060
49.8+	COC	6010
49.9+	HIX	6000
49.9 Ex. Tues., Thu. Sat.	RV59	6000
22 G. M. T. 5 P. M. E. S. T.		
15.9+ Irregular	PLE	18860
19. ? Sun.	PRADO	?
19.8	GSF	15140
24.8+ Ex. Sun.	CT1CT	12082
25.2	FYA	11900
25.2	W8XK	11870
25.4	I2RO	11810
40.5	EA8AB	7403
45.0+ Sun.	HC2RL	6668
46.1	HJ5ABD	6504
45.5 Sun.	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
47.8 Sun.	HI1A	6272
48.7+	YV3RC	6150
48.8+	W8XK	6140
49.0	W2XE	6120
49.0+	YV2RC	6112
49.0+	VE9HX	6110
49.1+ Mon. Wed., Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.2 Sun	VE9GW	6095
49.3+ Irregular	CP5	6080
49.3+	W9XAA	6080
49.3+ Sun.	VE9CS	6070
49.3+ Temporary	YV5RMO	6070
49.4+	W8XAL	6060
49.4+ Temporary	OXY	6060
49.8	CQN	6020
49.8+ Sun., Irregular	COC	6010
49.9+	XEBT	6006
50.6 Tues., Thurs., Sat.	HJ4ABE	5860
51.4+	HJ2ABC	5824
69.4 Irregular	G6RX	4320
00 G. M. T. 7 P. M. E. S. T.		
15.9+ Except Sat., Sun.	PLE	18860
25.2	W8XK	11870
25.4+ Sun.	W1XAL	11790
25.5	DJD	11760
25.5	GSD	11750
25.6	FYA	11720
28.9+	LSX	10350
30.4	EAQ	9860
30.5+ Irregular	IRM	9820
31.2+	XETE	9605
31.3	GSC	9580
31.3	HBL	9580
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.4	W2XAF	9530
32.8+	CP5	9122
36.6+	PSK	8188
38.4+ Sat., Irregular	HBP	7795
40.5	HJ3ABD	7400
45.0+ Sun.	HC2RL	6660
46.1	HJ5ABD	6504
46.5	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
47.8	HI1A	6272
48.5	TGW	6180
48.7+	YV3RC	6150
48.8+	W8XK	6140
48.9+	ZGE	6130
49.0	W2XE	6120
49.0+	YV2RC	6112
49.0+	VE9HX	6110
49.1+ Mon., Wed., Sat.	W3XAL	6100
49.3+ Irregular	CP5	6080
49.3+	W9XAA	6080
49.3+	VE9CS	6070
49.3+ Temporary	YV5RMO	6070
49.4+	W8XAL	6060
49.8+	CQN	6020
49.8+ Sun.	COC	6010
49.9+	XEBT	6006
49.9+	HIX	6000
50.1	TGX	5984
50.4 Irregular	HJ2ABA	5880
50.6 Except Wed., Sun.	HJ4ABE	5860
51.4+	HJ2ABC	5824
69.4 Irregular	G6RX	4320
01 G. M. T. 8 P. M. E. S. T.		
15.9 Except Sat., Sun.	PLE	18800
25.2	W8XK	11860
25.5	DJD	11772
25.6	FYA	11760

(Continued on next page)

25.6	CJRX	11720
31.2+	XETE	9600
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.4+	W2XAF	9530
36.6+ Irregular	PSK	8185
37.5	HC2JSB	8000
40.5+ Except Sun.	HJ3ABD	7402
46.1	HJ5ABD	6504
46.5	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
47.8	HI1A	6272
48.5+	TGW	6180
48.7+	CJRO	6150
48.7+	YV3RC	6150
48.8+	W8XK	6140
48.9+	ZTJ	6122
49.0	W2XE	6120
49.0+	YV2RC	6112
49.0+	VE9HX	6110
49.1+ Mon., Wed., Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.2+ Except Fri., Sat.	VE9GW	6095
49.3+ Irregular	CP5	6080
49.3+	W9XAA	6080
49.3+ Sun.	VE9CS	6070
49.3+ Temporary	YV5RMO	6070
49.4+	W8XAL	6060
49.4+	W3XAU	6060
49.8	DJC	6020
49.8+	COC	6010
49.9+	XEBT	6006
49.9+	HIX	6000
50.1 Irregular	YV4BSG	5984
50.1	TGX	5984
50.4 Irregular	HJ2ABA	5880
50.6 Mon., Wed., Fri.	HJ4ABE	5860
51.4	HJ2ABC	5824
69.4 Irregular	G6RX	4320
73.0+ Except Mon.	HCJB	4107

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

25.2	W8XK	11870
25.5	DJD	11760
25.6	CJRX	11720
28.1	CEC	10670
31.2+	XETE	9600
31.3+	W1XAZ	9570
31.4+	W2XAF	9530
36.6+ Irregular	PSK	8185
37.5	HC2JSB	8000
40.5+ Except Sun.	HJ3ABD	7402
45.0+ Tues.	HC2RL	6668
45.3 Thurs.	PRADO	6618
46.1	HJ5ABD	6504
46.5	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
47.5 Sat.	HIZ	6315
47.8	HI1A	6272
48.5+	TGW	6180
48.7+	CJRO	6150
48.7+	YV3RC	6150
48.8+	W8XK	6140
48.9+	ZTJ	6122
49.0	W2XE	6120
49.0+	YV2RC	6112
49.0+	VE9HX	6110
49.1+ Mon., Wed., Sat	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.3+ Irregular	CP5	6080
49.3+	W9XAA	6080
49.3+ Sun.	VE9CS	6070
49.3+ Temporary	YV5RMO	6070
49.4+	W8XAL	6060
49.4+	W3XAU	6060
49.8	DJC	6020
49.8+ Sun.	COC	6010
49.9+	XEBT	6006
49.9+	HIX	6000
50.1 Irregular	YV4BSG	5984
50.1	TGX	5984
50.4 Irregular	HJ2ABA	5880
50.6 Mon., Wed., Fri.	HJ4ABE	5860
51.4	HJ2ABC	5824
69.4+	G6RX	4320
73.0+ Except Mon.	HCJB	4107

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

25.1+	RNE	11924
25.2	W8XK	11870
25.5 Irregular	DJD	11760
25.6	FYA	11720
25.6	CJRX	11720
31.2+	XETE	9600
31.3+	W1XAZ	9570
31.4+	W2XAF	9530
40.5+ Except Sun.	HJ3ABD	7402
44.8	YNLF	6692
45.0+ Tues.	HC2RL	6668
45.3 Thurs.	PRADO	6618
46.5	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
47.5 Sat.	HIZ	6315
47.8	HI1A	6272
48.5	TGW	6180
48.7+	CJRO	6150
48.7+	YV3RC	6150
48.8+	W8XK	6140
48.9+	ZTJ	6122
49.0+	YV2RC	6112
49.0+	VE9HX	6110
49.1+ Mon., Wed., Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.2 Except Sun.	VE9GW	6095
49.3+ Irregular	CP5	6080
49.3+	W9XAA	6080
49.3+ Sun.	VE9CS	6070
49.3+	YV5RMO	6070
49.4+	W8XAL	6060
49.4+	W3XAU	6060
49.8 Irregular	DJC	6020
49.8+ Sun.	ZHI	6012
49.9+	XEBT	6006
49.9+ Sat.	HIX	6000
50.1 Irregular	YV4BSG	5984
50.1	TGX	5984
50.6 Mon., Wed., Fri.	HJ4ABE	5860
69.4+ Irregular	G6RX	4320
73.0+ Except Mon.	HCJB	4107

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

25.1+ Irregular	RNE	11924
25.2 Sun.	W8XK	11870
25.6	FYA	11720
25.6	CJRX	11720
31.2+	XETE	9600
31.3+	W1XAZ	9570
40.5 Except Sun.	HJ3ABD	7402
45.0 Fri.	TGW	6180
45.0+ Tues.	HC2RL	6668
45.3 Thurs.	PRADO	6618
46.6+ Fri.	W3XL	6425
47.5	HIZ	6315
47.8	HI1A	6272
48.7+	CJRO	6150
48.7+ Sat.	VE9CL	6150
48.8+	W8XK	6140
48.9+ Except Sun.	ZTJ	6122
49.0+	VE9HX	6110
49.1+ Mon., Wed., Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.3+ Tues., Sun.	VE9CS	6070
49.4+	W8XAL	6060
49.4+	W3XAU	6060
49.8+ Sun.	ZHI	6012
49.9+	XEBT	6006
49.9+ Sat.	VE9DN	6005
49.9+ Sat.	HIX	6000
50.1	TGX	5984
73.0+ Except Mon.	HCJB	4107

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

19.7	DJB	15200
25.2 Sun.	W8XK	11870
25.5	GSD	11750
31.2+	XETE	9600
31.3+	W1XAZ	9570
31.5	GSB	9510
45.0+ Tues.	HC2RL	6668
47.8	HI1A	6272
48.8+	W8XK	6140
48.9+ Except Sun.	ZTJ	6122
49.0+	VE9HX	6110
49.1+ Except Sat.	W9XF	6100
49.3 Tues., Sun.	VE9CS	6070
49.4+	W3XAU	6060
49.4+	W8XAL	6060
49.8	DJC	6020
49.8+ Sat., Sun.	ZHI	6012
49.8+ Sat.	COC	6010
49.9+	XEBT	6006

06 G. M. T. 1 A. M. E. S. T.

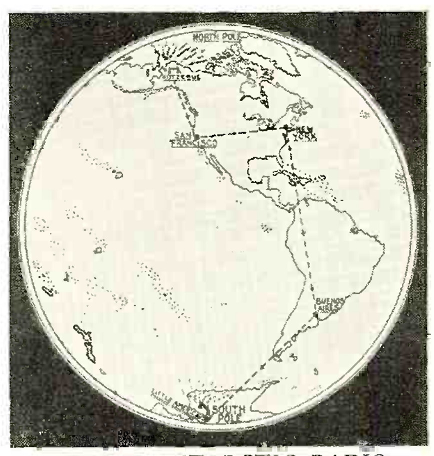
19.0+	JYT	15760
19.7	DJB	15200
25.5	GSD	11750
31.2+	XETE	9600
31.5	GSB	9510
38.0+	JYR	7880
49.1+ Except Sat.	W9XF	6100
49.4+	W8XAL	6060
49.8+ Sat., Sun.	ZHI	6012

07 G. M. T. 2 A. M. E. S. T.

19.7	DJB	15200
22.0	JYK	13610
25.5	GSD	11750
31.2+ Irregular	XETE	9600
31.5	GSB	9510

Station Locations

Wave-length Meters	*Call Letters*	*Frequency Kc.*	*City Country*
13.9+	W8XK	21540	Pittsburgh, Pa.
13.9+	GSH	21470	Daventry, England
14.2+	LSN	21020	Buenos Aires, Argen.
15.2+	IRW	19700	Rome, Italy
15.9+	PLE	18860	Bandoeng, Java
16.5	LSY	18115	Buenos Aires, Argen.
16.8+	GSG	17790	Daventry, England
16.8+	W3XAL	17780	Bound Brook, N. J.
16.8+	PHI	17775	Huizen, Holland
17.2+	J1AA?	17380	Kemikawa-Cho., Jap.
17.3+	W3XL	17300	Bound Brook, N. J.
19.	PRADO	?	Riobamba, Ecuador
19.5	W2XAD	15330	Schenectady, N. Y.
19.6+	CP5	15308	La Paz, Bolivia
19.6+	W2XE	15270	New York, N. Y.
19.6+	FYA	15243	Pontoise, France
19.7	W8XK	15210	Pittsburgh, Pa.
19.7	DJB	15200	Zeesen, Germany
19.8	GSF	15140	Daventry, England
19.8	HVJ	15123	Vatican City
22.0	JYK	13610	Kemikawa-Cho. Jap.
23.3	CNR	12830	Rabat, Morocco
24.8+	CT1CT	12082	Lisbon, Portugal
25.1+	RNE	11924	Moscow, U. S. S. R.
25.2	FYA	11900	Pontoise, France
25.2	W8XK	11870	Pittsburgh, Pa.
25.2+	GSE	11860	Daventry, England
25.3+	W2XE	11830	New York. N. Y.
25.4	12RO	11810	Rome, Italy
25.4	W1XAL	11790	Boston, Mass.
25.5	DJD	11760	Zeesen, Germany
25.5	GSD	11750	Daventry, England
25.6	FYA	11720	Pontoise, France
25.6	CJRX	11720	Winnipeg, Canada
26.0	XGR	11530	Shanghai, China
26.8	CT3AQ	11180	Funchal, Madeira
27.9+	JVM	10740	Kemikawa-Cho. Jap.
28.1	CEC	10670	Santiago, Chile
28.9+	LSX	10350	Buenos Aires, Argen.
29.0+	ZFD	10335	Hamilton, Bermuda
29.0+	ORK	10330	Ruysselede, Belgium
30.0	KAZ	9990	Manila, P. I.
30.4	EAQ	9860	Madrid, Spain
30.4+	JYS	9840	Kemikawa-Cho. Jap.
30.5+	IRM	9820	Rome, Italy
30.6+	GCW	9790	Rubgy, England
31.2+	XETE	9600	Mexico City, Mexico
31.2+	CT1AA	9600	Lisbon, Portgual
31.2+	W3XAU	9590	Philadelphia, Pa.
31.2+	VK2ME	9590	Sydney, Australia
31.3	HBL	9580	Geneva, Switzerland
31.3	VK3LR	9580	Lindhurst. Victoria, Australia
31.3	GSC	9575	Daventry, England
31.3+	W1XAZ	9570	Springfield, Mass.
31.3+	DJA	9560	Zeesen, Germany
31.4+	LKJ1	9540	Jeloy, Norway
31.4+	W2XAF	9530	Schenectady, N. Y.
31.5	VK3ME	9510	Melbourne, Australia
31.5	GSB	9510	Daventry, England
31.8	PLV	9415	Bandoeng, Java
32.2+	CNR	9300	Rabat, Morocco
36.2+	CM6XJ	8265	Tuinucu, Cuba
36.6+	PSK	8185	Rio de Janeiro, Braz.
37.5	HC2JSB	8000	Guayaquil, Ecuador
38.0+	JYR	7880	Kemikawa-Cho. Jap.
38.4+	HBP	7790	Geneva, Switzerland
40.5+	HJ3ABD	7402	Bogota, Colombia
43.8+	HAS	6840	Budapest, Hungary
44.8	YNLF	6692	Managua, Nicaragua
45.0+	HC2RL	6668	Guayaquil, Ecuador
45.3	PRADO	6618	Riobamba, Ecuador
45.3+	RV72	6611	Moscow, U. S. S. R.
46.1	HJ5ABD	6504	Cali, Colombia
46.5	HJ1ABB	6450	Barranquilla, Col.
46.6	W3XL	6425	Bound Brook, N. J.
47.5	HIZ	6315	San Domingo, D. R.
47.8	HI1A	6272	San Domingo, D. R.
48.5	TGW	6180	Guatemala City
48.7+	CJRO	6150	Winnipeg, Manitoba
48.7	YV3RC	6150	Caracas, Venezuela
48.7	VE9CL	6150	Winnipeg, Man.
48.8+	W8XK	6140	Pittsburgh. Pa.
48.9+	ZGE	6130	Kuala Lumpur, F. M. S.
48.9+	ZTJ	6122	Johannesburg, Africa
49.9	W2XE	6120	New York, N. Y.
49.0+	YV2RC	6112	Caracas, Ven.
49.0+	VE9HX	6110	Halifax, N. S.
49.1+	W3XAL	6100	Bound Brook, N. J.
49.1+	W9XF	6100	Chicago, Ill.
49.2	VE9GW	6095	Bowmanville, Can.
49.3+	CP5	6080	La Paz, Bolivia
49.3+	W9XAA	6080	Chicago, Ill.
49.3+	OER2	6072	Vienna, Austria
49.3+	VE9CS	6070	Vancouver, B. C.
49.3+	YV5RMO	6070	Maracaibo, Venez.
49.4+	VQ7LO	6060	Nairobi, Kenya, Afr.
49.4+	W8XAL	6060	Cincinnati, Ohio
49.4+	W3XAU	6060	Philadelphia, Pa.
49.4+	OXY	6060	Skamlebaek, Den.
49.5+	GSA	6050	Daventry, England
49.6+	W4XB	6040	Miami, Fla.
49.8	DJC	6020	Zeesen, Germany
49.8	CQN	6020	Macao, China
49.8+	ZHI	6012	Singapore, Malaya
49.8+	COC	6010	Havana. Cuba
49.9+	XEBT	6006	Mexico City, Mex.
49.9+	VE9DN	6005	Montreal, Quebec
49.9+	HIX	6000	San Domingo, D. R.
49.9+	RV59	6000	Moscow, U. S. S. R.
50.1	YV4BSG	5984	Caracas, Venezuela
50.1	TGX	5984	El Liberal, Guatemala
50.2+	HVJ	5969	Vatican City
50.4	HJ2ABA	5880	Tunja, Colombia
50.6+	HJ4ABE	5860	Medellin. Colombia
51.4+	HJ2ABC	5824	Cu Cuta, Colombia
52.9+	XQAJ	5660	Shanghai, China
69.4	G6RX	4320	Rugby, England
70.2	RV15	4273	Khabarovsk, Siberia
73.0	HCJB	4107	Quito, Ecuador
80.0	CT1CT	3750	Lisbon, Portugal
84.6+	CR7AA	3543	Lourenzo Marques, Mozambique



ARCTIC-ANTARCTIC RADIO LINK

The first two-way Arctic-antarctic conversation took place recently when C.B.S. engineers linked the Byrd Expedition with KILS, a temporary station in Northwest Alaska

The DX Corner (Short Waves)

(*Continued from page* 139)

OCJ reported on 15821 kc. between 20 and 21, G.M.T.

Has anybody ever heard DJE at 13-14, G.M.T.? They are reported on 17760 kc.

HJD, Bogota, Colombia, reported on about 19.5 meters rebroadcasting LSX.

KNRA, the Seth Parker Expedition, has been reported heard on 8840 kc., 6900 kc., 48.67 meters, etc.

PRB8, Pernambuco, Brazil, reported heard on 49 meters, 7 to 10 p.m., Rio de Janeiro time.

How many listeners heard the special program in honor of RADIO NEWS' readers from 10:15 to 11 p.m., Caracas time, on station YV3RC, July 14? This was broadcast at the request of C. H. Armstrong, our O.R.N.S.W.L.P.O. for Georgia.

CFCT, Victoria, B. C., reported on about 51 meters at 08 to 09, G.M.T.

JVE reported on 5700 kc., calling PLV, 06-07, G.M.T.

Jap station announcing as JOAK, 06-09, G.M.T., reported heard on about 10760 kc.

JYT heard on about 9 meters.

PK1WK, Java, reported on 49.02 meters from 4 to 6 a.m. and 6 to 8 a.m.

HC2BC, Guayaquil, Ecuador, reported on 4600 kc.

Another reader reports the Japanese station on 10740 heard irregularly 5 to 7 a.m.

XECL relaying XETE, heard at 9600 kc., 10 to 11 a.m., E.S.T.

JVF, 15620 kc., calling KWO at 17, G.M.T., and between 13 to 14, G.M.T.

JVE reported on 15650 kc. at 17, G.M.T., relaying broadcasts.

JVM reported variously at 10800 kc., 10740 kc., playing Japanese records at 20, G.M.T.

RIM reported on 76300 kc. at 10, G.M.T.

PDK, Kootwijk, 28.8 meters, heard and reported with special program to the Dutch East Indies.

PCK, 16.29 meters, 18400 kc., reported with special musical programs.

VE9AM, on about 54 meters, heard testing with CJA at 06, G.M.T.

PHI, Huizen, Holland, reported and verified on 49 meters relaying to Java, 11 to 14, G.M.T., except Thursdays.

JYR reported heard on 38.07 meters, relays JOAK and strikes chimes just before closing down. Speaks English from 10 to 10:10, G.M.T.

CFU reported as Canadian station at Rossland, B. C., talking and playing music to Canadian northwestern pioneers.

KAY, Manila, P. I., 14980 kc., reported on the air at 9:50 p.m., Honolulu time.

JYK, 13610 kc., reported at 07, G.M.T.

PLV, 9415 kc., reported transmitting from Bandoeng, Java, at 08, G.M.T.

PRADO has been heard on 19 meters relaying programs at 23, G.M.T.

CJA8, Montreal, on 4908 kc., heard at 02, G.M.T. Seems to be broadcasting from a boat.

The new call letters for LCL are reported as LKJ1 on 31.4 meters.

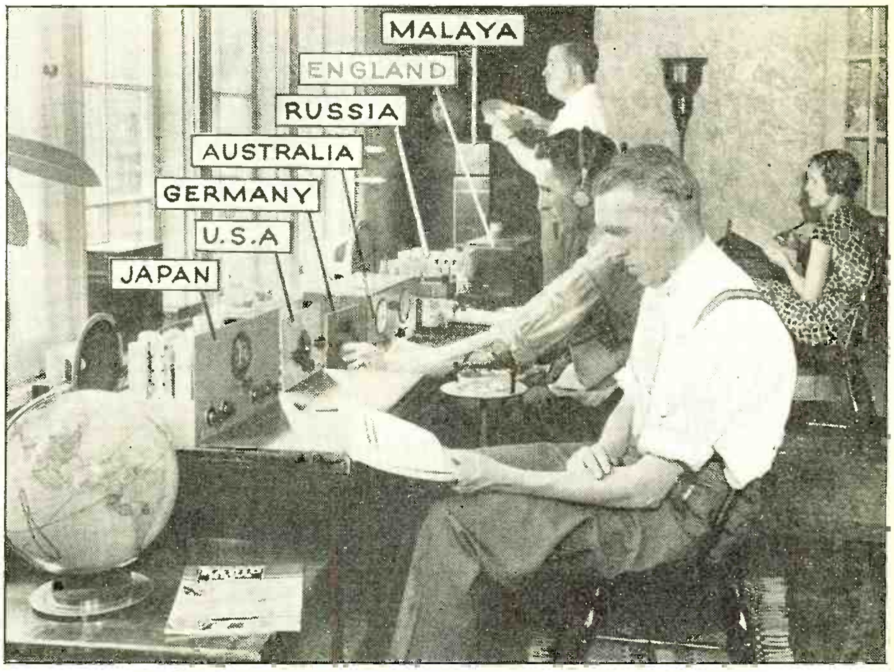
PMY reported on 5100 kc.

Listening Post Observers Wanted!

We are especially desirous of locating reliable listening post observers in the following remaining States in the United States of America. Any one feeling that they would like to undertake this work and that they have the necessary qualifications and interest in Short Waves to be able to log stations for us accurately, should make their application for appointment immediately, sending in at the same time a sample log, made at their receiving apparatus: Arizona, Arkansas, Connecticut, District of Columbia, Louisiana, Montana, Oregon, Rhode Island, South Dakota, Wyoming.

We also want to locate reliable listening posts in the following countries outside of the United States: Alaska, Algeria, Argentina, Austria, Belgium, Bolivia, Canary Islands, Central America, Colombia, Czechoslovakia, Denmark, East Indies, Ecuador, Egypt, Finland, Germany, Greece, Holland, Hungary, Irish Free State, Italy, Java, Japan, Malay State, Manchuria, Norway, Paraguay, Portugal, Poland, Siberia, Spain, Sweden, U. S. S. R.

All applications should be accompanied with a statement as to qualifications, the kind of receiving set used, antenna, etc., and a sample log. Appointments will be made as the individual cases are considered and passed upon by the Editor.



IN THE "SUMMER" WESTCHESTER LISTENING POST

This is the way stations in various parts of the world are tuned in on a number of receivers with directional antennas at the RADIO NEWS *Listening Post in Pelham. They remain tuned in with the volume control turned off and occasionally the observers check them on the air while a stenographer makes up the hourly list. In the illustration, a record has just been made on a recording apparatus of an Oriental station*

VQ7LO's Schedule

Albert E. Emerson sends in this month a very fine set of almost daily reports for his location, including the official time schedule of VQ7LO and many other stations. His brother and he are new O.R.N.S.W.L.P.O.'s.

Report from Texas

Mr. Frank Hilburn, using a 19-tube Twinplex receiver, sends in the following list of Best Bets for his location at Yoakum: HJ4ABF, W9XAA, YU2RC, YV3RC, HJ1ABB, HC2RL, EAQ, DJC, DJA, DJB, FYA, GSF, GSE, GSD, GSB, CJRX, VE9GW, XETE, VK3ME, VK2ME, JVM.

A Report from Buffalo, N. Y.

Mr. J. C. Kalmbach, Jr., sends in Best Bets for Buffalo on a one-tube 230 battery set: W8XAL, W8XK, K2XAL, W2XE, W3XAL, W3XAU, W9XF, W9XAA, VE9GW, CJRO, W2XBJ, CJA8, DJC, HJ1ABB, PRADO. He says HJ3ABD is on the air daily from noon to 2 p.m. and from 7 to 11 p.m., E.S.T. DX'ers should try for this station because it presents a gift to foreign short-wave listeners who mention any advertising heard from this station.

Honolulu Speaks Up

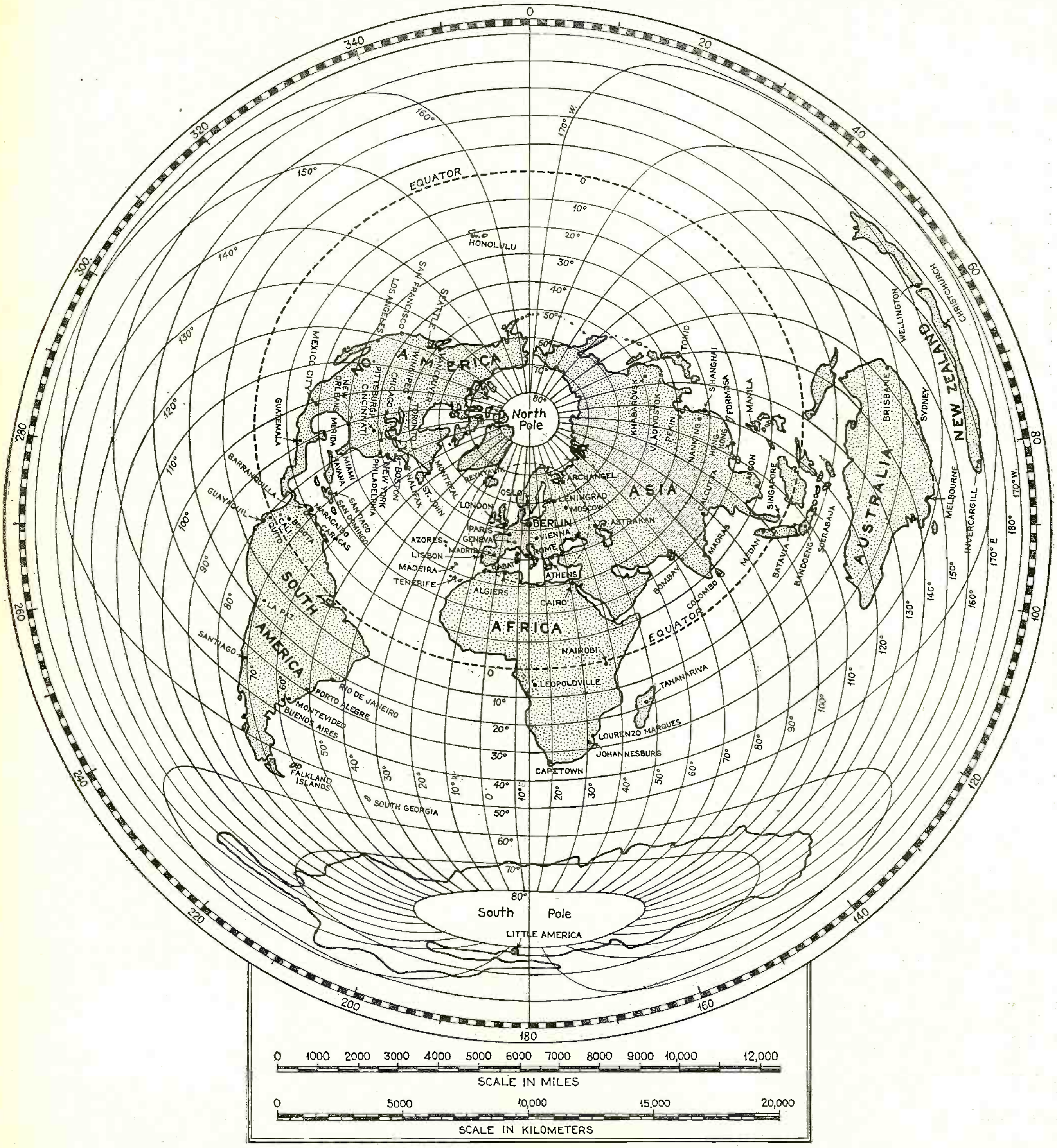
Mr. O. F. Sternemann of Honolulu, T. H., sends in a very fine report as his first duty as O.R.N.S.W.L.P.O. for the Hawaiian Islands. His five-year log of stations, giving wavelength, frequency, location and time heard, has furnished an important amount of checking material for this month's Time-Table. He notes that the Australians and Japanese come in regularly, loud and clear, in Hawaii. His Best Bets are: W8XK, W3XAL, W2XAD, XETE, VK2ME, VK3LR, PRADO, W3XL, W9XF, W8XAL, KKZ, W1XAZ, XEBT, WEF, KGMB. He uses a Postal International Nine, an RCA-Victor with a Colonial model 55 short-wave converter. He is using a four-wire cage type antenna, 50 feet long and 35 feet high with a transposed lead-in. He uses an "Ollie Ross ground."

A "Ham Fest" at Bloomington

BLOOMINGTON, Ill.: The following excerpt from a letter from the Secretary of the Central Illinois Radio Club tells of a "ham fest" to be held at about the time this magazine comes on the newsstands: "Our organization numbers around 40 members, all of which reside within a radius of 25 miles and all of which operate amateur short-wave stations. We will be organized two years on the date of this anniversary "ham fest," August 5th, and this is the first affair of this kind we have ever put on. While our "ham fest" is not being sponsored by the American Radio Relay League, they have heartily approved of it as a good method of establishing good fellowship among the amateurs in this vicinity.

"Without good radio magazines to guide their steps amateur radio enthusiasts would still be 'in the dark.' When you step into the operating room of any amateur, the first thing you notice is his equipment, and the second, his technical library. In the latter in most every case, you will see

WORLD DISTANCE CHART No. 3



WORLD DISTANCE MAP FOR THE EUROPEAN AREA

Here is the third RADIO NEWS *azimuthal map for the European area centered on Berlin. Measurements can be accurately made from any spot within the dotted circle to any other place on earth. Simply lay a ruler from any spot within this circle to any other location on the map and refer this distance to the scale in miles or kilometers printed with the map. This will give the actual distance. This is the third exclusive* RADIO NEWS *Chart published in this series. The fourth installment is for South America*

copies of RADIO NEWS. We amateurs have appreciated all you have done for us. Since short-wave interest has replaced the broadcast-receiver interest of earlier days, it is to the amateurs, who carry on their experiments on these bands, that you must look forward to to buy and read RADIO NEWS. I speak from my own experience. I followed the trend to those fascinating high-frequency bands and am happy to say that RADIO NEWS was my guide." J. A. Umstattd, W9CFV, Secretary.

Report from Alberta

Our old friend, A. B. Baadsgaard of Ponoka, sends in some hard-to-get station information this month and includes a verified report of PHI transmitting on 49 meters. This is a relay of a long-wave Dutch station directed to Java and coming to Ponoka all the way around on the other side of the globe by way of the Pacific Ocean. The station is heard on 49 meters at 4 to 7 a.m., M.S.T., silent on Thursdays. Mr. Baadsgaard states, "With regards to the Hilversum transmission, this has been a heated controversy, inasmuch as Mr. A. J. Green of the I.S.W.C. was extremely dubious of its origin as reported by the writer. However, now have a verification duly authenticated by Edward Startz, the versatile announcer of PHI, under his hand and seal."

A Report from Nevada

D. H. Townsend, Official Listening Post Observer of Fallon and also charter member of the International DX'ers Alliance, sends in the following list of Oriental sta-

(*Continued on page* 180)

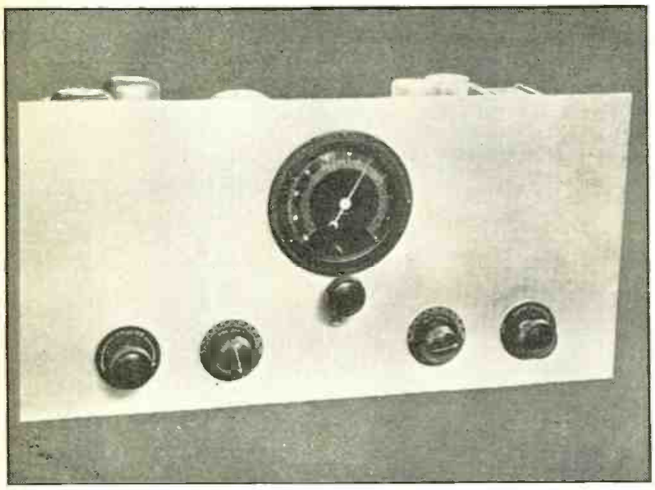
SHORT-WAVE STATION LIST

(Giving Wavelength, Frequency, Call, Location and Service)

(Continued from the August issue)

meters	kc.	call	location	Service and schedule
23.46	12,780	GBC	Rugby, England	Phone
24.19	12,394	DAF	Norddeich, Germany	Phone to ships
24.29	12,345	KNRA	Schooner "Seth Parker"	Phone
24.38	12,300	ZLW	Wellington, N. Z.	Phone to Australia
24.40	12,290	GBU	Rugby, England	Phone to New York
24.46	12,250	FTN	Ste. Assise, France	Phone
24.46	12,250	GBS	Rugby, England	Phone
24.46	12,250	PLM	Bandoeng, Java	Phone to Holland
24.60	12,190	YBJ	Medan, Sumatra	Phone
24.60	12,150	GBS	Rugby, England	Transatlantic Phone
24.68	12,150	FQO, FQE	Ste. Assise, France	Phone
24.89	12,045	NAA	Arlington, Va.	Time signals; 11.57—noon
24.89	12,045	NSS	Annapolis, Md.	Time signals; 9.57—10 P.M.
24.83	12,028	CT1CT	Lisbon, Portugal	Broadcast, Sun., Thurs.
24.99	12,000	FZG	Saigon, Indo-China	Time signals; 2-2.05 P.M.
25.02	11,980	FZS	Saigon, Indo China	Phone to FTK
25.10	11,950	KKQ	Bolinas, Calif.	Phone
25.10	11,950	FTA	Ste. Assise, France	Phone to Rabat
25.16	11,924	RNE	Moscow, U. S. S. R.	Broadcast
25.20	11,905	FYA	Pontoise, France	Broadcast
25.20	11,900	XGOX	Nanking, China	Broadcast
25.24	11,880	W9XF	Downer's Grove, Chicago, Ill	Broadcast
25.26	11,870	W8XK	E. Pittsburgh, Penna.	Broadcast
25.26	11,870	VUC	Calcutta, India	Broadcast
25.27	11,860	GSE	Daventry, England	Broadcast
25.28	11,860	VE9CA	Calgary, Alberta	Broadcast
25.33	11,840	KZRM	Manila, P. I.	Broadcast
25.34	11,835	VE9HX	Halifax, N. S.	Broadcast
25.35	11,830	W9XAA	Chicago, Ill.	Broadcast
25.35	11,830	W2XE	New York, N. Y.	Broadcast
25.35	11,830	KFZ, KFY	Little America	Phone
25.40	11,810	I2RO	Rome, Italy	Broadcast
25.40	11,810	VE9GW	Bowmanville, Ontario	Broadcast
25.42	11,801	OER2	Vienna, Austria	Broadcast
25.43	11,790	W1XAL	Boston, Mass.	Broadcast
25.43	11,790	TITR	San Jose, Costa Rica	Broadcast
25.45	11,780	VE9DN	Drummondville, Que.	Broadcast
25.45	11,780	VE9DR	Drummondville, Que.	Broadcast
25.50	11,760	XDA	Mexico City, Mexico	Phone; tests with Merida
25.50	11,760	DJD	Zeesen, Germany	Broadcast
25.52	11,750	GSD	Daventry, England	Broadcast
25.56	11,730	PHI	Huizen, Holland	Broadcast during winter mons.
25.59	11,720	FYA	Pontoise, France	Broadcast
25.59	11,720	CJRX	Middlechurch, Man.	Broadcast
25.62	11,695	YVQ	Maracay, Venezuela	Phone
25.67	11,680	KIO	Kahuku, Hawaii	Phone to Bolinas
25.73	11,660	PPQ	Rio de Janeiro, Brazil	Experimental, irr. evenings
26.00	11,530	LSN	Buenos Aires, Argentina	Phone, relays broadcast
26.00	11,530	CGA	Drummondville, Que.	Phone
26.10	11,490	GBK	Bodmin, England	Phone
26.15	11,470	IBDK	S.S. Elettra, Marconi's Yacht	Experimental
26.22	11,435	DHC	Nauen, Germany	Phone
26.46	11,340	DAN	Norden, Germany	Time signals, 7 A.M.; 7 P.M.
26.80	11,187	XAM	Merida, Yucatan	Tests with XDA
26.83	11,180	CT3AQ	Funchal, Madeira	Broadcast; Tu., Thu., 5-6.30 P.M.; Sun., 10.30 A.M.—noon
27.00	11,111	XFD	Mexico City, Mexico	Broadcast
27.26	11,000	PLP	Bandoeng, Java	Phone, occasional bc.
27.30	10,990	ZLT	Wellington, N. Z.	Phone to VLJ; irr. 5-7 A.M.
27.35	10,975	OCI	Lima, Peru	Phone to Bogota; eve.
27.63	10,850	DFL	Nauen, Germany	Phone
27.68	10,840	KWV	Dixon, Calif.	Phone to Hawaii, irr. daytime
27.84	10,770	GBP	Rugby, England	Tests with LSX, relays KFZ
27.91	10,740	JVM	Kemikawa, Cho Chiba-Ken, Japan	Phone; relays J OAK
28.10	10,675	WNB	Lawrenceville, N. J.	Phone to Bermuda, daytime
28.12	10,670	CEC	Santiago, Chile	Tests with Bogota
28.22	10,630	PLR	Bandoeng, Java	Phone to Holland and France
28.25	10,620	KEI	Bolinas, Calif.	Phone
28.25	10,620	EDN-EDX	Madrid, Spain	Phone
28.28	10,610	WEA	Rocky Point, N. Y.	Experimental
28.44	10,550	WLO	Lawrence, N. J.	Phone to Argentina, irr. eve.
28.75	10,430	YBG	Medan, Sumatra	Phone to Java and Australia; sometimes broadcast
28.48	10,525	VLK	Sydney, Australia	Phone to England
28.80	10,415	PDK	Kootwijk, Holland	Phone
28.82	10,410	KES	Bolinas, Calif.	Phone
28.82	10,410	LSY	Buenos Aires, Argentina	Phone
28.83	10,400	KWZ	Dixon, Calif.	Phone irr. 12.45-3.45 A.M.
28.83	10,400	KEZ	Bolinas, Calif.	Experimental
28.87	10,390	KER	Bolinas, Calif.	Phone
28.87	10,390	GBX	Rugby. England	Phone
28.98	10,350	LSX	Buenos Aires, Argentina	Phone, sometimes broadcast
29.00	10,335	ZFD	Hamilton, Bermuda	Phone
29.04	10,330	ORK	Ruysselede, Belgium	Broadcast
29.12	10,300	LSL	Buenos Aires, Argentina	Phone to Europe, irr.
29.14	10,290	HPC	Panama City, Panama	Phone
29.14	10,290	DIQ	Koenigswusterhausen, Ger.	Phone
29.25	10,260	PMN	Bandoeng, Java	Phone, occasional bc.
29.35	10,220	PSH	Rio de Janeiro, Brazil	Tests with W2XBJ evenings
29.50	10,163	DDAC	S. S. Europa	Phone
		DDAS	S. S. Bremen	Phone
		DDBR	S. S. Berlin	Phone
		DDCB	S. S. Columbus	Phone
		DDCG	S. S. Resolute	Phone
		DDCP	S. S. Cap Polonio	Phone
		DDDT	S. S. Deutschland	Phone
		DDDX	S. S. Hamburg	Phone
		DDEA	S. S. Cap Arcona	Phone
		DDED	S. S. New York	Phone
		DDFF	S. S. Reliance	Phone
		DDFT	S. S. Oceana	Phone
		DDNY	S. S. Albert Ballin	Phone
29.56	10,150	DIS	Nauen, Germany	Press (code)
29.59	10,140	OPM	Leopoldville, Belgian Congo	Phone to Brussels
29.70	10,100	EHY	Madrid, Spain	Tests afternoons, irr.
29.80	10,060	ZFB	St. George, Bermuda	Phone to WNB, daytime
29.84	10,055	SUV	Cairo, Egypt	Phone to England
29.98	10,000		Belgrade, Yugoslavia	Broadcast
30.03	9,990	KAZ	Manila, P. I.	Phone
30.10	9,964	LSL	Buenos Aires, Argentina	Phone to New York
30.15	9,950	GCU,GBU	Rugby, England	Phone
30.20	9,928	RRLY	Moscow, U. S. S. R.	Phone
30.20	9,928	YBF	Medan, Sumatra	Phone
30.21	9,930	HJY	Bogota, Colombia	Phone to Peru
30.28	9,905	CGA5	Drummondville, Que.	Tests with Rugby
30.28	9,900	LSN	Buenos Aires, Argentina	Phone to Europe and U. S. A.
30.32	9,890	LSA	Buenos Aires, Argentina	Phone
30.38	9,870	WON	Lawrenceville, N. J.	Phone to England
30.41	9,860	EAQ	Madrid, Spain	Broadcast
30.47	9,840	JYS	Kemikawa-Cho, Chiba-Ken, Japan	Tests and broadcast
30.47	9,840	FTI	Ste. Assise, France	Phone
30.50	9,830	LSI	Buenos Aires, Argentina	Phone
30.50	9,830	IRM	Rome, Italy	Phone, sometimes broadcast
30.59	9,800	GCW	Rugby, England	Phone
30.63	9,790	GBW	Rugby, England	Phone to New York
30.68	9,772	EAM	Madrid, Spain	Broadcast
30.72	9,760	VLK-VK2ME	Sydney, Australia	Phone to Java
30.75	9,750	WOF	Lawrenceville, N. J.	Phone to England
30.88	9,710	GCA	Rugby, England	Phone
30.91	9,700	WMI	Deal, N. J.	Phone
30.91	9,700	LQA	Buenos Aires, Argentina	Phone
31.00	9,672	TI4NRH	Heredia, Costa Rica	Phone
31.10	9,640	HSP2	Bangkok, Siam	Phone
31.17	9,620	DGU	Nauen, Germany	Phone to Egypt; experimental
31.16	9,616	VQ7LO	Nairobi, Kenya, Brit. E. Afri.	Broadcast
31.23	9,600	LGN	Bergen, Norway	Phone
31.23	9,600	YV5BMO	Maracaibo, Venezuela	Broadcast
31.23	9,600	XETE	Mexico City, Mexico	Broadcast
31.23	9,600	CT1AA	Lisbon, Portugal	Broadcast; Tue., Fri.
31.26	9,590	WKJ	Rocky Point, N. Y.	Phone
31.26	9,590	WEF	Rocky Point, N. Y.	Phone
31.26	9,590	TIRA	Cartago, Costa Rica	Broadcast
31.26	9,590	VK2ME	Sydney, Australia	Broadcast; Sunday mornings
31.26	9,590	W3XAU	Byberry, Penna.	Broadcast; relays WCAU
31.28	9,585	GSC	Daventry, England	Broadcast
31.30	9,580	HBL	Geneva, Switzerland	Broadcast
31.30	9,580	VE9DR	Drummondville, Que.	Broadcast
31.30	9,580	VK3LR	Melbourne, Australia	Broadcast
31.33	9,570	KZRM	Manila, P. I.	Broadcast
31.33	9,570	W1XAZ	Springfield, Mass.	Broadcast
31.33	9,570	SR1	Poznan, Poland	Broadcast
31.33	9,570	SUV	Cairo, Egypt	Broadcast
31.36	9,560	DJA	Zeesen, Germany	Broadcast
31.43	9,540	LKJ1	Jeloy, Norway	Experimental
31.46	9,530	W2XAF	Schenectady, N. Y.	Broadcast
31.49	9,520	KFZ,KFY	Little America	Phone
31.53	9,510	VK3ME	Melbourne, Australia	Broadcast
31.53	9,510	YV3RC	Caracas, Venezuela	Broadcast
31.53	9,510	GSB	Daventry, England	Broadcast
31.56	9,500	HSP2	Bangkok, Siam	Broadcast
31.56	9,500	XGOX	Nanking, China	Broadcast
31.56	9,500	PRBA	Rio de Janeiro, Brazil	Broadcast
31.58	9,495	OXY	Skamlebaek, Denmark	Broadcast
31.60	9,490	WEF-W2XBJ	Rocky Point, N. Y.	Experimental
31.61	9,485	PLW	Bandoeng, Java	Phone
31.63	9,480	KET	Bolinas, Calif.	Phone
31.71	9,455	WKJ	Rocky Point, N. Y.	Phone
31.73	9,450	WES-W2XBJ	Rocky Point, N. Y.	Experimental
31.84	9,415	PLV	Bandoeng, Java	Phone, occasional broadcast
31.90	9,400	XDC	Mexico City	Experimental
31.96	9,380	CE32	Los Andes, Chile	Broadcast
31.97	9,375	XDA	Mexico City, Mexico	Phone
32.00	9,370	CT3AQ	Funchal, Madeira	Broadcast
32.15	9,332	CGA	Drummondville, Que.	Phone; tests
32.20	9,310	GBC	Rugby, England	Phone
32.24	9,300	CNR	Rabat, Morocco	Broadcast
32.27	9,280	GCB	Rugby, England	Phone
32.41	9,250	GBK	Bodmin, England	Phone to Canada
32.48	9,230	FLJ	Paris, France	Phone
32.59	9,200	GBS	Rubgy, England	Transatlantic phone
32.66	9,180	YVR	Maracay, Venezuela	Phone to Europe
32.70	9,170	WNA	Lawrenceville, N. J.	Phone to England
32.75	9,115	CP5	La Paz, Bolivia	Broadcast
32.93	9,104	LST	Olivos, Argentina	Phone
32.99	9,091	XFD	Mexico City, Mexico	Broadcast
32.99	9,091	XDA	Mexico City, Mexico	Phone
33.26	9,020	GCS	Rugby, England	Phone to New York
33.28	9,010	KEJ	Bolinas, Calif.	Tests, irr.
33.50	8,950	TGX	Guatemala City, Guatemala	Broadcast
33.50	8,950	WEL-W2XBJ	Rocky Point, N. Y.	Tests, irr. evenings
33.57	8,930	WEC	Rocky Point, N. Y.	Experimental; tests with Europe irr.
33.69	8,900	ZLT	Wellington, N. Z.	Phone to Australia
33.80	8,870	NPO	Cavite, P. I.	Time signals, 9.55-10 P.M.
33.92	8,840	KFZ,KFY	Little America	Phone
33.95	8,830	GDLJ	S. S. Homeric	Phone
		GFWV	S. S. Majestic	Phone
		GKFY	S. S. Minnetonka	Phone
		GLSQ	S. S. Olympic	Phone
		GMBJ	S. S. Empress of Britain	Phone
		GMJQ	S. S. Belgenland	Phone
		VTSX	S. S. Monarch of Bermuda	Phone
33.99	8,820	KFZ,KFY	Little America	Phone
34.13	8,790	TIR	Cartago, Costa Rica	Phone, afternoons
34.17	8,775	——	Makassar, Celebes	Phone, occasional bc.

(To be continued next month)



THE FRONT VIEW OF THE RECEIVER

NOW YOU SHORT-WAVE
"ALL
ALL-WAVE

Here is the design for a home-constructed to 550 meters. It is a set designed, to build at home. After the technical standard-make components were combined no way a kit set. When completed it is one

Laurence M.

"I WANT to build a receiver that will cover all short-wave bands, but that I can also use for broadcast reception. I want it to be selective enough to discriminate between those jumbles of short-wave stations found on various s.w. bands; preferably I want a set with 'band-spreading.' I want a set that can be used with a noise-reducing antenna, without making changes in it. I want a high signal-to-noise ratio with sensitivity adequate to easily cover world short-wave reception. I want a set that I can build myself without special technical knowledge and without finding something in it that I will get 'stuck' with; some part or other that cannot be obtained or some component that needs special hand-work to make it fit. I know this is asking a lot, but—IS THERE 'ANY SUCH ANIMAL'?" *(This is a statement of a radio fan, made recently to the Editor on a visit to our offices. It seemed to fit the case for so many radio set builders that we had it taken down in shorthand and are printing it here.*—EDITOR'S NOTE.)

I DO not believe in using a lot of adjectives in describing a set. Either it is a *good* one or else it is *not worth a description!* This particular receiver, the All-Star superheterodyne, is really a good one, one that any person can build and operate, and without more ado I will point out some of its features.

It has a frequency range of from 10 to 550 meters (30,000 kc. to about 550 kc.), without gaps.

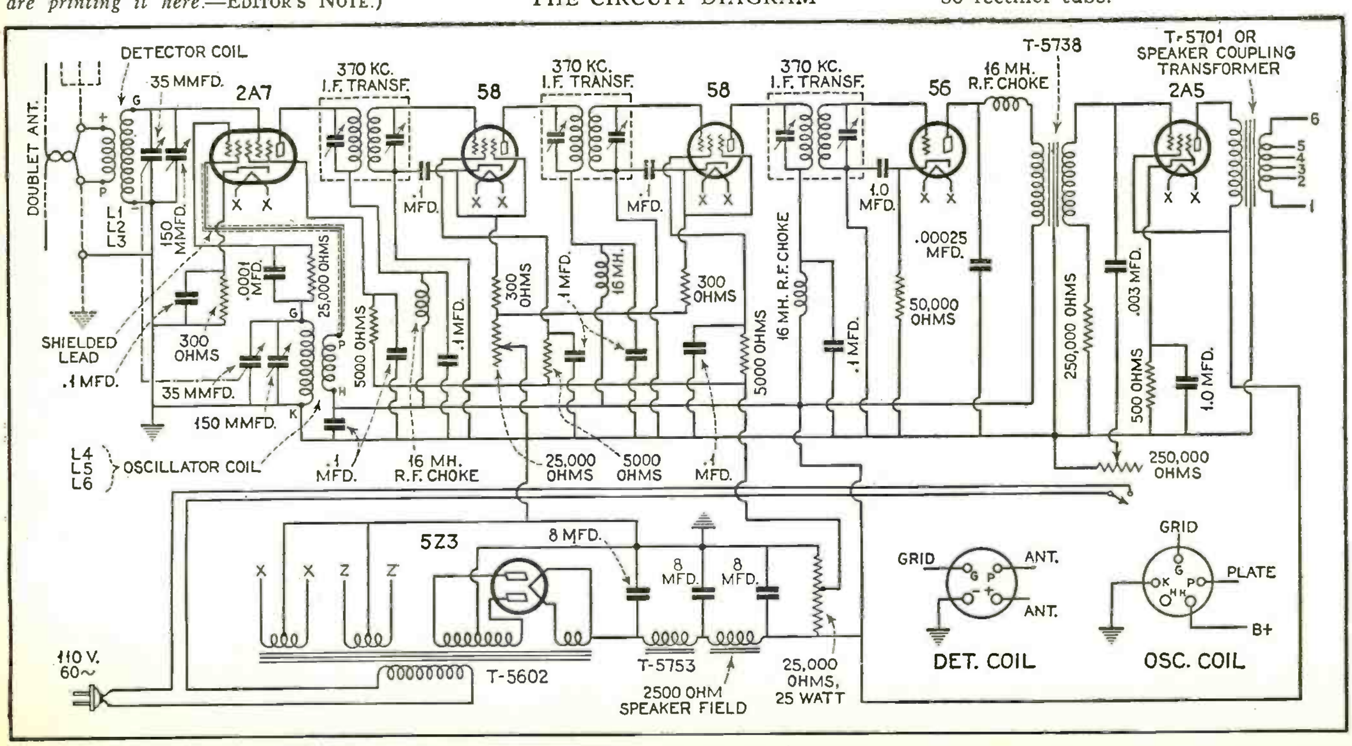
It is completely band-spread for all frequency bands within its usable spectrum. These bands can be adjusted quickly for any particular band by setting two dials. Each band chosen is automatically spread over 270 degrees on the central tuning control (which is of the airplane fine-pointer type).

For any given band, once set, the tuning is thereafter single-controlled through that band and the operator can come back to the same band by again setting two dials to the proper logging. Tracking errors and misalignment are therefore eliminated. The reason for this is that there is an initial separate control to be made for the first detector and for the oscillator tuning.

The set features a new circuit that is very sensitive and yet can be readily built by any constructor without precision aligning and testing equipment. The oscillator and i.f. coils are pre-adjusted at the laboratory.

An examination of the circuit itself in the diagram below shows that the new 2A7 tube is used as a combination oscillator and first detector, economizing on tubes and other equipment. The oscillator grid circuit is incased in a shielded lead to eliminate frequency shift troubles that might occur in ordinary wiring and resulting in throwing off the settings. The circuit utilizes two type –58 tubes in the first and second intermediate-frequency stages, with a standard triode –56 tube for the second detector and a 2A5 tube for the output circuit, feeding through a transformer to the loudspeaker. The set contains a power-pack and filter running off a standard type –80 rectifier tube.

THE CIRCUIT DIAGRAM



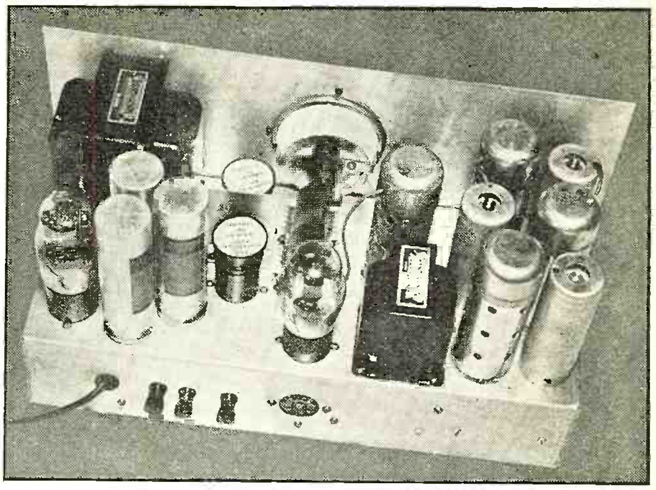
FANS CAN BUILD THIS DX

STAR"

RECEIVER

receiver for all-wave reception, from 10 non-commercially, for the short-wave fan work and design was completed a series of to build the first model. The receiver is in any short-wave DX fan would be proud of

Cockaday



REAR VIEW SHOWING LAYOUT

The intermediate-frequency amplification takes place at a new frequency of 370 kc., through which is claimed a great reduction of harmonics or image frequencies.

Three sets of coils are used to cover the short-wave band from 10 to 100 meters. Optional and additional coil equipment is available and consists of a pair of coils for 100-200 meters and two pairs of coils for the broadcast band. These coils can be easily inserted without the nuisance of removing shields necessary in some earlier types of sets.

All of the components used in the design and construction of this receiver are available from any radio dealer or serviceman. They are standard, high-grade components made by leading manufacturers.

The receiver was designed by experts who have specialized in laying out sets to be built by radio enthusiasts of small experience. Practically no technical knowledge is necessary to build it. An actual test has shown that it can be assembled and wired in less than three hours by a person who has only a speaking acquaintance with a screw-driver or a soldering iron. There are no adjustments or calibrations to be made after the set has been correctly put together and wired for operation. The front panel and sub-base may be obtained completely drilled for the mounting of the specified parts. No other drilling, filing or fitting is necessary.

The set is to be used with a standard dynamic loudspeaker having an input transformer for a 2A5 output pentode and having a field winding of 2500 ohms and connected to a four-prong loudspeaker socket. This is also obtainable through regular trade channels.

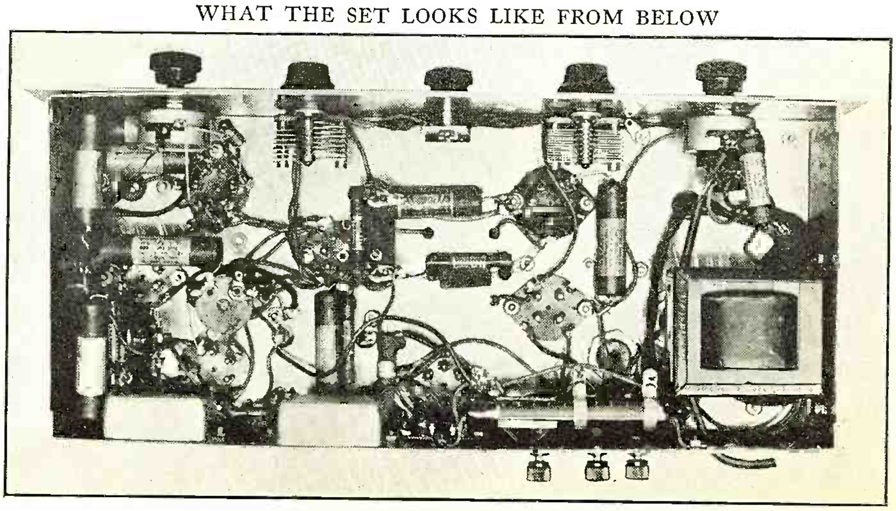
Looking at the front view of the panel, shown on the opposite page, we see (at the lower left) a control for volume; turning it to the right, it increases the volume. The next knob in line is the oscillator "tank" condenser with its own scale, from 0-100, for logging purposes. Next in line, to the right, is the detector "tank" condenser, also with its scale, from 0-100, for logging. The extreme right-hand dial is the combination "on-off" switch and tone control, which is useful in lowering static noise when the noise level is high. The central dial is the single-control, band-spread dial, set in 0-100 divisions, to actually cover a rotary range of 0-270 degrees.

Looking at the rear view of the set, shown on this page, we see (at the left) the power transformer, in front of which stands the rectifier tube. Next to this are the three tubular electrolytic filter condensers. Next (to the right) we can see the oscillator and detector coils, in their sockets, separated by an electrostatic metal shield. Next in line is the gang condenser, attached to the airplane-type dial and in front of which stands the 2A5 output tube. Alongside of this tube is the audio-frequency transformer and to the right of this stands the shielded –56 second detector tube, with its shielded third i.f. transformer. In back of these two we see the second i.f. –58 tube and transformer in reversed positions. In back of this we see the first i.f. –58 tube and transformer again in reversed positions. Directly in back of the audio-frequency transformer, we see the shielded 2A7 tube, which serves as first detector and oscillator. At the back of the chassis is seen the power-cable-and-plug extension, the three binding posts, for the doublet antenna and ground, and the four-prong socket for the loudspeaker. A simple but efficient-looking lay out—anyone will agree.

Looking at the bottom view of the receiver, we see (at the left) the choke-coil assembly and the instruments connected to the front panel controls, as well as the distribution of the sockets, the resistors and the filtering condensers. Notice that practically all of the wiring is done below the sub-base and that it is simplicity itself.

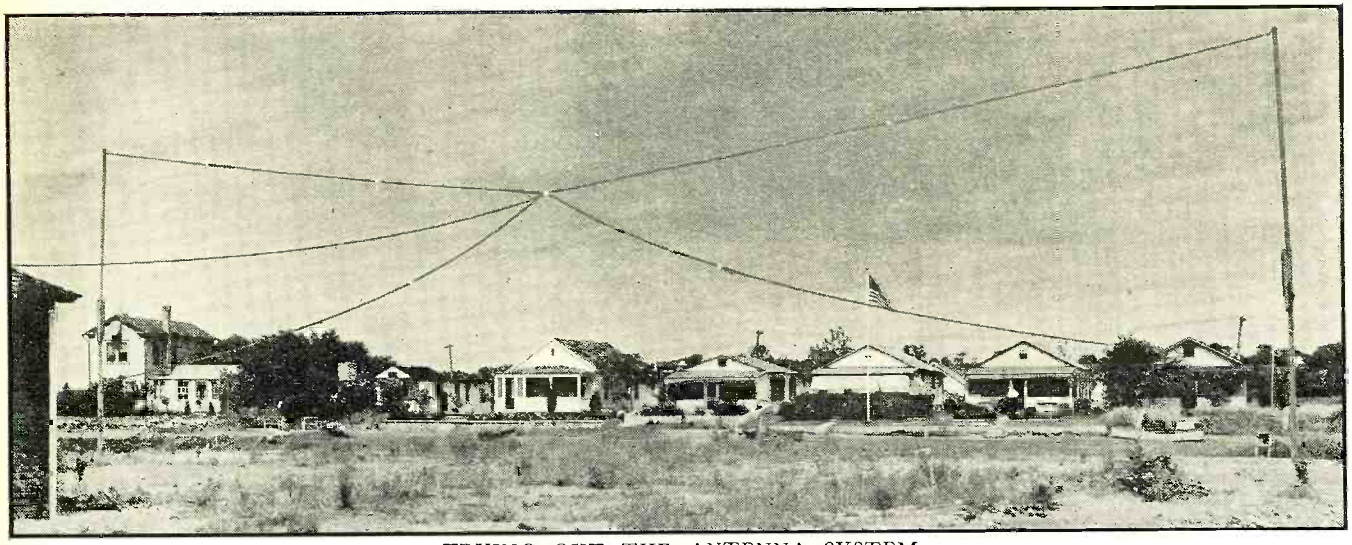
"All right," you say, "I am convinced that it looks like a good job." "It looks like something I would like to build." "How am I going to go about it?" "How do I begin?" The first thing you do is to go to your dealer or local serviceman or your jobber. You ask him for the (*Continued on page* 188)

WHAT THE SET LOOKS LIKE FROM BELOW



Do You Want Complete Instructions for Building This Set?

A FOUR-PAGE descriptive folder on the All Star superheterodyne receiver is waiting for you, to help you build this set. Simply address your request for this informative literature to RADIO NEWS, Blueprint Department, 222 West 39th Street, New York City. The folder contains a schematic diagram, a pictorial wiring diagram, a parts list, as well as assembly, wiring and tuning instructions. These will be sent to any of our readers free of charge.



TRYING OUT THE ANTENNA SYSTEM

The "double-doublet" antenna for all-wave reception as installed at the RADIO NEWS *listening post at Fairfield Beach, Connecticut. In spite of conditions which made it necessary to erect the antenna parallel with the road, it was highly successful in reducing ignition noise. Details of tests are given in a report at the end of this article*

LESS NOISE AND MORE SIGNAL WITH THE "DOUBLE-DOUBLET"

W. H. Bohlke

THE only principle which has been successfully employed at the receiver for the reduction of "man-made" static is to locate the antenna in a comparatively noise-free area and to employ a lead-in of such a type that pick-up by the lead-in is eliminated. There are two general types of such lead-ins—the shielded lead-in and the balanced transposed line. Experience, in most cases, shows the shielded line to be unsuitable for high frequencies. The balanced line, however, is eminently suitable for many reasons. When used in conjunction with a well-designed transformer at the set, the pick-up on the line is almost completely eliminated. No grounding is necessary and losses are practically negligible if the design is right.

In designing the line the space between the wires and the size of the wires is important. The farther apart they are, and the smaller they are, the higher is the characteristic impedance of the line. If a line is terminated at each end with its characteristic impedance, its transmission is nearly constant at all frequencies. However, when the terminating impedances are widely different from the proper value, the transmission effectiveness varies greatly with frequency, the curve passing through a series of peaks and valleys corresponding to resonance points in the line.

For the RCA "World-Wide" antenna system a line having 180 ohms impedance was chosen because this value is about the average input impedance of most short-wave receivers and because it is about the average impedance of the "double-doublet" antenna over the short-wave frequency spectrum.

Because the antenna does not represent an impedance exactly equal to the line impedance at all frequencies, the transmission curve does have a series of minor peaks and valleys, varying in efficiency two or three to one. The line length was adjusted experimentally by throwing short lengths in and out of the circuit until a length was found such that a transmission peak occurred at each of the important short-wave broadcast bands.

Mechanically, the line consists of a rubber-covered, twisted pair, with stranded, tinned copper wire for each conductor. After many tests, special submarine cable rubber was specified for insulation of the transmission line, due to its low losses and long life. While twisted pair was indicated to produce a line of the proper impedance, it was also important that the wires be close together with frequent transpositions

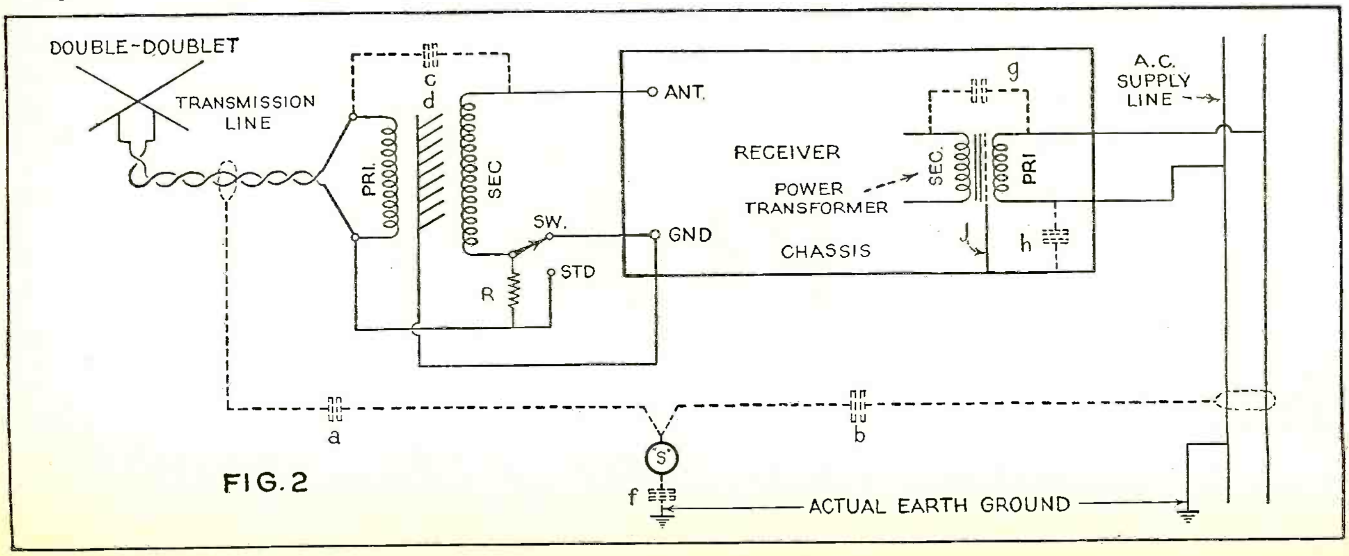


FIG. 2

to effectively balance out any pick-up.

In order to keep the losses low when the line is wet, it is important that no cotton be used as insulation. Even when a cotton wrap is well impregnated, the impregnating material soon evaporates and moisture then gets in, increasing the line losses.

The "Double-Doublet" Antenna

It is well known that a half-wave doublet is an efficient collector of short-wave signals. However, it is at its best only at or near its resonance point. Obviously, if two dissimilar doublets can be connected to the same transmission line without either harming the performance of the other, the overall performance of the combination will be better over a wider range of frequencies than that of a single doublet.

The secret of the "double-doublet" is the much discussed "cross-connection." That is, the left arm on the longer doublet connects to the same side of the transmission line as the right arm on the short doublet (see Figure 3). The connection must be made in this way in order for the output of the short doublet to be additive to the output of the long doublet at a frequency midway between their resonance points.

In order to understand this apparent paradox, consider the fact that the long and short arms connected to a given side of the line form a single, nearly straight wire which is resonant in the half-wave "node" at the frequency mentioned.

If the two sides of the line were connected near the center of these two straight wires, the antenna would form a low-impedance termination for the line. If the two line connections were then moved out from the center in opposite directions, the impedance of the antenna would rise progressively, reaching a very high value when the ends of the wires were reached. At the point actually used, the impedance of the line at this frequency is slightly higher than the line impedance.

At the frequency of the resonance of either the long or the short doublet, the impedance of the antenna system is somewhat lower than the line impedance. Thus it can be seen that the line impedance chosen is a good compromise value. The performance of the "double-doublet" is compared to that of single doublets in the curves of Figure 1.

The long doublet is resonant in the half-wave node at about 8 mc. and in the 3/2 node at 24 mc., as in Curve (A), Figure 1. The short doublet is resonant at about 14 mc., Curve (B). The response of the combination is relatively flat over the important part of the short-wave spectrum, as in Curve (C).

The Coupling Transformer

The noise-eliminating feature of the system depends entirely on the design of the transformer which couples the line to the set. The purpose of this transformer is to eliminate in-phase signals while transmitting out-of-phase signals. The expression "in phase" means that the voltages of the two sides of the line go positive together and then go negative together. Obviously, this type of signal will produce no current in the primary of the transformer. "Out-of-phase" signals are those which cause one side of the line to go negative when the other goes positive and then reverse. This type of signal does produce primary current. The mere presence of a transformer does not eliminate the in-phase signals (or noise), because if there is capacity coupling, the noise will be transmitted to the set through that capacity.

In the transformer under discussion a special and highly efficient static shield (Figure 2 [d]) is used to completely eliminate capacity coupling. As a result, the in-phase signals and noise picked up by the line are eliminated while the out-of-phase signals picked up by the antenna are transmitted to the receiver.

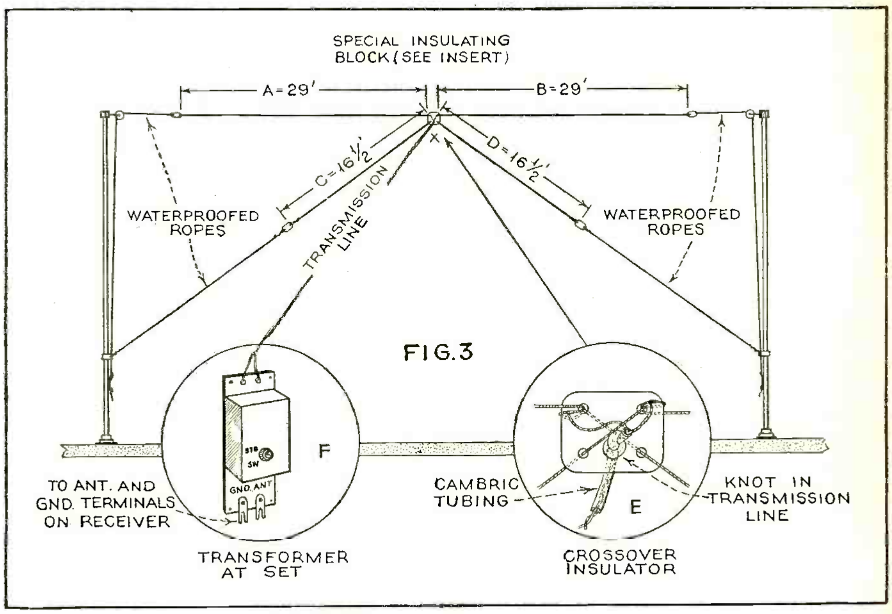
The circuit diagram of the complete antenna system connected to a receiver is shown in Figure 2.

When the switch is on position marked "SW," operation is as described above. When the switch is on "STD" position, the antenna and lead-in both act as antenna, and it is so used for broadcast-band reception.

A resistor (R) is connected from one side of the primary to ground to prevent the antenna system from collecting a high potential and sparking to ground, which would cause disturbing and periodic clicks in the receiver.

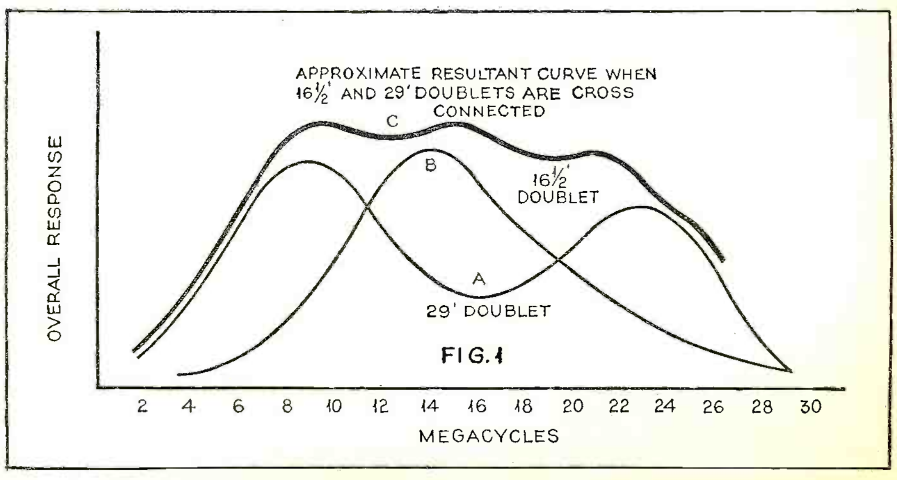
When choosing a noise-free area to locate the "double-doublet" antenna it is well to keep in mind the generally accepted theory that the strength of noise interference varies inversely as the square of the distance from the source of noise. Since the signal strength of the received broadcast signal is usually considered to increase in a direct proportion to the height above ground, it is recommended that the antenna be installed as high as possible.

On the short-wave signals originating at relatively short distances from the receiver it is often found with this antenna system that greater signal strength is obtained with the "SW-STD" switch in the "STD" position. This is to be expected, as the signal being received is probably the ground wave (that portion of the transmission vertical polarized) rather than the sky wave. The ground wave does not develop much signal voltage in the (*Continued on page* 183)



THE "DOUBLE-DOUBLET"

Figure 3. Specifications for the system. The correct angle for the short ends is obtained by sighting along holes provided in the insulator block, details of which appear in insert E. The transmission line consists of 110 feet of special twisted pair



A Scout's "OWN" S. W. SET
(The Pelham)

L. M. Cockaday

SCOUT CROCKETT AND HIS SHORT-WAVE SET

Fine little one-tube set installed in Scout Crockett's radio corner. Note buzzer code test set and interchangeable coils. Does it pull in DX? We'll say it does!

SCOUT ROBERT CROCKETT of Troup Three, Siwanoy Council, Pelham, New York, is an ardent short-wave enthusiast. He has recently built a single-tube set to be described forthwith and with it he has been able to bring in most of the long distance short-wave broadcast stations as well as amateur transmitters. He keeps his own radio notebook and log-book. It contains copies of the many hundreds of variations of single-tube short-wave circuits and data on coil winding, amplifiers, etc., that he has cut from radio magazines and newspapers during the past two years. He chose the circuit shown in Figure 1 because of its simplicity and because of the many reports of successful long-distance reception he had seen made with it. It is a modern version of the "Junk Box" circuit, made so famous by RADIO NEWS in 1928, and found to be, by thousands of fans, one of the most popular single-tube short-wave sets.

It uses a standard set of triple-winding, short-wave coils shown as L1, L2 and L3. It has an antenna condenser, C1, for adjusting the antenna frequency. This is placed on the baseboard. Another condenser, C2, the left-hand control on the panel, is used for tuning. Bob says in his notes it is very sensitive to adjust. The third condenser, C3, which is the right-hand control on the panel, is used for controlling volume through regeneration. The condenser, C4, is the grid condenser, while resistance R1 is the grid leak. Variable resistance R2, which is the central upper control on the panel, adjusts the filament current which should be kept as low as possible consistent with good results. The switch SW is the lower central control on the panel and is used for turning the set "on-and-off." The tube used is a type –30 three-element tube in the plate circuit of which is found a choke coil, RFC, and a condenser, C5, which act as a filter to a keep radio-frequency currents out of the 'phone circuit so that the set will not have "hand capacity."

Blueprints Available

FOR constructors who would like to work from full-scale blueprints a complete set has been prepared and is available to readers at a nominal charge of 25c to cover costs of preparing, handling and mailing. Such requests should be made to the Blueprint Department of the RADIO NEWS Laboratory.

Going back to coil L1, this is the *antenna* coil, while L2 is the *grid* coil and L3 is the *feed-back* coil. That's all there is to it, fellows!

The set is powered by dry cells and all that is necessary is two ordinary bell-ring batteries, connected in series across the two terminals marked A (plus) and A (minus), where A (plus) goes to the *positive* terminal and A (minus) goes to the *negative* terminal. A standard 45-volt B battery may be connected to the plate power terminals, B (minus) and B (plus), where B (minus) is connected to the *negative* terminal and B (plus) to the *positive* terminal. In the building of this set, these four terminals are brought out to binding posts on the back edge of the baseboard, as are also the two terminals for the antenna and the ground. This

SIDE VIEW OF THE RECEIVER

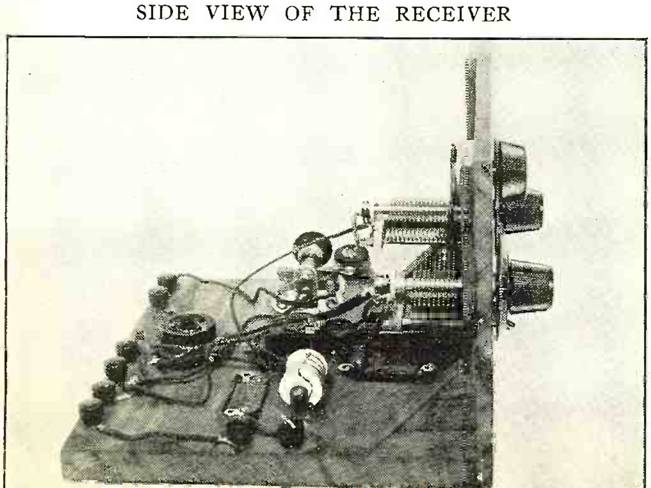
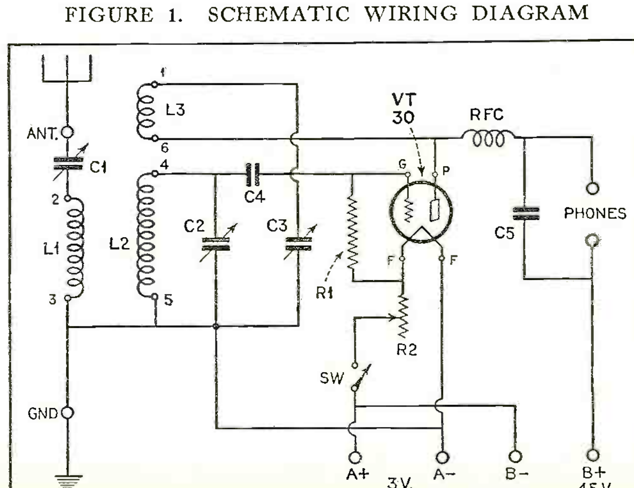
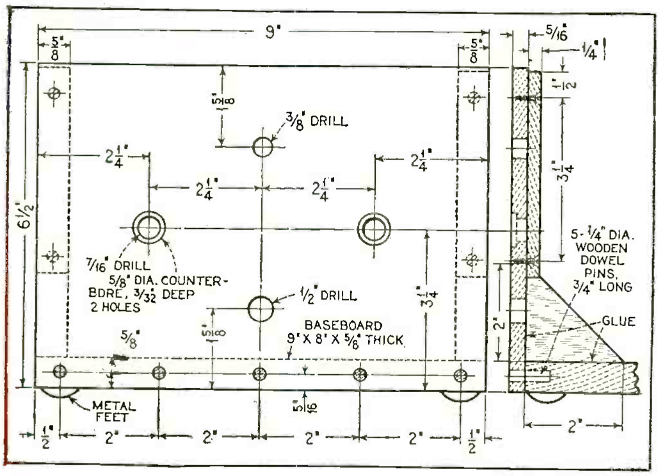
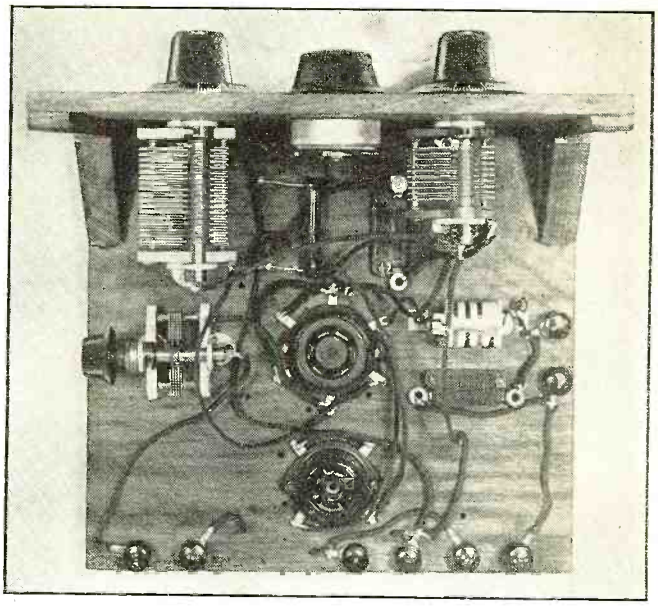


FIGURE 1. SCHEMATIC WIRING DIAGRAM







CONSTRUCTIONAL DETAILS OF THE SET

Figure 3. The details for making the wooden panel and base giving drilling holes, etc. At right, top view of the receiver showing layout of parts

may be seen clearly in the photographic illustrations. Two more binding posts are used for the phones.

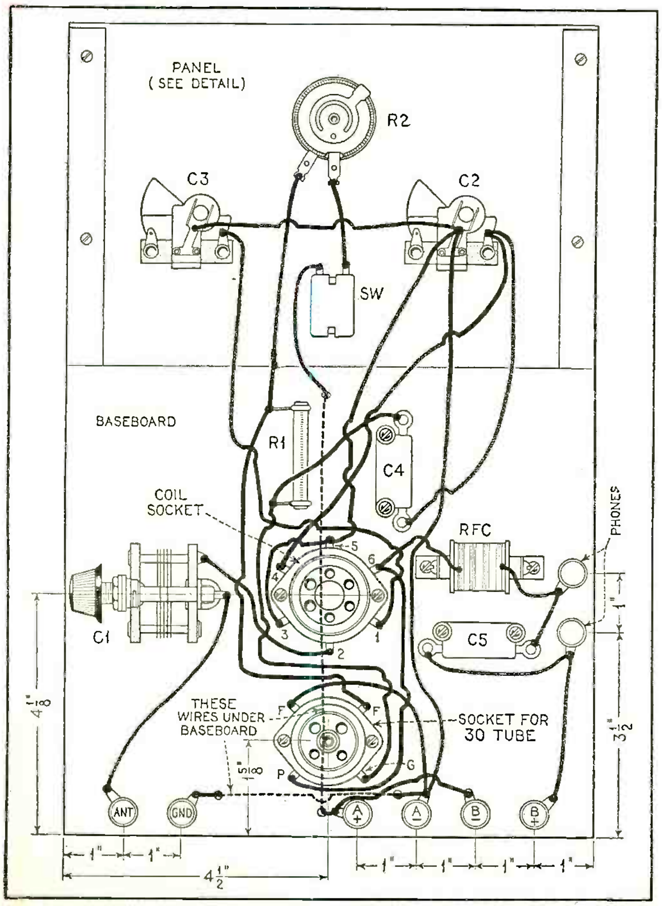
In building the set, the first job is to make the frame, consisting of front panel and baseboard. Bob built these of oak which had been boiled in paraffin wax, to fill up the pores, but that is not absolutely necessary. It could be built of a softer wood, although the oak makes a good strong job. Details and sizes of this framework are shown in Figure 3.

After the framework has been put together with a good grade of glue and small screws and given a coat of shellac (if desired), the next job would be to mount the parts in their proper places. The spacing for these is indicated in the picture-wiring diagram in Figure 2. Two sockets must be obtained, one is a standard four-prong socket (for the tube) and the other a six-prong socket (for mounting the coils). Otherwise follow the directions as shown in Figure 2 and in the photographs.

When all the parts have been mounted in their proper places, the next job would be to connect up the wiring, as is also clearly shown in the picture-wiring diagram, Figure 2. You can do it in about an hour, using flexible cloth-insulated connection or hook-up wire, obtainable from any radio dealer or serviceman. Lugs should be attached to the connections where they end under the binding posts.

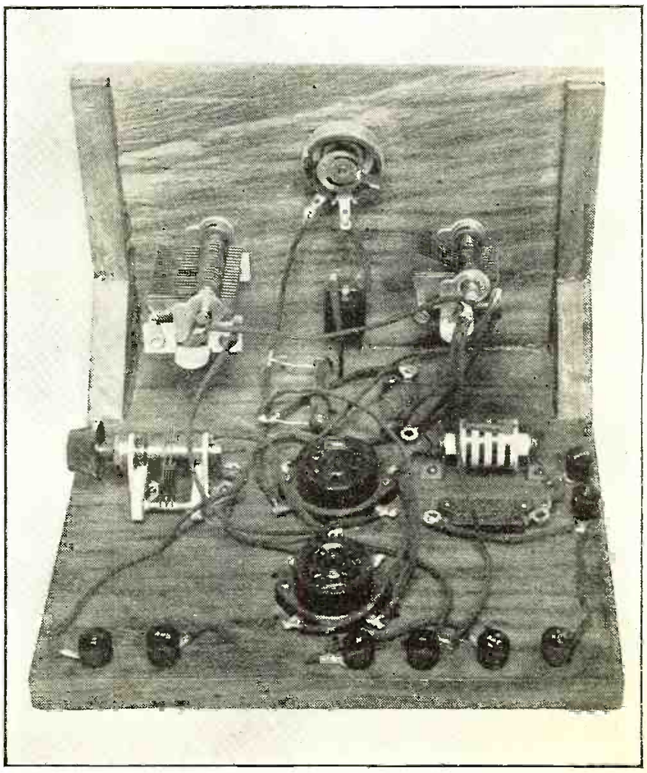
When the set is finished it may be hooked up to the batteries, as already described. An antenna of somewhere between 50 and 75 feet is found to give good results. It should be placed as high up as it is possible to erect it. A ground can be made to a suitable water pipe or gas pipe, whichever happens to be the most convenient position, although, if there is a choice, it should be tried out with a distant station tuned in.

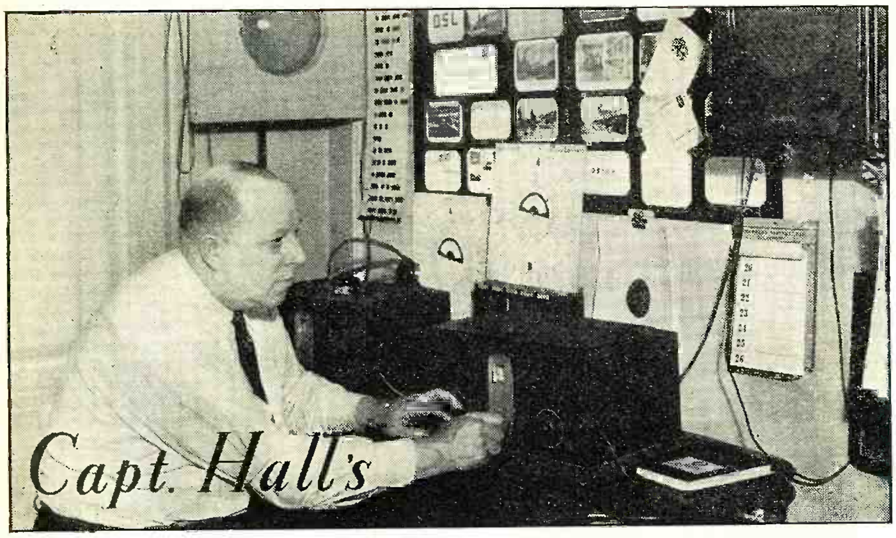
In looking through Bob's log book, I find that he has logged somewhere over 300 short-wave (*Continued on page* 181)



SIMPLIFIED WIRING DETAILS

Figure 2. At left is a picture wiring diagram of the set showing just how the wires run to the various parts. The panel is shown laid out flat but in reality it is at right angles to the base as shown in the view directly below





SHORT-WAVE PAGE

WHAT home, typical of the modern American, is complete without its radio room (or corner) set aside for the member of the family who is a radio fan. And now some whole families are becoming short-wave "bugs"; others have but one "black sheep" in the fold who is eyed with disdain when he dashes off from a day at school or office and literally throws himself into "short waves".

MOTHER and father cautiously touch finger to forehead and shake their heads as their "pride and joy" goes "short wave." "Let him alone, parents," is a remark that I would make when older folks get together in another part of the house. You say then, "He will get over it," but does he get over it? No! Instead he drags all his relatives into his hobby and finds them more enthusiastic about "fishing on the ether waves" than he himself.

Now you new radio short-wave fans or "almost" fans, who are thinking of shopping for an all-wave set. You can get a real kick going bargain hunting and then come with me DX "fishing." But you want to be careful about what you purchase before you start on your tour of the radio shops. You must first decide just what you want to buy. Do you want a receiver for short waves only, a real "DX" short-wave set? Or do you want an all-wave model, one that the family can use to tune in broadcasting when you are away from home or that, perchance, they may be able to tune on short waves for the principal English, German, French, Italian and other short-wave distance stations? Do you want a small beginner's set of a few tubes or do you want the highly perfected laboratory type of set? Maybe you want to build a small one- or two-tube set or it may be a set that covers but a part of the short-wave band would be suitable. Then again, you may have an excellent broadcast receiver and would like to "see what the short waves are" by means of a short-wave converter to attach to your present set.

Now if I were a beginner going shopping (perhaps I am old-fashioned), my idea would be to get a small tuned r.f. circuit that has as few tubes as possible but enough to have a loudspeaker volume. But if I were ultra-modern, I might turn my attention to a superheterodyne with ultra-selectivity, with low background noise, with a beat oscillator and with a headphone jack. It should have carefully wound and shielded coils and should be carefully calibrated and have a "complete" coverage of short waves. If you were to go with me on such a shopping tour, I could show you many of these types of receivers on the market today. The beginner who is all-wave minded has to be careful, however, that in making his selection he gets a set that goes all the way down in wavelengths (through the 16- and 19-meter bands) rather than a "so-called" short-wave and broadcast-band receiver that only goes down a little into the short waves to pick up the police broadcasts for the 175-meter amateurs and "ham" bands. If you want to hear most of the important short-wave broadcasts, the set must go down to at least the 25-meter band and preferably all the way down to 16 meters. Some few receivers can also pick up the 14-meter band, on which there are only one or two stations.

Now if you have gone and completed your shopping and brought back your set and gotten it hooked up, let us start out on a short-wave cruise of the Pacific. You will remember that last month we toured the principal European ports. But this time we will not be satisfied until we have thrown our anchor overboard in far Eastern harbors.

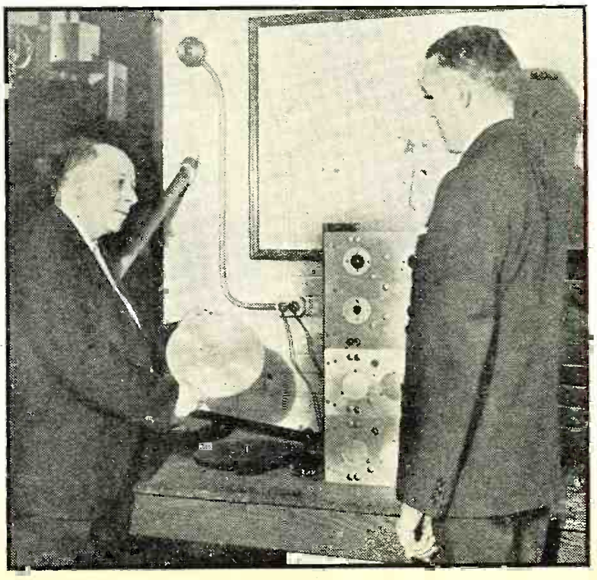
With our dials fairly bristling with a motley collection of Japanese broadcasting and commercial phone stations, we should have no difficulty snaring at least one Asiatic. The summer months never were considered the most ideal for logging stations to the west of us, but reception conditions have been topsy turvy lately and "what we don't expect is sure to come true," as the gypsy fortune teller would say.

Let us retrace a short "tour" I made last month. We started early, although the night before had also been devoted to a DX party. We charted our course (about 267 degrees) towards Tokio, Japan, where many of the Japanese programs originate. It may interest some of our readers to know that the writer is a strong believer in directional antennas. So the antenna which had been erected pointing directly towards Japan was called into use. We ran into a strong carrier on 38.5 meters. We fished for fully six minutes, and then a voice came "barking" in. This "wolfish" sound was probably caused by extremely poor modulation. If one can call what we heard a program, then this is what came through. A man was "hollering" with his hand across his mouth (or he might have been Japan's idea of Rudy Vallee). This kept up for about eight minutes, then that "funny" music began. Anyone who has heard truly Oriental music will know what I mean when I say that "funny" music. It sounds like a cross between a one-stringed ukulele and a traffic cop's whistle. Yes, I suppose it is called music. It is typical of those people and, strangely enough, not so nerve-racking as our American jazz. That was the first Jap of the season. Reports are coming in that they are being heard on about 22 meters (JYK), 27 meters, 30 meters (JYS) and 38 meters (JYR).

So the morning of the DX expedition we went after (*Continued on page* 187)

CAPTAIN HALL RECORDS JAPAN

The noted authority of short-wave reception demonstrates to our Associate Technical Editor a recording he made in his listening post of reception of the Japanese short-wave broadcaster



QUALITY WITH ECONOMY *in* ALL-WAVE SET DESIGN

This month the author describes the circuit finally evolved and incorporated in a new laboratory-built receiver made to sell in the moderate price class

McMurdo Silver

Part Two

IT is impossible to measure the gain of the r.f. stage on very short waves, but its gain is quite considerable and this r.f. gain is very important, for it permits operation of the first detector-oscillator at a high signal level. The additional selectivity of the r.f. stage also aids materially in eliminating the "repeat spot" or image interference.

It will be noted from the circuit diagram of the "World-Wide Nine," in Part 1, that not only is each of the three tuned input circuits (r.f., detector and oscillator) tuned by a separate section of the three-gang condenser, but each of the total of twelve individual circuits (three to each of the four bands) is individually padded or trimmed to insure accurate tracking throughout the entire tuning range of the set.

Separate antenna primaries are used for all bands, with both ends brought out to separate antenna binding posts. Thus a doublet antenna may be used, or the conventional single-wire antenna if preferred.

Following the first detector is the two-stage, 465 kc. i.f. amplifier employing Litz coils, and air dielectric tuning condensers which assure permanent performance, once set and sealed. They are a very important feature, for compression mica condensers in this portion of the circuit would not hold alignment accurately enough to maintain high sensitivity and selectivity over long periods of time.

The third of the three dual-tuned i.f. transformers feeds the two diode plates of the –55 tube. One diode serves as second detector, the rectified signal voltage appearing across volume control potentiometer, R5, from whence the audio signal is fed to the grid of the audio triode in the –55 bulb for audio amplification.

The second diode functions for automatic volume control, developing a rectified voltage across resistor R7 which is dependent entirely on the strength of the received signal. This voltage is filtered by resistors R1 and R8 with condensers C5 and C17, and fed to the control grids of the first detector and two i.f. tubes to automatically regulate sensitivity and volume. This automatic control voltage is not applied to the r.f. tube, it being desirable, as previously stated, to keep its amplification high at all times.

In addition to plate, screen, cathode and incidental by-pass and isolation circuits and condensers in this as in all superheterodynes, there arises a very interesting point. In a.c. operated superheterodynes there is a strong tendency to "modulation hum" or the appearance of a pronounced a.c. hum, particularly on short-wave stations tuned in. In the present case this is eliminated by electrostatic shielding in the power transformer and by very careful proportioning of plate and screen filtration and parts location.

The audio amplifier portion of the –55 tube develops sufficient output to supply the power necessary to the positive grid excursions required to drive the 2A5 tubes operated in push-pull Class A prime to a full 12 watts output, without distortion due to overloading.

Such operation of the 2A5's requires suitable input and output transformers and substantially fixed grid bias voltage. This bias is provided here by splitting the speaker field into two sections, using one of proper resistance in the negative B supply lead to the entire set in order that all current drawn by the receiver will flow through this winding, thus developing a voltage drop across it which will be practically fixed.

The remaining section of the speaker field required for adequate excitation (a full 12 watts for high speaker efficiency) is connected in the B plus supply lead, forming part of the voltage divider and contributing a little filtration. Actual filtration, however, is provided in a choke input filter (for good voltage regulation) by one very large, high-inductance filter choke and 20 microfarads of dry electrolytic capacity. The power supply uses a 5Z3 high-vacuum thermionic rectifier tube having a low voltage drop in order to provide the full 350 volts at 120 ma. required for operation of the receiver.

Such, then, is a brief description of an all-wave receiver designed with the single purpose of giving the greatest possible performance per dollar that could be obtained by painstakingly careful design and final sale in the most economical possible manner—direct from laboratory to user.

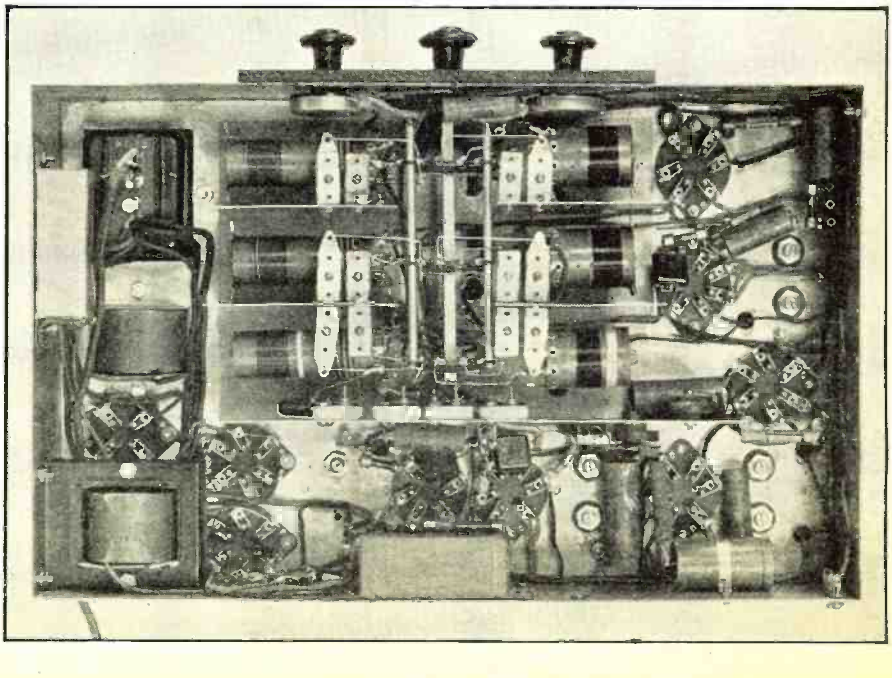
Operating Tests

(As conducted June 29 30, and July 1 by members of the RADIO NEWS *staff, in the Westchester Listening Post.)*

The "World-Wide Nine" was tried out over a period of three days in the Westchester Listening Post. Following is a partial (*Continued on page* 181)

VIEW UNDERNEATH THE RECEIVER CHASSIS

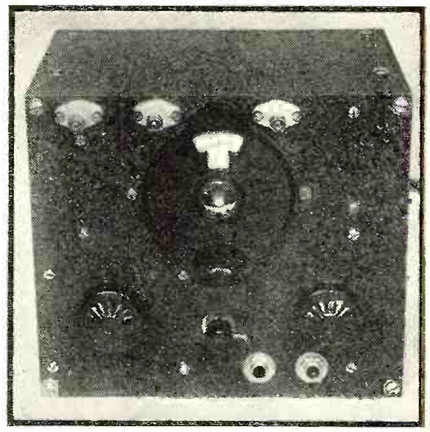
This photo shows what the new receiver looks like below deck. Notice the coils and the wave-change switch, centrally located, with individual static shields placed between each coil set. Other views of the receiver were shown in Part One



TINY TRANSCEIVERS IN 5-METER TESTS

Tests conducted by group of Long Island "hams" once more demonstrate the practical value of the 5-meter band for "local" communication

S. Gordon Taylor



DEPEW'S TRANSCEIVER

This tiny combination transmitter and receiver, installed in one of the planes, maintained constant contact with the test station within a cruising range of 25 miles. Constructional details of this unit will be provided next month

ONE Sunday late in January some tests were conducted by the members of the Garden City Radio Club which, while they may not be recorded in history, certainly offered significant promise for the future. With combination receiver-transmitters little larger than an ordinary box camera, two airplanes were able to maintain continuous two-way communication with a ground station while cruising about at altitudes of up to 5000 feet and at distances up to approximately 25 miles. And this without any special preparation. In fact, the conditions were about as bad as they could be in some respects. The transceivers employed were not especially designed for aircraft use, the ignition systems of the planes were not specially shielded and both planes were of the open cockpit type with no protection against the terrific roar of the engines. Yet in spite of these conditions, the men in the planes were able to pick up the ground station constantly, and despite their "flea-power" transmitters, were able to make themselves heard at the ground station, most of the time on the loudspeaker, throughout their flights.

It gave one an odd feeling to first see the flyers climb into the planes, carrying with them their tiny transceivers, then to see the planes rise and gradually disappear in the distance, yet to hear their voices come pounding in over the loudspeaker of the ground station long after the planes had been lost to sight. This was Jules Verne brought up to date! A vision 50 years ago and an actuality today! Just what it forecasts for the future it is hard to say, but it certainly offers an interesting commentary on the pioneer activities of the great American amateur fraternity and the contributions that have been made and are constantly making to the development of radio.

The ability of aviators to maintain contact with the ground via radio is nothing new. The radio installation has become a standard part of the equipment of many planes, particularly in transport service. Nor does the fact that these tests employed planes have any particular significance. The significant thing is that with such ridiculously small equipment as these transceivers it was found possible to communicate dependably by voice over distances of 25 miles. This indicates that the fundamental equipment problems involved in practical and economical short-distance communication have been largely solved. Where other means of communication are lacking, such equipment as that employed in these test planes might enable a man to keep in touch with his home constantly during the day, the police to keep in continuous touch with headquarters, exploration advance guards to communicate constantly with their bases, hunting and fishing parties to maintain contact, construction projects to be under more complete control during the early stages before ordinary telephone lines can be installed for the purpose. These and many others are the possibilities brought nearer or made more practical by such pioneer work and tests as those carried on by this group of amateurs.

The primary advantage of the equipment under consideration is that it operates on the ultra-high frequencies in the neighborhood of 56,000 kilocycles, or 5 meters. In this high-frequency region relatively low transmitter power is required, skip-distance effect is negligible and electrical disturbances of either the man-made or natural variety are almost completely absent. Many of the greatest obstacles to radio communication on the lower frequencies are therefore no longer problems at this high frequency. The one outstanding difference which favors the lower frequencies is that greater distances can be covered, but this, in turn, involves the use of higher power and correspondingly larger equipment. It is entirely safe to forecast that the practical utility of radio will be greatly increased as a result of the development work being carried on now, by both amateur and commercial interests, in this 56-megacycle region.

Coming back to the tests themselves, the equipment employed consisted of the two transceivers, one in each plane, and the transmitter and receiver employed at the ground station. One of the transceivers will be described in some detail next month. The ground station transmitter employed higher power, with a pair of –10's in push-pull for the oscillator, a pair of –50's for the modulator and a –56 tube for the one-stage speech amplifier. The receiver used on the ground was a National type SRR with a National 5880-AB power pack to provide the operating voltages from the a.c. line. The antenna was a half-wave doublet with a 35-foot double lead-in using Lynch transposition blocks.

THE GARDEN CITY RADIO CLUB "GANG"

This is the group of serious-minded (but not too serious!) amateurs who conducted the tests described here. From left to right: Ed. Ruth, S. P. McMinn (W2WD), Arthur H. Lynch (W2DKJ), Dick Depew (W2SB), Sonny Trunk, Dr. L. J. Dunn (W2CLA) and Harry Steenberg (W2AOL)

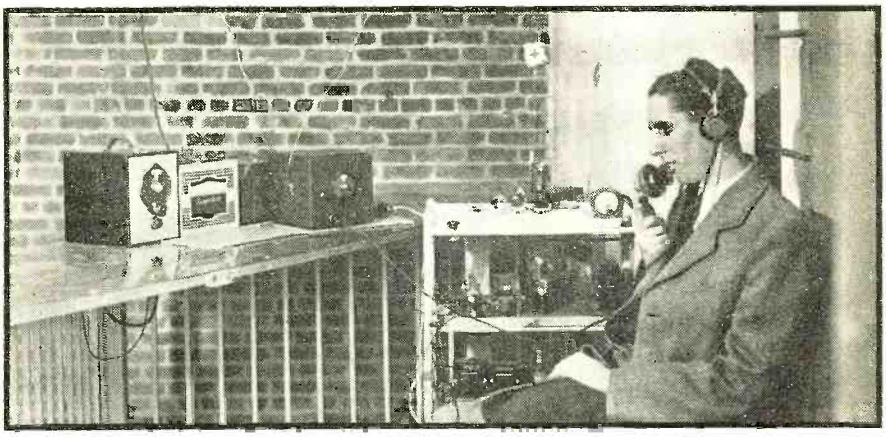
The transceivers in the planes employed dry-cell A and B batteries, 3 volts for the filaments and 135 or 180 volts for the plates. One of the planes employed a half-wave doublet mounted on the wing and fed through a lead-in consisting of a twisted pair. The other plane employed a quarter-wave duralumin tube for the antenna with an 8-foot parallel "Zepp" feeder, one wire connected to the antenna and the other to the metal of the plane which was employed for "ground."

All of the equipment was home-made with the exception of the receiver and power pack used at the ground station.

The tests were organized with Dick Depew (W2SB) and his transceiver flying as radio "op" in one plane (although he is a licensed pilot himself) and S. P. McMinn (W2WD), owner and constructor of the other transceiver, functioning as radio man on the other plane. The latter was piloted by Dr. L. J. Dunn (W2CLA), former director of the Hudson Division of the A.R.R.L. The ground station was under the supervision of Arthur H. Lynch (W2DKJ), who as former editor of RADIO NEWS needs no introduction to readers, and operated by Harry Steenberg (W2AOL).

Before starting the flight tests everything was made ready on the ground and each of the transmitters "spotted" on the two other receivers. When the planes took off, one after the other, their transmitters went into operation and each could be followed as it gained altitude and distance.

Almost immediately trouble was encountered in understanding Dick Depew. His signals were strong, but the microphone which he employed was too sensitive to work against the background of engine noise. If he raised his voice to override the background noise, the microphone would blast. He therefore switched to buzzer modulation and from that time on no difficulty was encountered. McMinn was using a regular airplane type microphone, intended for use under just such conditions, and as a result was able to use 'phone throughout the tests.



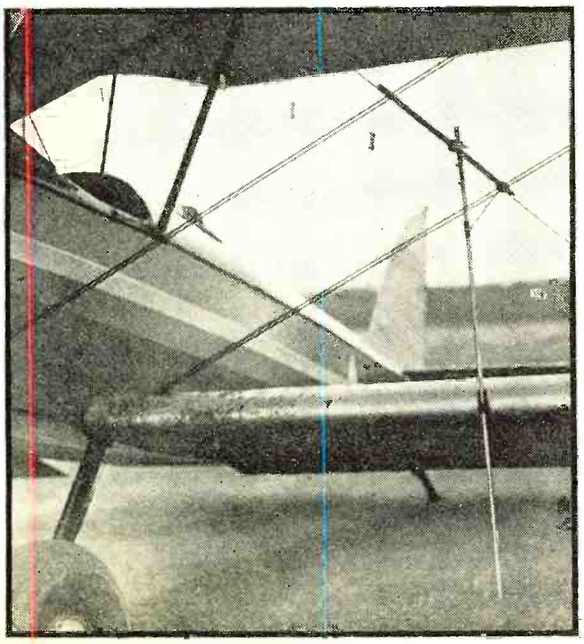
THE GROUND STATION

Designed, constructed and installed by McMinn, this outfit gave a good account of itself throughout the tests. Steenberg operating.

The only obstacle to the complete success of the tests was encountered at the ground station and was due to the "blooping" of other 5-meter receivers in the neighborhood. An announcement of the tests had been broadcast a few days earlier and it seemed that everyone for miles around who owned a 5-meter receiver was listening in. These 5-meter super-regenerative receivers have the old single-circuit regenerative receiver left at the post when it comes to "blooping." One "ham" who had heard about the tests, not satisfied to listen in at a distance, had driven to the flying field, parked his car right next to the hangar in which the ground station was operating, and was taking it all in by means of a tiny receiver installed in his car. The interference caused by this receiver was so severe as to completely obliterate signals from the planes. Fortunately, he was located and shut down after a moment or two.

THE 5-METER ANTENNA

This 4-foot duralumin tube mounted on the wing served as the quarter-wave antenna and was connected to the transceiver by an 8-foot parallel "Zepp" feeder with the fusilage as "ground"



An attempt was made to carry on communication between the two planes while in the air, but, due to the low power used, their signals were not loud enough in the headphones to be heard above the noise level of the motors. Had the transceivers been equipped with more audio amplification, the signal level could undoubtedly have been brought up sufficiently above this noise to permit successful communication. Or, if the planes had been of the cabin type, the engine noise would likely have been cut down enough to enable the operators to hear each other satisfactorily.

The test flights continued for approximately an hour, and during that entire time contact was not broken with either plane except for the two or three short breaks caused by interference from "bloopers." Later reports were received from many other amateurs who had been listening in on the tests from various parts of Long Island, New Jersey, New York City and Brooklyn, indicating that signals from the planes and the ground station all got out well over a rather extensive area.

Knowing that many readers will be interested in these little transceivers, Dick Depew has been good enough to provide information on the outfit he used during the tests.

This will be published next month in sufficient detail to enable anyone interested to duplicate the unit. The circuit diagram, inside and outside views, the complete list of parts employed and some information on suitable 5-meter antennas will be provided in this forthcoming article.

Lest an incorrect idea be formed from the foregoing concerning applications of 5-meter equipment to communication work, it is well to point out that these short waves take on some of the characteristics of light. They lack the penetrating power of longer waves, and metallic masses such as the steel frames of buildings, etc., have a decided shielding effect. In sections of cities where there are numerous large buildings, therefore, communication is often found quite unsatisfactory.

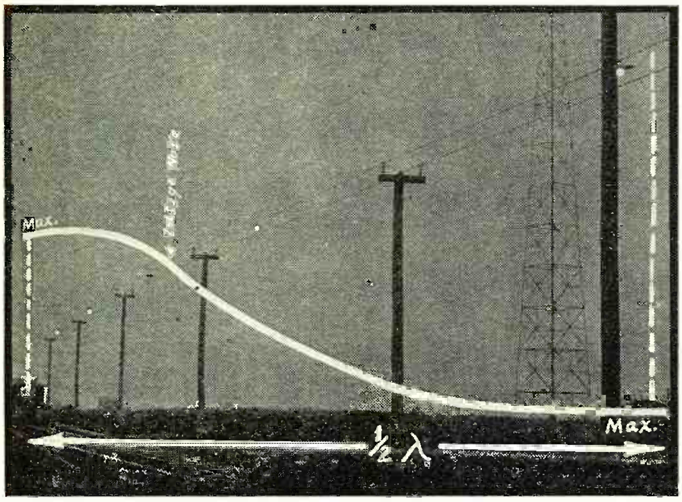
Another peculiarity they seem definitely to show is their inability to either penetrate or curve around the earth's surface. Marconi, with the aid of directional beams, reflectors, etc., has been able to overcome this to a certain extent, but in normal use of these wavelengths, with ordinary equipment, this condition is one which must be faced. One plan which helps, where the maximum distance range is desired, is to elevate the antenna as far above ground as possible. The higher the antenna at both the transmitting and receiving ends, the greater will be the distance covered. Just as the curvature of the earth limits the range of (*Continued on page* 179)

MATCHING IMPEDANCES IN ANTENNA AND FEEDER DESIGN

There is hardly a subject more puzzling to the amateur and experimenter than that of transmission lines. The author gives an unusually clear explanation of this all-important problem of aerial design

Verne V. Gunsolley

Part One



MATCHING THE IMPEDANCE

Figure 3. The lamps show standing waves on the transmission line. Note that one lamp is dark. This is NOT *as it should be; all lamps would be equally bright if impedances were properly matched, as will be explained next month*

If an automobile is jacked up and put in high gear it will be found that it is comparatively easy to turn the engine by means of the rear wheels. If the gear is then shifted into "low," the effort required to turn the engine is found to be enormously increased.

The same principle applies when the car is coasting downhill. In "high" it coasts quite freely, but putting it in "low" is almost equivalent to locking the brakes. Thus we might say that the impedance is high when in low gear and very low when in high gear.

Considering now the impedance of the road, we know that the impedance to the car is high on hills and through mud, but low on level, smooth, hard stretches. It follows that the impedance looking into the rear wheels of the car must be made to match the impedance looking into the road or there will not be a maximum transfer of power. When the impedance of the road is high, we therefore make the impedance of the gearing high by shifting into "low." Likewise, when the road impedance is low, we make the car impedance low by shifting into "high."

In this manner only is it possible to make maximum use of the available power. If the impedances are not matched, there seems to be a lack of power. That is, taking the heavy pulls on "high," the car seems to lack power transfer, and, taking the light pulls on "low" there again seems to be a lack of power transfer.

The principles outlined in the foregoing apply to all transmission systems for any kind of energy. We are more particularly interested in the case of electrical energy, but before going on, will take two more examples.

Consider the case of steam power. Steam is capable of expansion at high speed with comparatively low pressure. In this case it is much like magnetic force which is capable of pulling an armature around at high speed but with low torque. The steam may be made to expand against a piston head at low speed and high pressure (torque), and fair efficiency may be obtained by this means. However, the impedances are more closely matched at high speed and low pressure against the piston; or a blade (as it will have to be) of a turbine wheel capable of greater velocity than a piston. Similarly such is the case with the electric motor.

Let V be the speed of the steam and v the speed of the blade. The force on the blade is proportional to the relative speed, or (V-v). The power, P, is equal to the force (V-v) times the speed of the blade v and some constant k; that is

$$P = kv\,(V-v)$$

This is a maximum when $\frac{\delta P}{\delta v} = 0$; from which $V - 2v = 0$ and $v = \frac{1}{2}V$; that is, when the speed of the blade equals one-half the speed of the steam jet, the impedances within the steam turbine are matched and maximum power transfer results.

In the case of a phonograph horn, the output from the diaphragm is a maximum when the impedances between air and diaphragm are matched. The object of the horn is to load the diaphragm. The small portion of the neck matches the impedance for high frequencies while the larger portion matches the impedance at low frequencies. It was not possible to get a maximum of power out of the low frequencies until this principle was realized. The logarithmic horn matches the impedances for all the frequencies in the range for which it is designed, thereby giving them more equal reproduction.

Suppose we have a cell of internal resistance r and an external circuit of resistance R. When will the power output be a maximum as we vary R?

The power in the external circuit is E^2/R. But E is equal to $I(R + r)$. Substituting for E its value gives

$$P = \frac{I^2\,(R + r)^2}{R}$$

This is a maximum for the condition $\frac{\delta P}{\delta R} = 0$, and thus for $\frac{I^2R^2 - I^2r^2}{R^2} = 0$; from which $R = r$. Thus when the resistances are equal, the power output is a maximum.

What is (*Continued on page* 177)

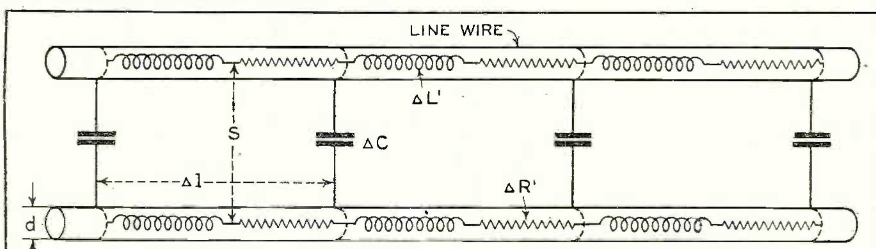


FIG. 1

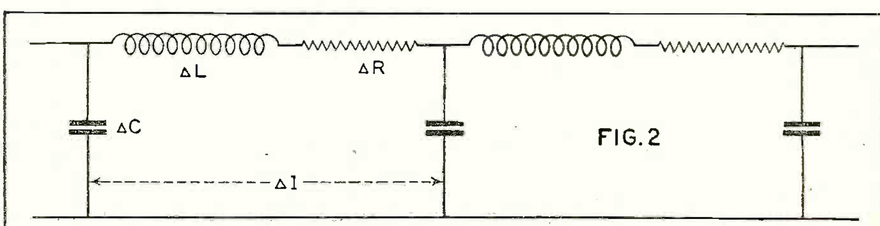


FIG. 2

PHENOMENA UNDERLYING RADIO

Pyro-electric, Thermo-electric effects

E. B. Kirk

Part Nine

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

A crystal, when heated or cooled, develops charges on the extremities of its hemihedral axes. If a crystal (tourmaline, for example) be heated and then broken, the parts will show the same polarity as the unbroken piece, and if it be powdered and spread on a glass plate and its temperature changed, the particles of the crystal will arrange themselves in line similar to iron filings in a magnetic field. This shows that there is a polarity developed even in the smallest pieces. This action is explained in a manner somewhat similar to the explanation of the piezo-electric action. The heat causes changes within the crystal which are unequal along the various axes, and since the electrons are "bound," there is only a shift of polarization in the rearrangement of the molecules. When the temperature gradients are removed—that is, when the crystal has been restored to a state of thermal equilibrium with its surroundings—the stresses and strains disappear and the crystal becomes electrically neutral again.

Pyro-electricity has not been put to any startling use, but it is evident that, since mechanical change always involves heat, an application of mechanical force (compression, tension, bending, twisting and so forth would cause inequalities of temperature) gives rise to electric charges on these crystals. A series of compressions and rarefactions (such as sound waves) would cause a corresponding variation in the electrical condition which, in turn, could be detected or amplified. Further, the converse, as in the case of the piezo-electric effect, is possible: changes in the potential difference applied to the appropriate faces of a crystal would cause changes in the temperature within the crystal. However, it follows at once that if this were done a condition exactly similar to that considered under the piezo action is brought about. Obviously the four (the two piezo- and the two pyro-electric) effects are inextricably tied together.

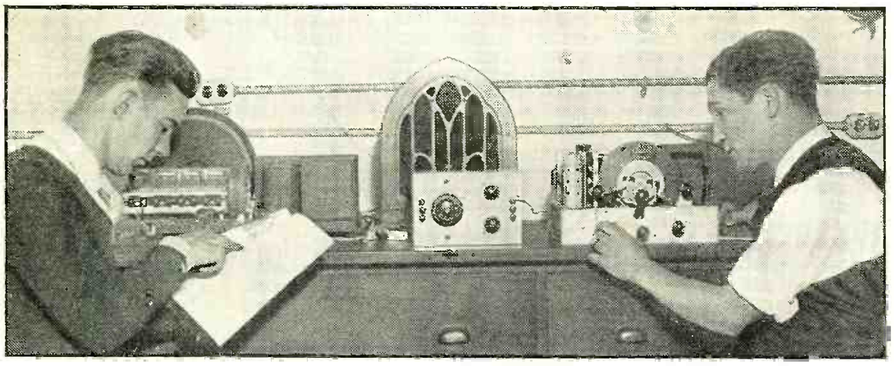
We are now ready to inquire into the actions falling under the third division, namely: dissimilar materials in contact. Under this division, the largest of the three and one which permits of practically endless combinations of material, we shall first examine the thermo-electric effects, later, electric-cell action, electrolytic conductance and the anomalous behavior of alloys.

Thermo-Electric Effects

The discovery of thermo-electricity was made in 1821 by Thomas Johann Seebeck (1780-1831). While attempting to establish the truth of certain of his speculations about the magnetic nature of electric current, he noticed his galvanometer was unexpectedly deflected. The cause for this unlooked-for current he found to be the heat from his hand when held in contact with one of two copper-bismuth connections in the circuit. Further experimentation showed him that the current produced was dependent on the difference of temperature between the two junctions; also, that for a given temperature difference, the strength of the current was determined by the choice of the metals forming the junctions. Thus, accidentally, Seebeck discovered the possibility of producing electric currents directly from heat. Currents so produced—that is, directly as a consequence of a difference of temperature between the parts of a conducting circuit—are termed thermo-electric currents, and the phenomena involved in the conversion of heat energy into electric energy is termed the Seebeck Effect.

At the time of its discovery there was no satisfactory explanation for this phenomena. The majority of physicists still held to the Caloric theory of heat which stated that heat was an imponderable fluid. That heat was a mode of motion had been postulated by Rumford in 1812, fourteen years after his classic cannon-boring experiments at Munich by which he had shown that an unlimited amount of heat could be produced from one piece of metal as long as mechanical energy was supplied in the form of friction, but this found little support except from Sir Humphrey Davy (first electrochemist) and Thomas Young (champion of the wave theory of light). There was no electron theory at that time and the theories of electricity were in general speculative if not fanciful. However, the discovery of the direct convertibility of heat into electric currents was a forward step toward the correlation of all of the natural forces. Ohm resorted to the use of thermo-electricity as a means of obtaining constant potentials for the investigations which led to the enunciation of his famous law. With the researches of Mayer, Helmholtz and Joule it was contributory to the evidence in favor of the theory of conservation of energy which was first put forward by Robert Mayer in 1842. In addition to its theoretical importance the Seebeck effect claims attention because of its practical radio applications. A number of various types of high-frequency ammeters depend upon the generation of secondary direct currents by the heating effects of the a.c. Temperature measurements beyond the range of the ordinary thermometers can easily be made if the ammeter in the circuit with a thermocouple (junctions of dissimilar metals) is calibrated in degrees. Precision measurements in radio are often liable to errors arising from unexpected sources of thermal e.m.f. within the measuring circuit. In micro-wave production and detection, fortuitous currents arising from temperature gradients within the vacuum tubes (or within the tube circuits) can be responsible for important shifts of the operational characteristics.

Before taking up the quantitative relationships between temperature difference, kinds of metals in contact, and the strength of the resulting currents, and further an examination of the action in the light of the electron theory, it will be helpful to know that an inverse thermo-electric effect exists. Thirteen years after Seebeck's discovery, Jean Charles Athanase Peltier (1785-1845), a Parisian watchmaker, demonstrated that an electric current flowing through a junction of dissimilar metals may produce cold as well as heat (Joulean heat, commonly called I^2r losses). Using copper-antimony junctions, he found that the current when flowing from antimony to copper liberated heat while actually cooling the junction when flowing from copper to antimony. Here again the amount of heating or cooling of a junction depended on the metals in contact, and on the direction and strength of the current flowing. The Peltier Effect, as this phenomena is called, has so far been of more theoretical interest than practical importance, although Lenz did succeed in freezing water by means of it. Here again we see the principle of reversibility in operation; namely, if an action or phenomena involves the conversion of one form of energy into another, in general it will be possible to effect the inverse conversion. The reversible character of a phenomena may be so obvious as to pass unnoticed or, on the other hand, although the prediction of an inverse effect may be made on theoretical or other grounds, the means for detecting or measuring it experimentally may not be available. We have seen the (*Continued on page* 188)



THE DX CORNER

FOR BROADCAST WAVES

READERS who are desirous of receiving appointments as Official Listening Posts should make application now in order to be in line for consideration when selections are made early in the Fall.

* * *

The Editor will be glad to receive photographs and brief descriptions of DX receiver installations. Many readers of this department undoubtedly have installations of which they are justifiably proud and photographs of such installations, if published in this department, would be helpful to other readers who contemplate making changes in their own installations with the idea of improving their appearance or effectiveness. Likewise descriptions of antenna systems, antenna switching arrangements, or any other ideas which have improved reception results will be welcome.

* * *

In submitting reports to this department concerning station lists, station changes, etc., it is suggested that the source of the information be given. This not only indicates the authenticity of the material but enables the Editor to give credit where credit is due. Thus if a reader submits information provided to him by a DX club of which he is a member, it is only fair that both he and the club receive their share of credit in this department.

* * *

It is a wise move to take advantage of the Summer months to check over the DX receiver and make any changes in it or its accessories that have been planned. Too often such activities are put off until good DX weather rolls around. Give a thought to your equipment now. Are there changes which should be made to make it more effective (or perhaps more sightly). Servicemen are not as busy now as they will be next winter and many of them will welcome an opportunity to "hop up" your receiver, during this slack period, if you are not qualified to do this work yourself. Also, it will be far easier and more comfortable to erect that new antenna now rather than waiting until the cold weather has set in. If you take the precaution to accomplish these changes at this time, you will be all set for an uninterrupted round of DX in the months to come.

—The Editor

Changes in Canadian List

H. J. Roberts, Winnipeg, Manitoba, calls attention to the fact that CJRC which was recently listed in RADIO NEWS as being located at Moose Jaw, Sask., is actually located in Winnipeg. Also he states that our list omitted CKY, the telephone system station at Winnipeg. His local newspapers report that CKY is now installing new equipment and when the changes are completed in the fall will be on the air with a power of 15 kw., making it the most powerful Canadian station.

U. S. Station Changes

The following applications for changes were granted by the Federal Radio Commission during the month of June. (Abbreviations employed are: CP—construction permit, LS—local sunset, Mod—modification, Lic—license):

Call and Location	*Change*
WOW Omaha Nebr.	Granted CP to move transmitter to new site, make changes in eqpt. and increase day power from 1 kw. to 2½ kw.
KGBZ York, Nebr.	Granted CP to make changes in eqpt. and increase day power to 2½ kw. LS.
WHEC Rochester, N.Y.	Granted Mod. of Lic. to increase day power from 500 w. to 1 kw.
WINS New York City	Granted Mod. of Lic. to increase power from 500 w. night, 1 kw. day, to 1 kw. day and night. (No change in hours of operation.)
KTSA San Antonio, T.	Granted Spec. Exp. Auth. to change freq. from 1290 kc. to 550 kc. and increase day power from 1 kw. to 2½ kw. for period ending Oct. 1, 1934.
WGST Atlanta, Ga.	Granted Mod. of Lic. to increase power from 250 watts night, 1 kw. day to 500 w. night and 1 kw. day.
KLUF Galveston, Tex.	Granted Spec. Exp. Auth. to increase daytime power from 100 to 250 watts, for period of 6 months.
WSMB NewOrleans, La.	Granted Mod. of Lic. to increase power from 500 kw. to 1 kw.
KMA henandoah, Ia.	Granted Mod. of Lic. to increase day power to 2½ kw. KW-LS; application for increase. in night power from 500 w. to 1 kw. was designated for hearing.
KMTR Los Angeles, C.	Granted Mod. of Lic. to increase power from 500 watts to 1 kw.
KVI Tacoma, Wash.	Granted Mod. of Lic. to increase power from 500 w. to 1 kw. day and night.
WJDX Jackson, Miss.	Granted Lic. covering increase in power and change in eqpt. 1270 kc. 1 kw. night, 2½ kw. day.
WJBK Detroit, Mich.	Granted Mod. of Lic. to increase power from 50 to 100 watts.
WNOX Knoxville, Tenn	Granted Mod. of Lic. to change freq. from 560 to 1010 kc.
WIS Columbia, S.C.	Granted CP to move transmitter to site to be determined; make changes in eqpt. change freq. from 1010 kc. to 560 kc. and increase power from 500 w. night 1 kw—LS to 1 kw. night, 2½ kw.—LS.
KGGF Coffeyville, Kan.	Granted Mod. of Lic. to increase power from 500 watts night 1 kw. day, to 1 kw. day and night.
WHA Madison, Wis.	Granted CP to make changes in eqpt. and increase power from 1 kw. day to 2½ kw. day.
KXL Portland, Ore.	Granted CP to make changes in eqpt. increase daytime power from 100 w. to 250 watts.
WOKO Albany, N. Y.	Granted Mod. of Lic. to increase day power from 500 w. to 1 kw.
KSD St. Louis, Mo.	Granted Mod. of Lic. to increase daytime power from 500 w. to 1 kw.
WDBJ Roanoke, Va.	Granted CP to increase daytime power from 500 watts to 1 kw. and install new eqpt.
KIDO Boise, Idaho	Granted CP to increase daytime power from 1 kw. to 2½ kw. make changes in eqpt.
KQW San Jose, Calif.	Granted CP to increase day power from 500 watts to 1 kw. up to 7 p.m.
WEBQ Harrisburg, Ill.	Granted CP for increase in daytime power from 100 to 250 watts, and make changes in eqpt.
WOL Wash., D. C.	Granted CP to increase daytime power from 100 watts to 250 watts and make changes in eqpt.
WISN Milwaukee, Wis.	Granted Mod. of Lic. to increase daytime power from 500 w. to 1 kw.
WINS New York City	Granted Mod. of Lic. to increase daytime power from 500 w. to 1 kw.
KECA Los Angeles, C.	Granted authority to increase day power to 2½ kw. and use old eqpt. of KFI.
WNAC Boston, Mass.	Granted CP to increase daytime power from 1 kw. to 2½ kw. and make changes in eqpt.
WIND Gary, Ind.	Granted CP to increase daytime power from 1 kw. to 2½ kw. and install new eqpt.
KOL Seattle, Wash.	Granted CP to increase daytime power from 1 kw. to 2½ kw. and make changes in eqpt. also move transmitter locally.
WCNW Brooklyn, N. Y	Granted Mod. of CP to increase day power from 100 w. to 250 watts, and make changes in eqpt.
WDAE Tampa, Fla.	Granted Spec. Exp. Auth. to increase daytime power from 1 kw. to 2½ kw. for period ending Oct. 1, 1934 and make changes in eqpt.
KGW Portland, Ore.	Granted CP to move studio locally in Portland, install new eqpt. and increase daytime power from 1 kw. to 2½ kw.
KGW Portland, Ore.	Granted CP to change maximum rated carrier output power, increase power from 1 kw. to 1 kw. night, 2½ kw. day and make changes in eqpt.; also change studio location.
KTRH Houston, Tex.	Granted CP to make changes in eqpt. and increase day power from 1 kw. to 2½ kw.
KHJ Los Angeles, C.	Granted CP to install new eqpt. increase power from 1 kw. to 1 kw. night, 2½ kw. to LS.
KFRC SanFrancisco, C.	Granted CP to install new eqpt. increase power from 1 kw. to 1 kw. night, 2½ kw.—LS.
KGB San Diego, Cal.	Granted CP to install new eqpt. increase power from 1 kw. to 1 kw. night, 2½ kw.—LS.
WBRC Birmingham, Al.	Granted license: 930 kc., 500 w. night, 1 kw.—LS unltd. time.
WCBS Charleston, W. Va.	Granted Mod. of Lic. to increase day power from 500 w. to 1 kw.
KGA Spokane, Wash.	Granted Spec. Exp. Auth. to operate on 900 kc. with 1 kw. night, 2½ kw. LS. unltd., time, for period ending Nov. 1, 1934,
KGIR Butte, Mont.	Granted mod. of lic. to increase night power from 500 watts to 1 kw.

YV1BC Changes Call

The Caracas, Venezuela, station, operating on 960 kc., which is commonly heard by DX fans of the U.S., announces that its call is now YV1RC.

Station Changes Reported by a Listener

John C. Kalmbach, Jr., Buffalo, N. Y., makes application for appointment as an Official RADIO NEWS Listening Post and at the same time passes on some information, gleaned from the "Globe Circler" (International DX'ers Alliance) which he believes will be of special interest to other DX listeners. So far he has logged 300 stations on the broadcast band; stations ranging in power from 25 watts up.

Some changes made by U. S. stations he lists as follows:

KPCB, Seattle, Wash., changed from 650 kc., 100 watts to 710 kc., 250 watts.

KFPY, Spokane, Wash., 1 kw., changed from 1340 kc., to 890 kc.

KGIR, Butte, Mont., changed from 1360 kc., 500 watts to 1340 kc., 1 kw.

KXYZ, Houston, Texas, 1440 kc., increased power from 250 watts to 500 watts.

KNX, Hollywood, Calif., 1050 kc., increased power from 25 kw. to 50 kw.

WHN, New York City, 1010 kc., increased power from 250 watts to 1 kw.

WFEA, Manchester, N. H., 500 watts, changed from 1340 kc. to 1430 kc.

WSVS, Buffalo, N. Y., 1370 kc., to be off the air until September 1, 1934.

He lists the changes in frequency of Mexican stations as follows:

Call	*From (kc.)*	*To (kc.)*
XEA	550	1060
XEBC	815	760
XEI	1310	1370
XENT	1115	1120
XEY	547	1150
XEAL	——	660
XEBF	1315	1240
XEK	990	1100
XEU	1010	980
XEZ	630	1310
XEAZ	——	1240
XEH	1132	1150
XFB	1290	1270
XEMA	——	1080
XEWZ	——	1150

Finally Mr. Kalmbach includes an "up-to-date" list of Russian stations. We refrain from publishing this list, however, because it appears that the U.S.S.R. stations are being shifted around at such a rate that before RADIO NEWS readers would see the list it would in all likelihood be out of date. The U.S.S.R. list published in the July issue, for instance, was fresh from the Soviet Government office but by the time it appeared in print was already shot with mistakes due to changes which in the meantime had been made in station frequencies.

Norwegian Stations

In a letter dated June 11, 1934, the Norwegian Consul General of New York provides a list of the broadcasting stations now in operation in his country. Of the 14 stations listed only three operate within the 550-1500 kc. band, as follows:

LKO, Oslo; 1181 kc., 60 kilowatts
LKI, Finnmark; 845 kc., 10 kilowatts
LKH, Hammar; 578 kc., 700 watts

FINNMARK RADIO (NORWAY)
The opening of station LKI at Finnmark, Norway, was the cause for the celebration pictured here. The small size of the audience is understandable when it is realized that this is the world's most northern station. It operates on 845 kc.

African Stations and Schedules

A letter received from the broadcast manager of the African Broadcasting Company of Johannesburg gives the listing of the African stations operated by that company and the operating schedules of the more powerful ones. The time given is Eastern Standard Time:

Johannesburg, 645 kc., 10,000 watts;
- midnight—12:30 a.m., daily except Sunday
- 3:30 a.m.-7:00 a.m., daily except Sunday
- 9:00 a.m.-4:00 p.m., daily except Sunday
- 11:45 p.m.-midnight, daily except Saturday
- 8:00 a.m.-10:15 a.m., Sunday only
- 12:30 p.m.-3:00 p.m., Sunday only
- 4:00 p.m.-4:45 p.m., Saturday only

Cape Town, 600 kc., 10,000 watts;
- midnight-12:30 a.m., daily except Sunday
- 3:30 a.m.-7:00 a.m., daily except Sunday
- 9:00 a.m.-3:30 p.m., daily except Sunday
- 11:45 p.m.-midnight, daily except Saturday
- 8:00 a.m.-10:15 a.m., Sunday only
- noon-3:00 p.m., Sunday only
- 3:30 p.m.-4:00 p.m., Friday only

Durban, 723 kc., 1,000 watts
- midnight-12:30 a.m., daily except Sunday
- 4:00 a.m.-7:00 a.m., daily except Sunday
- 9:00 a.m.-3:30 p.m., daily except Sunday
- 11:45 p.m.-midnight, daily except Saturday
- 8:00 a.m.-10:45 a.m., Sunday only
- 11:55 a.m.-3:05 p.m., Sunday only
- 3:30 p.m.-4:00 p.m., Saturday only

Pretoria, 940 kc., 50 watts;
(No schedule given)

Bloemfontein, 800 kc., 500 watts;
(No schedule given)

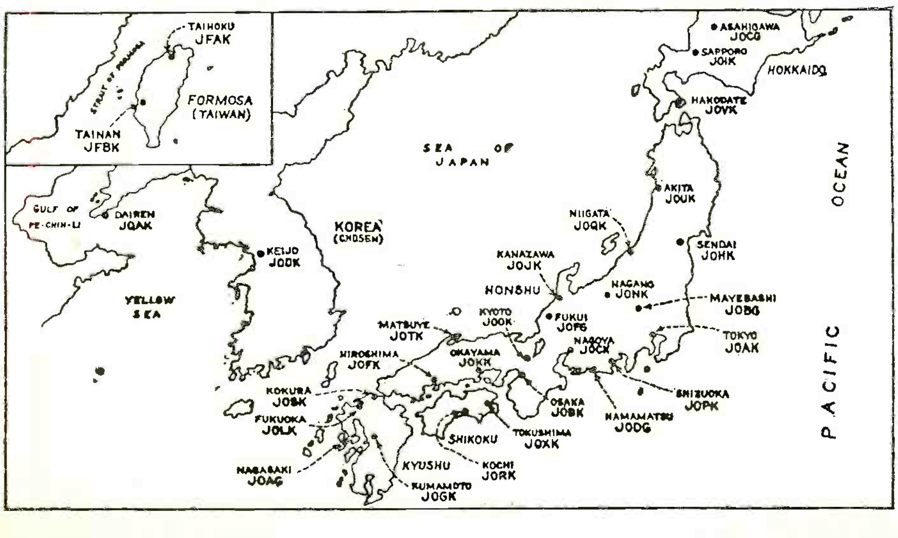
These schedules should be of material assistance to those seeking to add Africa to the countries represented in their logs. Unfortunately these schedules do not provide much operating time when the signal path between South Africa and the U. S. lies entirely in darkness but at least it is helpful to know just when such hours do occur, to serve as a guide in trying for these South Africans.

Broadcasting Stations in Japan

Masall Satow, a reader of Tokio, Japan, forwards a list of Japanese broadcast-band stations and also a map showing the locations of these stations. The list and map are reproduced here and a vote of thanks is extended to Mr. Satow for his excellent co-operation.

Call		Location	Kilocycles	Watts
JFAK		Taihoku, Formosa	670	10,000
JFBK		Tainan, Formosa	720	1,000
JOAG		Nagasaki	930	500
JOAK	1	Tokyo	870	*10,000
JOAK	2	Tokyo	590	*10,000
JOBG		Mayebashi	970	500
JOBK	1	Osaka	750	10,000
JOBK	2	Osaka	1085	10,000
JOCG		Asahogawa	655	300
JOCK	1	Nagoya	810	10,000
JOCK	2	Nagoya	1175	10,000
JODG		Hamamatsu	635	†500
JODK	1	Keijo, Korea	610	10,000
JODK	2	Keijo, Korea	900	10,000
JOFG		Fukui	990	300
JOFK		Hiroshima	850	10,000
JOGK		Kumamoto	790	10,000
JOHK		Sendai	770	10,000
JOIK		Sapporo	830	10,000
JOJK		Kanazawa	710	3,000
JOKK		Okayama	700	500
JOLK		Fukuoka	680	500
JONK		Nagano	940	500
JOOK		Kyoto	960	300
JOPK		Shizuoka	780	500
JOQK		Niigata	920	500
JORK		Kochi	720	500
JOSK		Kokura	735	1,000
JOTK		Matsuye	625	500
JOUK		Akita	645	300
JOVK		Hakodate	680	500
JOXK		Tokushima	980	500
JQAK		Dairen	760	500

*Will increase power to 150.000 watts.



Tuning Meters

As a result of items which have recently appeared in this department containing instructions for connecting a standard milliammeter to a.v.c. superheterodynes, and pointing out the advantages of such meters as signal strength indicators, letters have been received from 3 readers stating that their attempts to follow these instructions had not met with the anticipated degree of success. Investigation showed that in each case the receiver employed was a Midwest—and in each case the complaint was the same. Instead of maintaining a constant degree of deflection on a given station the meter hand would fluctuate with modulation. This constant fluctuation made it impossible to obtain an accurate reading of carrier strength, and even made the meter ineffective as a tuning meter or resonance indicator. An effort is now being made to determine whether there is any practical method of using such a meter with Midwest receivers and if such a method is found it will be reported in this department. In the meantime, the foregoing is published to avoid disappointment on the part of other Midwest owners who may be contemplating the installation of a meter in their receivers. To date this is the only receiver reported by readers as not being adaptable to the tuning meter idea.

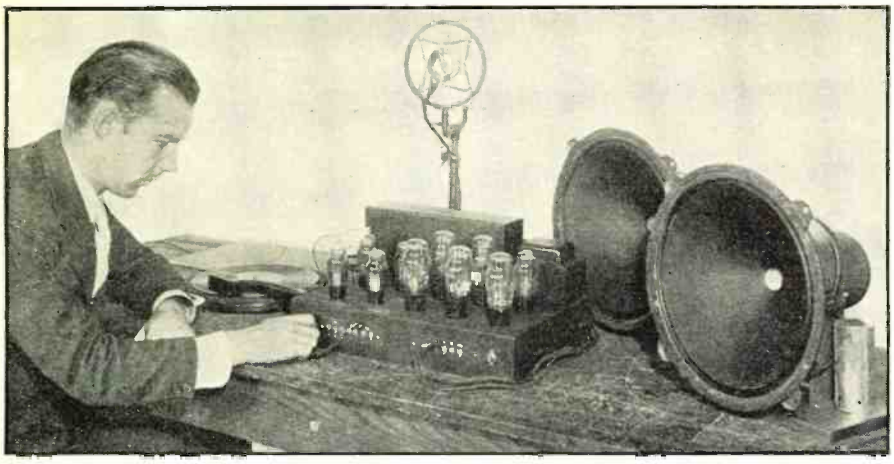
Tuning the Antenna

The "Tenatuner" described in the February 1934 issue (page 483) has given excellent results in the way of improved DX reception to numerous readers. This device will not work satisfactorily, however, when used with a receiver which employs a choke or high resistance input circuit. This applies not only to receivers in which a choke (or resistance) is connected from the grid of the first tube to ground and in which the antenna is connected to the grid through a coupling condenser, but also to receivers having the so called "high-impedance antenna couplers" in which the primary takes the form of a choke and the secondary is part of the tuned grid circuit.

In response to an invitation from the Editors of this department, some readers have submitted suggestions for methods of tuning the antennas with receivers of this type and two of these are being passed along herewith:

Norman L. Scott, New Dayton, Alberta, Canada, suggests the arrangement shown in Figure 1. No change need be made in the receiver. The coil L1 is adjustable and is shunted by a variable tuning condenser. It is this coil that tunes the antenna. L2 is a fixed coil which is closely coupled to L1 and is connected across the antenna and ground terminals of the receiver. The coils

(*Continued on page* 184)



A POWERFUL 30 WATT

P. A. SYSTEM

(Using Class "A" Prime Amplifier)

W. F. Marsh

WITH the advent of the type 2A3 tube a new field has been opened for the design of powerful, high-fidelity public-address systems of compact and light-weight construction. The three-stage, push-pull, 30-watt, Class A prime amplifier engineered by the Allied Radio Corporation and described in this article is built around the highly efficient Class A triode type 2A3 tube and, with the additional refinements and new developments which are incorporated in the amplifier, it is especially suitable to serve as the heart of a complete sound-reproducing system to meet practically all public-address requirements.

A pair of 2A3 type tubes connected in push-pull, with 300 volts on the plate and 62 volts bias, will deliver 15 watts output power. In this amplifier four 2A3 tubes are employed in a parallel push-pull output stage, with a fixed bias, to deliver 30 watts of output power. To obtain a fixed bias for the 2A3 tubes which will not vary with changes of power output, an 82 type rectifier is employed in a separate biasing circuit.

The complete sound system, as shown in the illustration at the top of this page, consists of the ten-tube amplifier, two Oxford auditorium size a.c. dynamic type reproducers (each with its own field supply, including an 80 rectifier) with tubes, one Knight two-button carbon type microphone, one microphone floor stand, one 25-foot microphone cable and two 20-foot speaker connection cords for leeway in placing the speaker.

In designing the system, particular attention was given to its universal application. The input of the amplifier is arranged for single- or double-button carbon type microphones, a crystal type microphone, a high impedance magnetic or crystal type phonograph pick-up, a radio tuner output and for connection to a pre-amplifier, commonly used with the condenser and ribbon type microphone.

The amplifier is equipped to supply its own microphone current, thus eliminating the necessity for a microphone battery. The output transformer is tapped at 4, 8 and 16 ohms for dynamic speaker voice-coil connection and is also tapped at 500 ohms for an output line.

It will be seen that the amplifier has universal and flexible input and output provisions for meeting practically every input or output requirement. It is housed in a steel case in black crystal finish, measuring only 17 inches long by 12¾ inches wide by 8 inches high.

The amplifier has a gain of 92 db. and the frequency response curve in Figure 2, as measured from the input grid, shows the amplifier to be practically flat within plus or minus 2 db., from 60 to 10,000 cycles. This excellent frequency response is not only due to the type 2A3 tubes but also to the method of coupling employed and to the high quality parts utilized in the construction of the unit.

Figure 3 shows the power output distortion curve, revealing only 2 percent at 2 watts output, rising to 3 percent distortion at 20 watts, with 7 percent at the full 30 watts output. An interesting feature of the curve is its flat characteristic at low output levels and in sound work there is a real necessity for an amplification system which can be operated at a point well below its maximum power output, with minimum distortion.

The application of this sound system is practically unlimited. The many features which it incorporates will recommend it to the sound engineer, serviceman and radio dealer for profitable sales or rentals in auditorium, church, hospital, theatre and school installations; also, for outdoor use in stadiums, skating rinks, yacht clubs.

The Circuit

In looking over the schematic circuit diagram, Figure 1, it will be noted that two 58 type tubes are used in a push-pull circuit as voltage amplifiers and are resistance-coupled into a pair of 56 type tubes also operating in a push-pull circuit. These tubes acting as drivers are in turn transformer-coupled to four type 2A3 tubes in a (*Continued on page* 185)

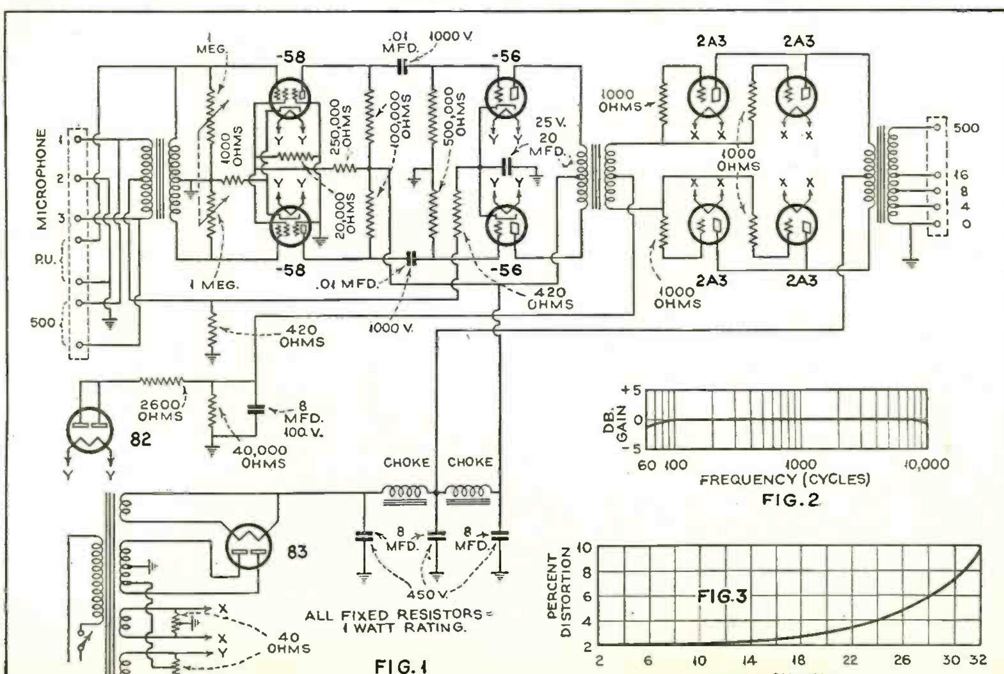


FIG. 1

FIG. 2

FIG. 3

NEW THINGS in RADIO

Brief descriptions of some new radio devices that have just been developed by American engineers

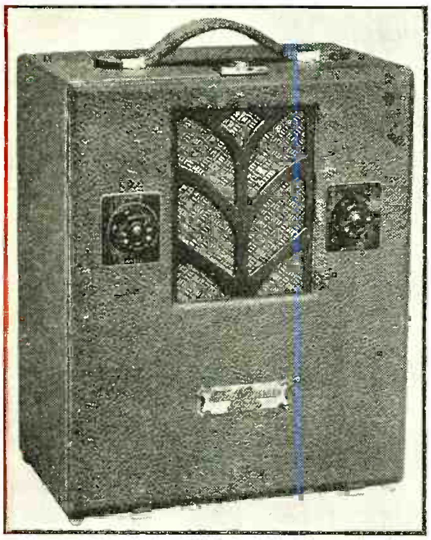
William C. Dorf

A MIDGET VELOCITY MICROPHONE

On his lapel Dr. H. F. Olson, research engineer of the RCA Laboratories wears a tiny lapel microphone, weighing only three ounces, utilizing the "velocity" principles like its bigger brother

A New Portable Receiver for Marine Use

The Freed-Eisemann models 406 and 432 radio receivers are especially designed for marine radio installation. The model 432 is made for use on boats equipped with 32 volts d.c. supply and the model 406 for boats where the power supply is 6 volts



d.c. The set is compactly designed, measuring only 12 inches high by 9½ inches wide by 6 inches deep, and it weighs 14 pounds. The circuit comprises a combined first detector and oscillator, and i.f. stage tuned to 462 kc., a second detector and an output tube. The set is equipped with a 5-inch electrodynamic type speaker and an antenna reel. The feature of this receiver is the small built-in motor-generator which supplies 250 volts to the plates of the radio tubes. The generator and the filaments of the tubes are operated from the ship's power supply, 6 volts or 32 volts, as the case may be. The set, speaker and generator are enclosed in a waterproof Dupont fabrikoid-covered carrying case.

A Universal A.C.-D.C. Dual-Wave Receiver

The International Kadette model ES-20 superheterodyne dual-wave receiver covers the broadcast band from 200 to 550 meters and also the principal domestic and foreign short-wave stations from 18 to 55 meters. The speaker grille is attractively set off with the design of a world-map outlined on a soft pastel shade of china silk showing the principal short-wave stations of the world. The vertical lines in the map represent hourly differences in time at various points on the globe. This feature is seconded by the airplane type dial which is marked with the names of foreign countries indicating the receiving points for the most prominent short-wave stations. The dial is illuminated in one color for the

short-wave band and another for the regular broadcast band. The tube complement is as follows: one 6A7, one 6D6, one 6B7, one 43 and the 25Z5 voltage doubler rectifier tube.

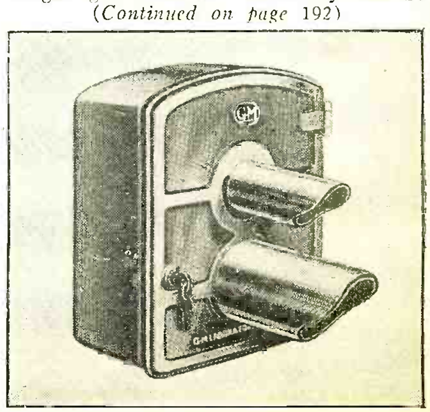
NO JOKING—IT'S A FORD AUTO RADIO!

A new type auto radio receiver has been developed for Ford V-8 cars. It is a six-tube superheterodyne, self-powered with a dynamic speaker and features base compensation

New Photoelectric Device

This is an announcement of the new G-M Laboratories weatherproof photoelectric relay for outdoor use. It is completely enclosed in a cast aluminum case with a hinged gasket cover. The relay can be

(Continued on page 192)



RADIO NEWS SERVICE INSTRUMENTS NO. 2

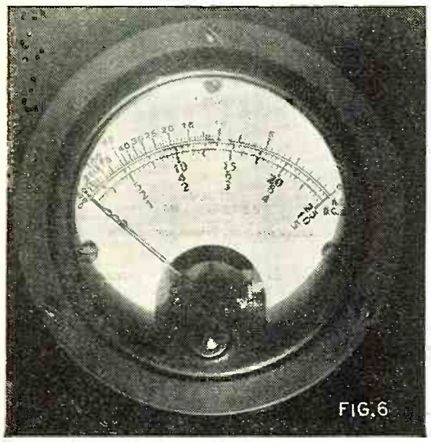


FIG.6

"UNIVERSAL" MULTIMETER

This month the author continues his discussion of this unusual all-purpose service meter, and provides complete data on its construction, its adjustment and use

John H. Potts

Part Two

IT is the firm conviction of the editors that the universal meter panel described in this article (and in an article last month) is the finest single-meter unit ever offered to the serviceman, technician and experimenter. Certainly a meter unit which will permit current reading as low as *2 microamperes* and voltage readings as low as *10 millivolts* fills a long-felt need. When this same meter likewise provides all the higher ranges required in service work, and in addition a wide variety of a.c., resistance, capacity and inductance measurements, it *is* something worth writing about. The meter described here does all these things, and yet is as rugged as any of the meters used commonly in portable service equipment.

LAST month we discussed the design features of the voltage and resistance ranges of this tester. Now let us consider the current ranges. The point of particular interest is the method of switching used, which has been adopted at the suggestion of the Technical Staff of RADIO NEWS. The method employed in many testers was shown in Figure 3c last month. The switch used in this common system must be of a type which makes connection at the new position before the contact at the former position is opened. While one less deck may be required in this old system, if high-resistance contacts should develop at the moving arm contactor inaccuracy will result. What is even more important, any failure of the arm to make contact before the previous connection is broken will cause a severe overload and possible damage to the meter. The method employed in our tester overcomes these troubles and permits the use of a non-shorting switch throughout all decks, giving a positive indication of its position at each setting. A diagram of this portion of the circuit was shown in Figure 3d last month.

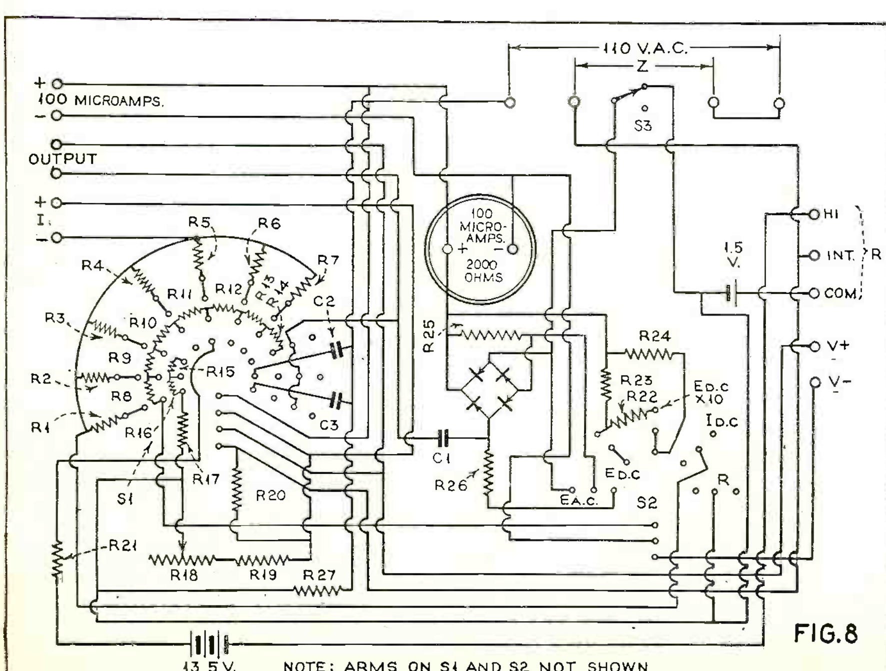
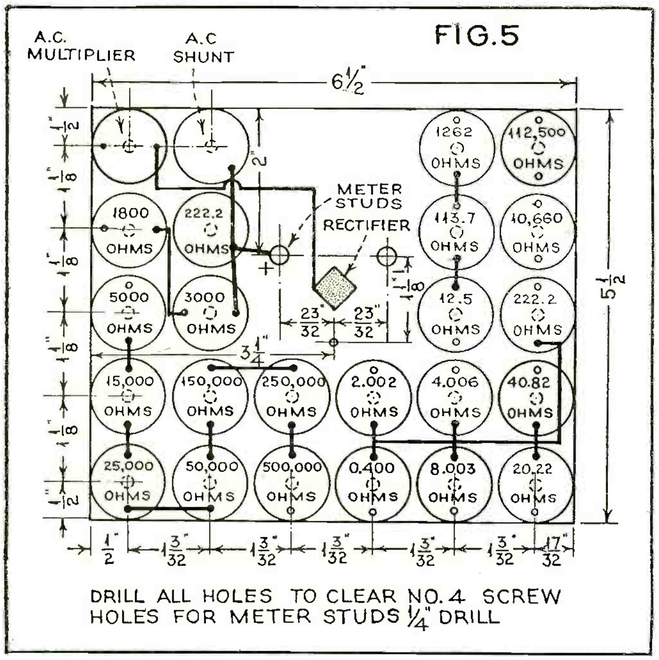


FIG.8

It will be noted that the two moving-arm terminals are in series with one side of the meter and current pin-jack terminal. Therefore, failure of either moving-arm contactor to make connection will simply open either the meter circuit or the main circuit, *in either case providing absolute protection for the meter*. The shunts have one common terminal, which should be of heavy wire, and the other individual terminals each connect to two switch points of adjacent decks wired in parallel. If high-resistance contact develops, this added resistance *does not become a part of the shunt*, but merely adds slightly to the resistance of the meter branch or measuring circuit where its influence on accuracy is negligible. The current ranges provided are 0-1/5/10/25/50/100/500 ma., d.c. In addition, pin-jacks make available the 100-micro-ampere range direct. In conjunction with the use of the very low current ranges, the effect of the resistance of the meter upon the resistance of the circuit under test should be taken into consideration.

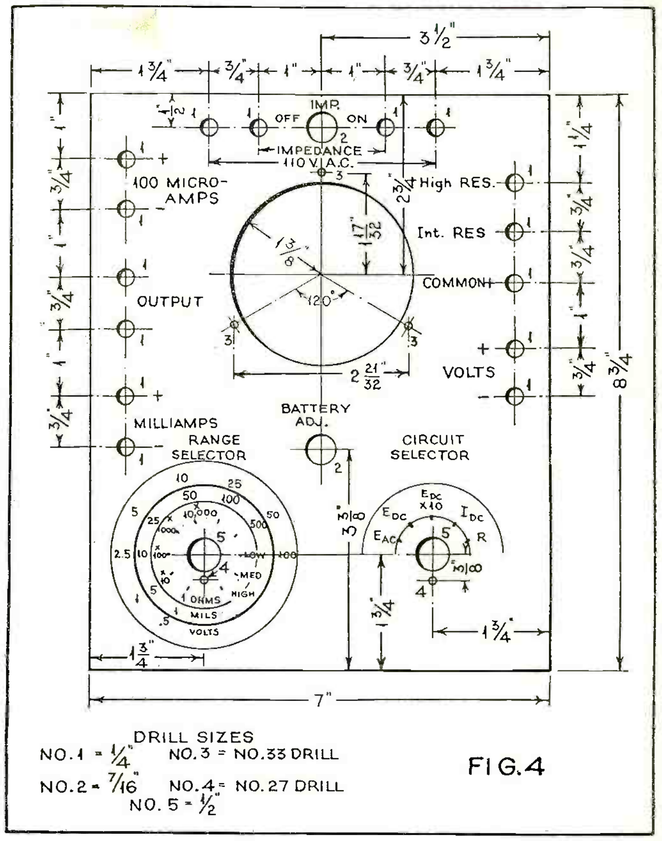
Some may wonder why we have so many ranges for voltage and current. The advantage of a large assortment of ranges is that the meter may be read near full-scale deflection and greater accuracy thus secured. It should be remembered that the accuracy rating of a meter is based on its full-scale deflection. A 2-percent error, with a scale of 100 divisions, means 2 divisions error. Therefore, if the meter reads .9 volt on a 10-volt scale when the actual voltage is 1 volt, the error is actually over 10 percent, although it is well within the usual 2 percent of full-scale tolerance. If we read the same voltage on a 1-volt scale, and a uniform meter error existed, the reading would be .99 volt, or about 1 percent.

An extremely sensitive method for aligning sets is provided by cutting in the output blocking condenser ahead of the a.c. multiplier. When connected across a voice coil, the full-scale deflection is less than two volts at 60 cycles. At higher modulation frequencies the sensitivity is even greater. If the input signal is very weak, below the point where the a.v.c. tube becomes effective, accurate aligning is greatly simplified. When used in other portions of the circuit, the multipliers may be cut in by



SPECIFICATION FOR PANELS

Figure 5, above, shows the drilling specifications for the sub-panel, and the arrangement and wiring of the shunts and multipliers. Figure 4, at right, shows drilling specifications and suggests engraving for the front panel



means of the range selector switch, to adapt the meter to higher output signals.

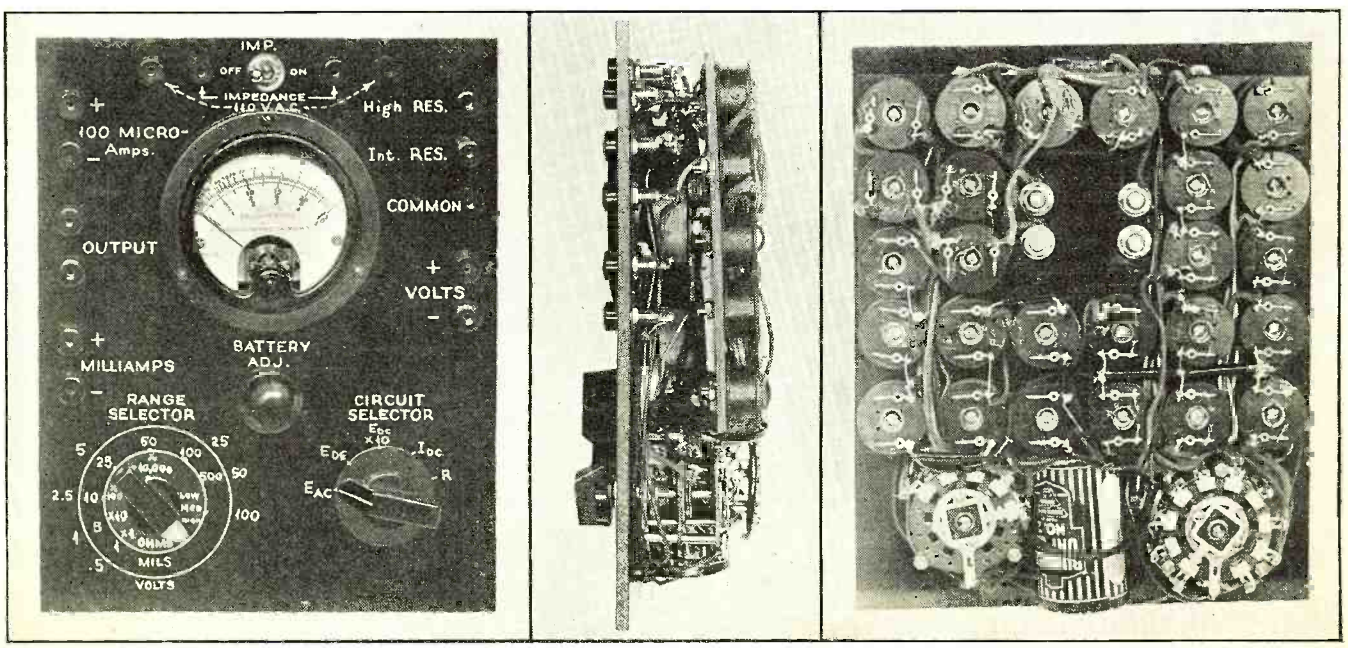
Figure 7 shows a diagram of the circuit used for capacity and inductance measurements. Part of the resistor network used for resistance measurements is used for this test. For the two higher-capacity ranges the unknown capacity is placed in series with a known capacity, and the reading is therefore substantially independent of line voltage. For the small-capacity range, the unknown capacity (or inductance) is placed in series with the resistor network alone. The switch S3 is required to disconnect the voltage adjuster from the rectifier when the multimeter is used for any purpose other than impedance measurements.

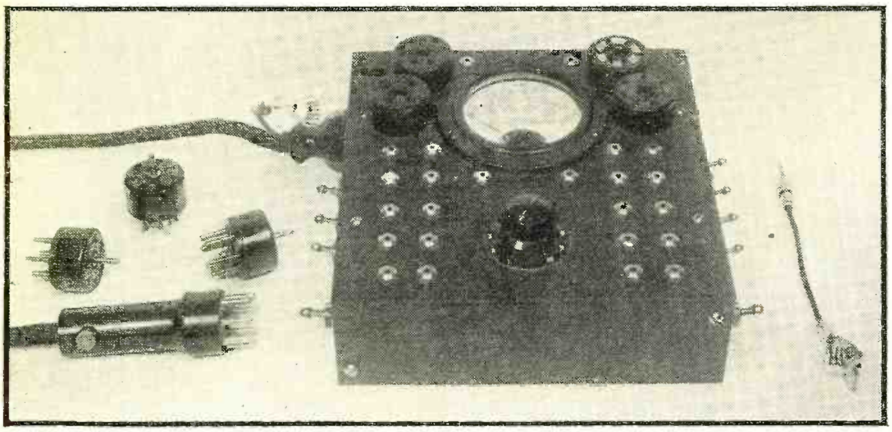
The new Weston meter, type "S-21702-Modified," was especially designed for the unit described in this article. It is probable that it will not be generally available from dealers for the time being, but in such an event may be purchased direct from the Weston Company. The movement of this meter is adjusted for 0-100 microamperes at full-scale deflection. The internal resistance is adjusted at the factory to 2000 ohms. The scale is shown in the photograph, Figure 6. The upper arc contains the resistance calibration with a range of 0-500 ohms, the mid point being 12.5 ohms. This single scale serves for all resistance ranges. The lower arc is used for reading all d.c. measurements, as well as for a.c. voltage ranges of 25 volts and higher. The middle arc is for a.c. voltage ranges of 0-5 and 0-10 volts. The pointer is of the knife-edge type to provide greater accuracy in readings.

In Figure 8 we have a schematic diagram of the complete circuit. It will be noted that several changes in the circuit have been made, if compared with the (*Continued on page* 191)

ASSEMBLED VIEWS

The production model of the Weston meter differs from the experimental model shown in the rear view of the panel, in that it has an external instead of an internal rectifier and therefore has only 2 studs instead of 4. This in no way effects the circuit of Figure 8, however





An Inexpensive POINT to POINT ANALYZER

This analyzer employs the point-to-point system for voltage and resistance measurement and provides for present and future tubes

Emile Milles

THE need for service analyzer equipment which can not easily be outmoded and which is sufficiently flexible to cope with the serviceman's ever increasing problems is effectively met by the instrument described in this article—and it can be constructed for less than twenty-five dollars. The cost is made possible through wise purchasing and the use of a few odds and ends which every radio man has on hand.

Since the average serviceman has to carry analyzer, tools, tubes, etc. on the job, the instrument was designed as compactly as possible. The case measures only 7" x 7" x 2".

Among its numerous features are: ten ranges of a.c. and d.c. voltages up to 1,000 volts, six ranges of direct currents up to 100 ma., high alternating currents may be measured by reading the voltage drop across an external one ohm resistor, direct reading ohmmeter, it can also be used for capacity or inductance measurements. Additional uses and possibilities will reveal themselves as necessity arises. Of course, considerable ingenuity must be used to realize its full capabilities. Heretofore such diversified utility has been quite expensive and instruments of equivalent performance have cost many times as much. Barring the most radical changes in receiver design this analyzer cannot be antiquated.

Building this analyzer will enlighten many, and will clear up many of the mysteries usually surrounding analyzer equipment in addition to saving quite a bit of money. Its construction, while not simple, is still considerably easier than many previous designs, and if the builder follows carefully the constructional details he should encounter no real difficulties.

A sufficient number of new ideas have been used to warrant a brief explanation at this point.

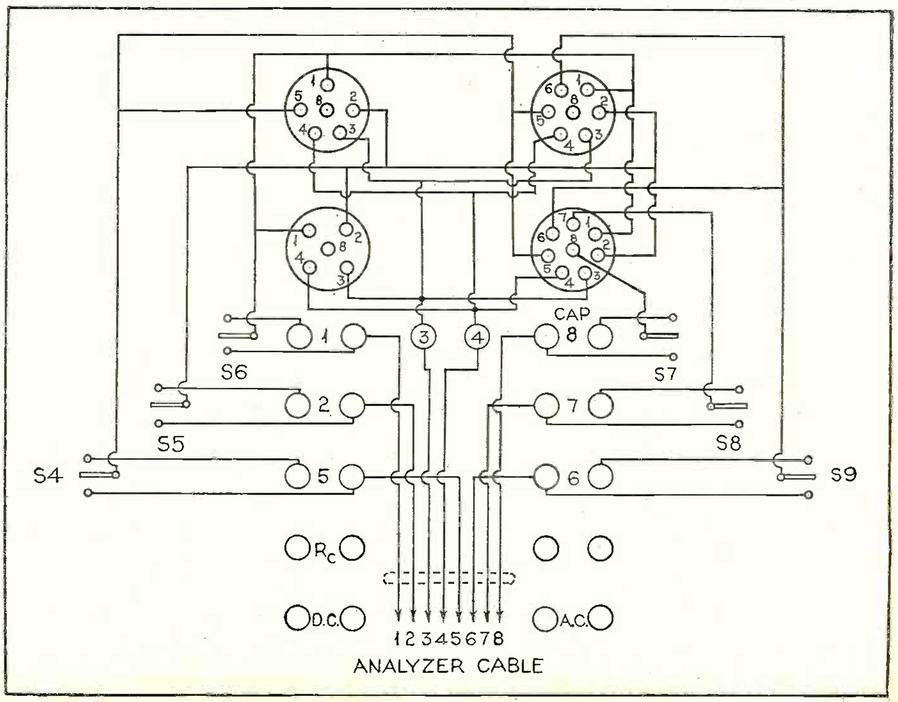
Since it is impossible to call any one prong of all tubes the grid, for example, it was decided to use numbers for the socket connections, as shown in Figure 1.

Toggle switches were used to break the circuits chiefly because they are less expensive and more compact than push buttons. Single-pole-double-throw switches were used in preference to s.p.s.t. switches in order that no tube circuit need be left open for any length of time, thus eliminating the possibility of any damage to set being tested, or the tubes or the meter. For current readings the d.c. meter connections are made to the jacks of the circuit to be measured and then the circuit is opened. Voltage measurements, when made with reference to the heaters may be made between No. 3 or No. 4 and the inner jacks of the remaining tube circuits. If we wish to measure the voltages on a type –24 tube in operation: by means of test leads, connect the d.c. negative to prong number 5, making certain that the a.c.-d.c. switch is on d.c. and the volt-ma. switch is on volts, and a high voltage range is selected; contact the positive meter circuit to No. 1 for the screen grid voltage and contact No. 2 for the plate voltage.

This operation is accomplished by simply running over the respective jacks with a prod, and is far more rapid than selector switches or push buttons, with the additional advantage that any reference point may be used—heater, cathode, or ground. For resistance analysis use the jacks Rc. Connect the prods and jacks in series with a 4½-volt battery, adjust the meter to full scale deflection, then simply contact the different tube circuits. Capacity measurements for paper condensers are made using the 110 volt a.c. line and an a.c. voltage range; and for electrolytic condensers, measure the leakage with the condenser in series with 250 volts d.c. Output measurements are made using

ANALYZER SECTION

Figure 1. The circuit of the analyzer section and the layout of parts on the main panel. For the sake of clarity, the meter wiring is shown separately



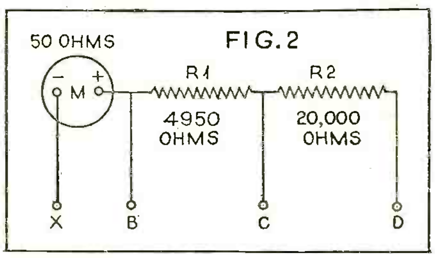
the a.c. ranges. Inductance measurements are made the same as paper condensers.

The accessibility of the tube circuits permits easy demonstrations of microphones, pickups, or additional speakers. Incidentally this is quite an item for additional profits. Many persons have idle phonographs. These people are excellent prospects for microphone and pickup installations.

Cut and drill the bakelite case first. Wire the toggle switches and the rotary switch. Use regular stranded pushback hookup wire. Make the toggle leads about six inches long, and make the leads to the rotary switch eight to ten inches long. The reason for these rather lengthy leads will be quite evident as the analyzer nears completion, for wiring space will be quite limited, and having these switch and toggle leads a trifle long allows the panel to be swung clear when wiring the multimeter connections. Extreme care should be used in wiring the rotary switch so no flux gets on the contact surfaces. Hold the switch in such a position so that the flux runs on the leads rather than on the contact surfaces. As an added precaution the contact surfaces should be gone over with alcohol. With such small currents flowing, dirty contacts can cause large discrepancies in the readings. Mount everything on the top panel and two sides and complete the wiring of the analyzer circuits. Tuck all wires in close to the panels.

Selecting the resistors for the voltmeter multipliers will perhaps be the most difficult task since the meter accuracy depends entirely on your care in selecting accurate resistors. ±2 percent accuracy in resistors used in the voltmeter multipliers is close enough for all practical purposes. Thus, where a 2500 ohm resistor is needed, a resistor testing 2450 ohms to 2550 ohms is suitable for your multipliers. A good grade of carbon resistor can therefore be employed.

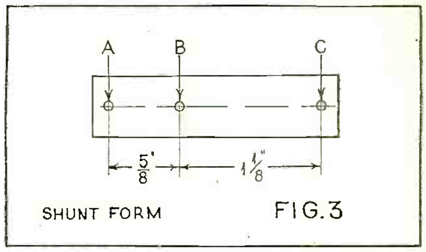
The measuring procedure is simply an

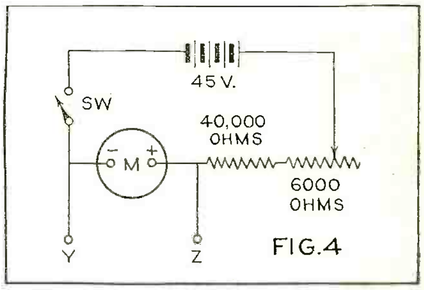


application of Ohm's Law.

R equals E/I, in which R is the total resistance in the circuit; E is the battery voltage; and I is the current flowing. Since the d.c. voltage ranges are 1000 ohms per volt, and the meter has a resistance of 50 ohms, 950 ohms will be necessary to raise the meter reading to 1 volt. 950 ohms is not a commercial-sized resistor, but since carbon pigtail type resistors are very often 5% to 10% inaccurate, no great difficulty should be experienced in finding a resistor rated at 1000 ohms which will be within 2% of 950 ohms. That is, if we have a 1000 ohm commercially rated resistor that tests from 931 ohms to 969 ohms it is within 2% of the required rating for our voltage multiplier, and therefore can be used as the 1 volt d.c. multiplier. The multiplier resistances are in series, hence, the mean accuracy is likely to be better than 2% because one resistor may be a trifle high and another a trifle low, thereby compensating the error.

Using the setup as in Figure 2, connect the battery (4½-volt) and a 1000 ohm resistor (this is a commercially rated carbon pigtail type) in series with points X and C. R1 and R2 are precision wire-wound resistors rated 1% accurate. R1 is 4,950 ohms and R2 is 20,000 ohms. If the meter shows a current flowing of .754 ma., and the battery voltage as read on the five-volt scale (XC) is 4.5 volts, then, according to Ohm's law: 4.5 divided by .754 will give the total resistance in the circuit (5,965 ohms). Since we know that the





resistance XC is 5,000 ohms; then subtracting, we find the resistance under test is 965 ohms which is within 2% of 950 ohms, and thus eligible for use as a multiplier.

This same procedure is to be used up to and including the 5,000 ohm multiplier.

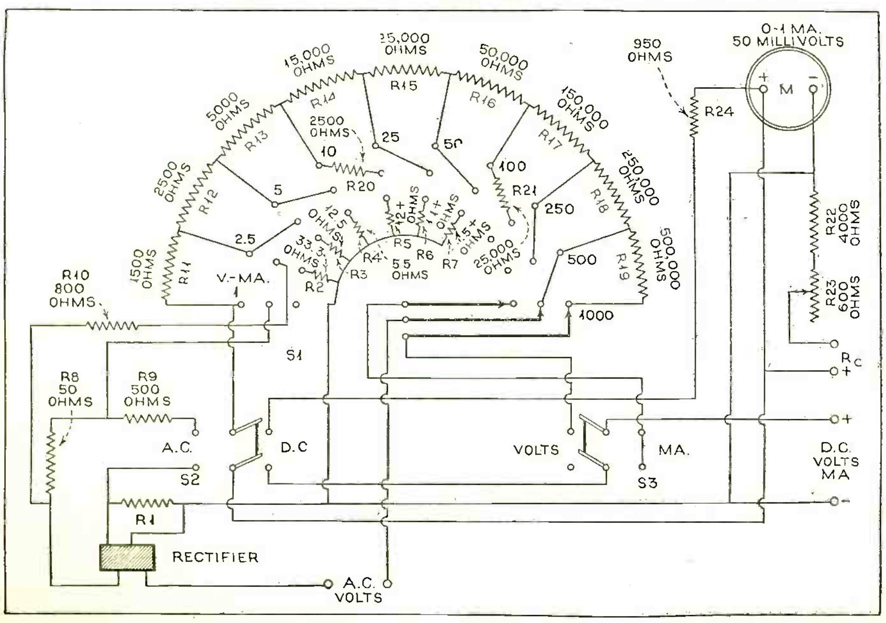
For the 15,000 ohm resistor and the 25,000 ohm resistor (still using Figure 2 and the above procedure), connect a 22½-volt battery and the resistor being tested in series with XD. Read the current flowing and the battery voltage, then using Ohm's law, compute the total resistance in the circuit. Subtract from the total resistance the sum of the resistance of the meter (50 ohms) plus R1 (4,950 ohms) plus R2 (20,000 ohms) which is a total of 25,000 ohms, and we have the value of the resistor under test. If this value is within 2% of the required resistance of the multiplier, it may be used as such.

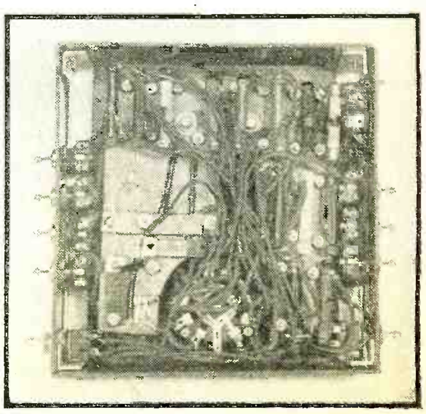
For all the higher resistors: connect the resistor under test and a 45-volt battery in series across XB and read the current flowing. Use XD, the 25-volt range, measure the two 22½-volt sections of the battery and add to get the total voltage. As before, ascertain the total resistance in the circuit; then subtract the resistance of the meter and we have the resistance of the resistor under test.

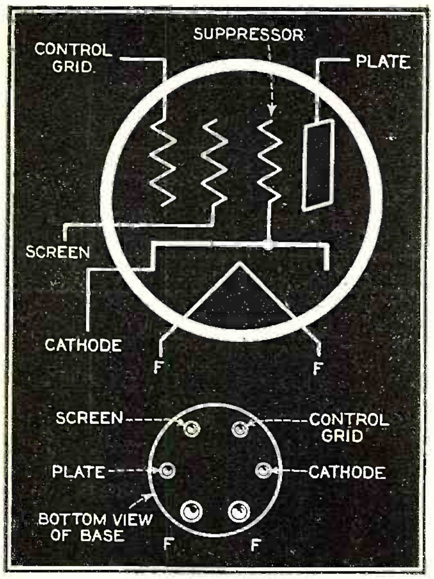
In making the above measurements, be sure that all connections are good electrical contacts. It is extremely important (*Continued on page 186*)

THE UNIVERSAL METER

Figure 5. Wiring diagram of the meter with its multipliers and shunts







DATA ON THE *TYPE 18* TUBE

Also more information on its prototypes, the 42 and 2A5 tubes

J. van Lienden

ALL of us are familiar with the first power pentode, type 47. An improved model with an indirect heater has appeared in three versions. One, type 2A5, for 2.5-volt filaments, the second, type 42, for 6.3 volts operation, and now type 18 with a 14-volt, .3 amp. filament for a.c.-d.c. or transformerless sets. All these types have the same characteristics except for the filament.

The original article on the 2A5 appeared in RADIO NEWS for June, 1933, and on the 42 in the July, 1933, issue. For the reader's convenience we again include the characteristics in Table I.

This type of tube should be especially suitable for use in transformerless receivers employing voltage doubling, since no other tube can deliver as much output. Type 18 is manufactured by Sylvania.

Triode Operation of 42 and 2A5

When the plate and screen of the power pentode are connected together the tube becomes a triode. As a Class A amplifier a single tube can deliver only 650 milliwatts, but in a push-pull amplifier in an over-biased condition (intermediate between Class A and Class B), a pair of these tubes can deliver 18 watts with low distortion.

Either self bias or fixed bias can be employed, the latter giving the greater power. Due to the increase of plate current with the signal, the self-bias circuit gives a lower output because the bias changes (*Continued on next page*)

TABLE I

	2A5	42	18	
Ef	2.5	6.3	14	VOLTS A.C. OR D.C.
If	1.75	0.65	0.3	AMP.

ALL THREE TYPES

LENGTH	4 1/16	INCH
DIAMETER	1 13/16	"
BASE	MEDIUM 6-PIN	

INTERELECTRODE CAPACITIES

GRID TO PLATE	0.5 MMFD
INPUT	7.5 MMFD
OUTPUT	8.6 MMFD

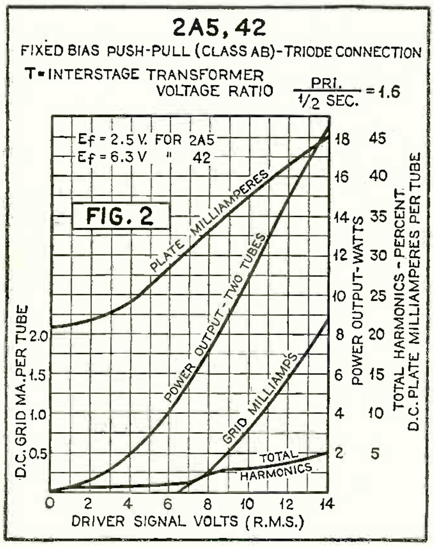
CLASS A AMPLIFIER

Ep	250 MAX. VOLTS
Esg	250 MAX. VOLTS
Eg	-16.5 VOLTS
μ	165
Rp	75000 OHMS
Gm	2200 MICROMHOS
Ip	34 MA.
Isg	7.5 MA.
LOAD	7000 OR 9000 OHMS
OUTPUT	3 WATTS MAX.

TABLE II

OUTPUT STAGE: TWO TYPE 42'S OR 2A5'S
Ep=350 Eg=-38 WITH NO SIGNAL INPUT.

	FIXED	SELF	BIAS
DRIVER PLATE LOAD	24600	25200	OHMS
TRANSFORMER RATIO PRIMARY TO 1/2 SEC.	1.6 TO 1	1.14 TO 1	
TRANSFORMER EFFICIENCY	84.5	65.0	PERCENT
PEAK GRID VOLTS (PER GRID)	63.5	82.15	VOLTS
PEAK POWER INPUT TO GRIDS	366	300	MILLIWATTS
P TO P LOAD	8000	8000	OHMS
POWER OUTPUT (8% DISTORTION)	18.4	14.8	WATTS
SELF BIASING RESISTOR	—	730	OHMS



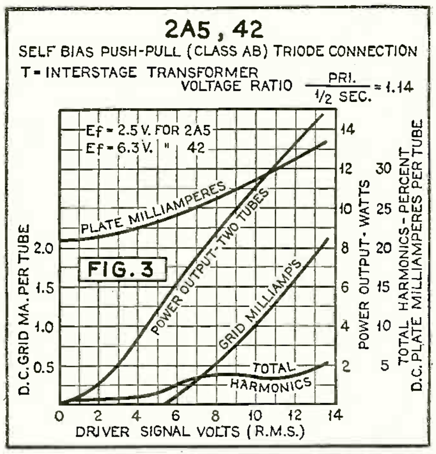


TABLE III

42 OR 2A5 AS CLASS A DRIVER

Ep	250 MAX. V.
Eg	-20 V.
Ip	31 MA.
Gm	2300 μMHOS
rp	2700 OHMS
LOAD	3000 "
POWER OUTPUT	650 MILLIWATTS

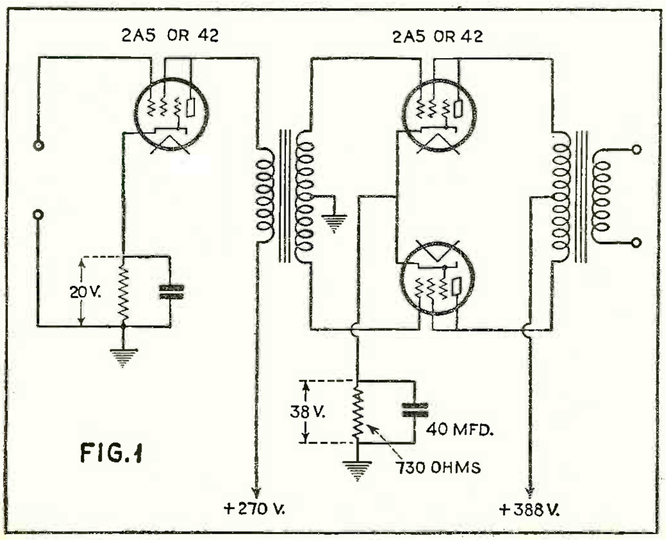
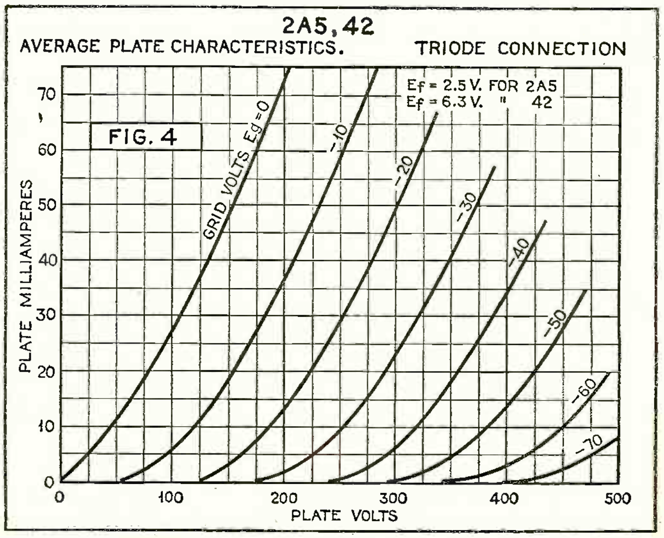


FIG. 1



during operation and the by-pass condenser is likely to be too small. Characteristics for this Class AB operation are shown in Table II.

The grids of the output stage require appreciable power, 217 and 230 milliwatts (r.m.s. value), respectively, for the fixed and self-bias conditions, when the transformer efficiency is taken into account. A 2A5 or 42, operated as a Class A triode, is suitable as a driver. The circuit for this combination is shown in Figure 1.

The curves of Figures 2 and 3 show the relation between input signal volts and output power, as well as the total harmonics, grid and plate milliamperes. Figure 2 refers to the fixed-bias condition, Figure 3 to the self-biased circuit. The latter is the highest output available with a large condenser across the bias resistor.

The characteristics for the 2A5 and 42, used as a Class A driver, are shown in Table III. A family of plate volts-plate current curves appear in Figure 4.

The above circuits are of course applicable to type 18 also, but the average "transformerless" receiver would not have an adequate power supply for this purpose. A rectifier of greater capacity would have to be used.

Information and curves for this article were supplied by RCA Radiotron and Sylvania.

World Convention

(*Continued from page* 137)

to stations capable of causing international interference, the right of a nation to use any frequency, upon the sole condition that no interference to the service of other nations would result, was recognized.

The greatest amount of controversy at the conference was caused by the desire of the European nations to make more frequencies available for broadcasting.

The General Radio Regulations also provided for the establishment of a frequency list of world radio stations arranged by frequencies. These lists, together with their supplements, may be obtained from the Bureau of the International Telecommunication Union, Berne, Switzerland, at the following prices in Swiss gold francs:

1. List of Frequencies and supplements—40 francs.
2. List of Coast Stations and Ship Stations—4.35 francs.
3. List of Aircraft and Aeronautical Stations—4.15 francs.
4. List of Broadcasting Stations and supplements—3.70 francs.
5. List of Stations Performing Special Services and supplements—5.50 francs.
6. List of Call Letters of Fixed, Land and Mobile Stations and supplements—9.30 francs.

The Acts of Madrid which were not signed by the United States include the Additional Radio Regulations, the Telegraph Regulations, and the Telephone Regulations, all of which come under the head of operational and management questions and appeared to be without the scope of the authority of the American delegation.

On January 27, 1934, President Roosevelt transmitted the Convention and General Radio Regulations to the Senate for its advice and consent to ratification. After a careful study, the Senate Committee on Foreign Relations made its report to the Senate on April 6, 1934, recommending that the resolution of ratification be adopted by the Senate, and ratification by the United States followed on May 1, 1934. The new allocations will therefore hold until at least 1939. Gerald C. Gross, Chief of the International Relations Section, Federal Radio Commission.

BACKSTAGE *in* BROADCASTING

Samuel Kaufman

COUNTESS OLGA ALBANI

ELLSWORTH VINES, JR.

JESSICA DRAGONETTE

WILLIAM M. DALY

Chatty Bits on Radio Personalities

WITH Jessica Dragonette vacationing from the Cities Service program, Countess Olga Albani, popular radio soprano, has been assigned the featured soloist rôle of the NBC Friday hour. Rosario Bourdon's orchestra continues to supply the musical background to the popular program. It is understood that Miss Dragonette will make a talkie during her vacation. Other radio stars who are scheduled to fulfill talking picture engagements during the Summer are Jack Benny and Mary Livingstone, Joe Penner, Lanny Ross, and Pick Malone and Pat Padgett—the Molasses and January of Show Boat fame.

TONY WONS, the "Are You Listening?" good-cheer broadcaster, recently celebrated his eighth year on the air. Tony first faced a microphone in the Spring of 1926 at Station WLS, Chicago. Four years later he joined the CBS with his famous "Tony's Scrapbook" feature. One of his biggest commercial breaks was his long assignment on the old daily Camel program when he was co-starred with Morton Downey and Jacques Renard's Orchestra. His "Scrapbook" is still one of the air's most popular features. He is co-featured on some current CBS spots with Peggy Keenan and Sandra Phillips, the noted piano duo.

ELLSWORTH VINES, Jr., Davis Cup tennis star and former national amateur champion, is conducting a microphone course in the high spots of tennis technique over an NBC hook-up each Sunday. The series has proven a very popular Summer presentation. Vines deserted the amateur ranks last Fall to win new honors as a "pro."

BRAD BROWNE and Al Llewelyn, pioneer radio comics, have returned to the air with a new song and comedy program. The funny men are heard on the Tastyeast series Tuesdays over NBC. The team utilizes a distinctive and original brand of humor. Most of the songs on the programs are of the pair's own composition. One of Browne's most popular song creations is "The Girl in the Little Green Hat." Brad and Al launched their joint radio career eight years ago over a New Jersey station and the networks soon grabbed them. They appeared on many CBS and NBC features of the past.

AFTER being signed as prima donna of the Palmolive Beauty Box Theatre broadcasts on NBC, Gladys Swarthout soon snatched a second important microphone contract. The Metropolitan Opera contralto is now featured in the Summer series of Firestone programs presented over an NBC hook-up Monday nights. She replaces Lawrence Tibbett and Richard Crooks—the Winter stars of the program. William Merrigan Daly's orchestra continues on the seasonal series.

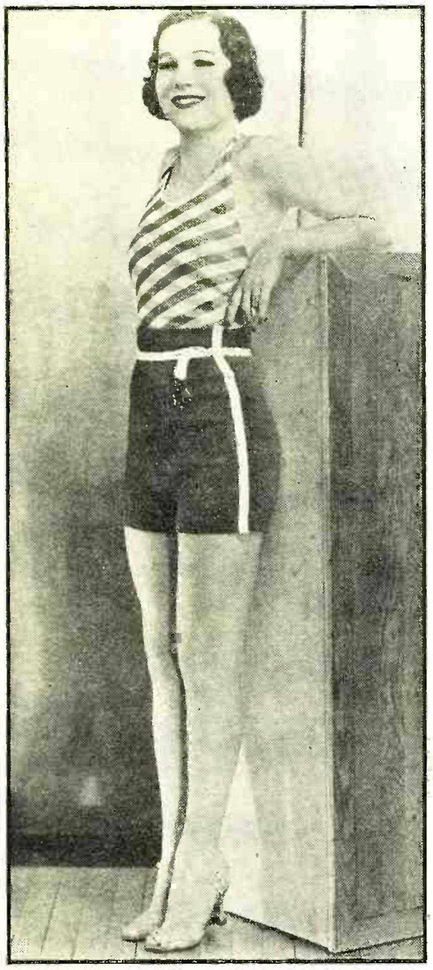
THE fictional character of "Raffles—the Amateur Cracksman" has come to life in a new microphone series presented over CBS Thursday nights. Frederick Worlock, an English actor, was assigned

PEGGY KEENAN AND SANDRA PHILLIPS

BRAD BROWNE

FREDERICK WORLOCK

MAJOR EDWARD BOWES



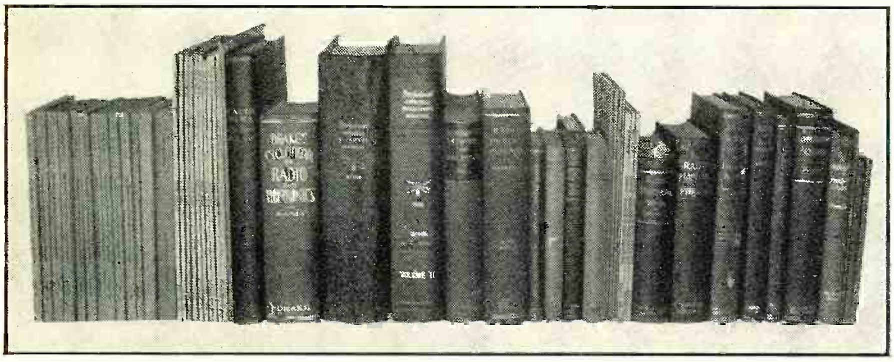
VIVIENNE SEGAL

the title rôle of the dramatic series and he has scored favorably. Worlock's first efforts were confined to minor Shakespeare rôles, but he was soon assigned stellar parts. He toured England, Australia, New Zealand and South Africa with dramatic companies. The war interrupted his stage career and he won high British military honors. He came to the United States in 1922 as leading man for Elsie Ferguson in "The Wheel of Life" and, since that date, he appeared in leading rôles of many Broadway hits. In addition to the "Raffles" series, he participates in several other CBS dramatic programs.

CLAIMED to be the oldest sustaining radio feature, the Capitol Theatre program recently celebrated is six hun-

(*Continued on page* 185)

MORTON DOWNEY



THE TECHNICAL REVIEW

JOSEPH CALCATERRA

So-o-o-o You're Going on the Air!, by Robert West. Published by Rodin Publishing Company, Inc., 1934. This book a guide to Broadcasting procedure, contains facts from various sources to enlighten the radio novice as to the essential qualifications for a successful radio program. It is a popular review of the field rather than a textbook. Portions of successful continuities which make interesting reading are included. There are chapters on the various types of programs and pointers are given to aspirants for all forms of microphone work. A section of the book is entitled: "The Radio Speech Primer." In this portion, the author discusses faulty and correct radio speech. Appendices, which should be of especial value to persons seeking a microphone career, include lists of advertising agencies placing programs, radio producing companies and American and Canadian broadcasting stations.

Technical Manual of Sylvania "Set-tested" Radio Tubes, published by Hygrade Sylvania Corporation. A handy manual of information on all tubes manufactured by Sylvania. The data on each tube consists of socket "prong" arrangement, characteristics, hints on circuit applications, etc. Also, this manual includes all the new tube types recently released, such as the 1C6, 12A7, 12A5, and the many types intended to replace the Majestic tubes. General information on tubes, the calculation of gain, etc. and some typical circuits complete the booklet.

Bakelite Synthetic Resins for Paints and Varnishes, published by the Bakelite Corporation. Most of us think of bakelite as that black or brown stuff you drill holes in and mount condensers on, but there is a whole world of applications besides that. By the addition of various materials, over two thousand products are now available which are used as molding materials, cements, flexible coatings for fabrics, etc. Paints and varnishes also have been produced which will withstand weather and dampness better than some older types of protection. The story of bakelite resin coatings is interestingly told in this booklet.

Principles of Public-Address Systems, by M. N. Beitman; Supreme Publications. Servicemen and others interested in the installation of public-address systems will find much practical information in this book. It tells how to place and connect microphones, how to interconnect microphones and other sources to the same amplifier. There are chapters on attenuators, on amplifiers, on loudspeakers, etc. Some reliable circuits are given for amplifiers and how to calculate the power output from tubes and how to find the harmonic distortion are explained. Copies are available from the publishers in a special offer to persons having a direct technical interest in public-address work. Each individual or company is restricted to one copy. A charge is made of 20c to cover printing and mailing expense.

Simplified Disc Recording, published by Universal Microphone Co. A 12-page leaflet, compiled by Mr. E. E. Griffin, engineer of the company. It is intended to serve as a guide to experimenters, short-wave enthusiasts, and others who may wish to record speech or music. The booklet discusses: the amplifier, hum and volume levels, turntable, recording heads, types of record material, playback, mounting the lead screws, the pickup, weight on the recorder, playing time of records and general problems.

Review of Articles in the June 1934 Issue of the Proceedings of the Institute of Radio Engineers

Suppression of Interlocking in First Detector Circuits, by Paul W. Klipsch. The advent of the pentagrid converter brings up a new set of causes by which interlocking in first detector circuits can occur. This paper discusses the causes and the manner in which they manifest themselves.

Resistance Tuning, by Sewell Cabot. In this paper, resistance tuning and reactance tuning are analyzed postulating the absence of interstage reaction and grid conductance. Formulas are developed by which it is possible to compute both the amplification and selectivity it is possible to attain in both cases.

Quartz-Crystal-Controlled Oscillator Circuits, by Harry R. Meahl. This paper gives a brief account of the developments conducted previously to 1930 which resulted in improved frequency stability for quartz-crystal-controlled oscillators. Complete data is given on an improved oscillator circuit whose use in commercial equipment has resulted in consistent stability of better than 10 parts in 1,000,000.

Dynamic Speaker Design Considerations, by J. D. Seabert. This paper points out that the operation of the diaphragm is so involved as to make its development difficult with any treatment other than an empirical one. The methods used to determine the efficiency of the diaphragm and the optimum mass of voice coil to be associated with it are described. The method used to determine the voice coil diameter and magnet dimensions is also given.

A Screen-Grid Voltmeter without External Leak, by Ronold King. This paper describes a highly sensitive screen-grid voltmeter using type 24 (or 32) tubes without grid leak.

Review of Contemporary Literature

Feedback Amplifiers, by H. S. Black. Bell Laboratories Record, June 1934. This article gives a general description and analysis of the action and formulas governing feedback circuits and points out the factors which must be taken into account in the design and operation of such circuits in telephone work.

The "Compandor"—an Aid against Radio Static, by R. C. Mathes and S. B. Wright; Electrical Engineering, June, 1934. The authors describe a system in use on the transatlantic telephone circuit. The purpose of this is to equalize the modulation percentage during the transmission so that weak voice currents will override static. This is accomplished by a "compressor" circuit at the transmitter end which reduces the variations of volume in speech. At the receiver end the variations in volume are returned to the original by the "expander." It is thus possible to maintain a high percentage of modulation without having to be on the lookout for sudden overload, since all variations in the volume are smoothed out.

Direction of Arrival of Radio Waves, by C. B. Feldman. Bell Laboratories Record, June 1934. This article describes the methods employed to determine the angle of arrival of radio waves and the extent to which the various modes of propagation of radio waves affect the angle of arrival, time of arrival, phase of received signals and fading.

Neutralizing Disturbance Voltages in Communication Circuits, by C. A. Brigham. Bell Laboratories Record, June 1934. A description is contained in this article of an effective method of using a special transformer and auxiliary line to overcome the effects of disturbance voltages induced in telephone lines by changes of load in nearby power lines.

Ranges of Frequency and Intensity of Speech and Orchestral Music, Bell Laboratories Record, June 1934. Two charts are shown which plot the areas of speech and orchestral music as to intensity and frequency range, also indicating the range of frequencies of which the various instruments are capable and the portion of those frequencies which are heard by average listeners.

A New Sweep Circuit for the Electron Oscillograph, by H. H. Scott. General Radio Experimenter, May 1934. A new low-priced sweep circuit, known as the General Radio Type 655-A Bedell Sweep Circuit, especially designed for use with the General Radio Type 635-A and Type 635-B Electron Oscillograph is described in this article. Suggestions for its operation and a description of its applications are given.

A Direct-Reading Thermal Modulation Meter, by F. R. W. Strafford. The Wireless Engineer and Experimental Wireless, June 1934. This article describes the applications, circuit and theory of operation of a modulation meter which is useful in the examination of detecting devices for broadcast reception.

Improving the Broadcast of Recorded Programs, by George H. Miller. Electronics, June 1934. The lack of low-frequency response in the broadcasting and reception of recorded programs is pointed out in this article. The design of a satisfactory wave-filter and resistance pad for use in conjunction with recorded program records, between the phonograph reproducer and the amplifier, to counteract, the loss of low frequency response is described.

Automatic DX Relay Work for the Ham, by D. A. Griffin. QST, July 1934. This article outlines the possibilities for DX relay work, gives details of the necessary equipment and technique and proposes layouts for International round-table nets and globe-circling relays.

Tube Consignment. Radio Retailing, June 1934. The pros and cons of the tube consignment plan are stated by a leading jobber and dealer *for* the proposition and a jobber and dealer *against* it.

The Queer Behavior of Oscillators at High Frequencies and How These Generators Change Their Nature, by J. E. Anderson and Herman Bernard. Radio World, June 30, 1934. This article gives circuit diagrams of the most popular types of oscillator circuits, describes their characteristics and explains how they may be stabilized.

How to Get Copies of Articles Abstracted in This Department

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

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Technical Booklets Available

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

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

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

6. *Line Voltage Control.* Characteristics and uses of a voltage regulator and a chart showing the correct Amperite recommended by set manufacturers for their receivers.

7. *Rich Rewards in Radio.* Information on the growth of radio and the opportunities existing in the field of radio manufacturing, radio servicing, broadcasting, talking pictures, television, public-address systems and commercial station operation on land and sea, for men who are trained to fill the many jobs created by the radio and allied industries. The book also contains detailed information on the complete home-study courses in radio and allied subjects offered by the National Radio Institute. This book is available only to RADIO NEWS readers who are over 16 years of age and who are residents of the United States or Canada.

9. *Resistor Catalog.* Specifications of the International Resistance Co. 1934 line of metallized, wire-wound, motor-radio suppressors, handy servicemen's kits, and valuable technical data.

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

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

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

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

56. *Quick Facts on Testing Instruments.* Essential features of the most important

(*Continued on page* 187)

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

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

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

....

....

My occupation or connection in radio is checked off below.

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

I am a ☐ subscriber ☐ newsstand reader.

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

Name..........................

Address........................

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

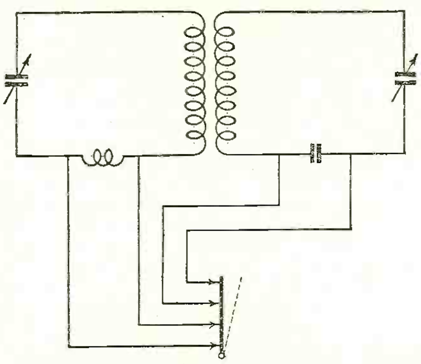
PLEASE USE PENCIL AND PRINT, IN FILLING IN COUPON

LATEST RADIO PATENTS

BEN J. CHROMY*

1,937,564. RADIO RECEIVING APPARATUS. ALFRED H. GREBE, Hollis, N. Y. Application June 3, 1931. Serial No. 541,929. 7 Claims.

1. In combination with a pair of loosely coupled tuned circuits, means including auxiliary reactances for increasing the natural frequency of one circuit by a small amount and decreasing the natural frequency of the other circuit by approximately the same amount.

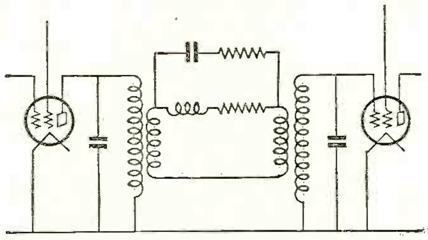


1,917,035. CIRCUIT FOR REDUCING INTERFERENCE. OLIVER B. JACOBS, Morristown, N. J., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a Corporation of New York. Filed Feb. 25, (1932. Serial No. 595,050. 7 Claims.

1. In a receiving system, a main signaling conductor exposed to interference, an auxiliary conductor exposed to similar interference, a receiver, separate receiver coupling circuits for said conductors, one including said main conductor and auxiliary conductor in series whereby the interference energy received from both conductors is balanced out in the receiver, and the other circuit of lower resistance noise, said receiver connected to both of said coupling circuits, and filter means for impressing only relatively high frequency currents from said circuit of lower resistance noise on said receiver whereby the resistance noise is kept low in the upper range of signal frequencies.

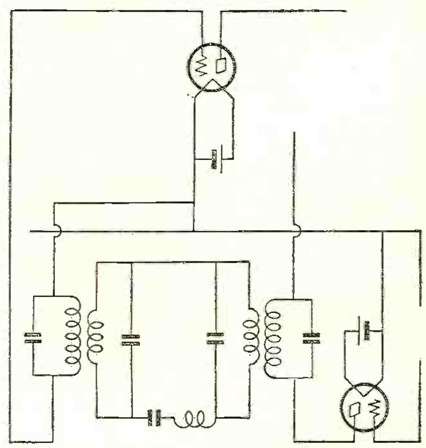
1,938,620. BAND-PASS AMPLIFIER. RENE A. BRADEN, New York, N. Y., assignor to Radio Corporation of America, a corporation of Delaware. Application August 23, 1929. Serial No. 387,836. 12 Claims.

1. A band-pass amplifier comprising two oscillatory circuits resonant to the same frequency, and a network resonant to said frequency for coupling the two circuits, said network comprising inductive and capacitative reactances of such relative magnitudes; that the coefficient of coupling between said circuits is substantially proportional at any frequency to the difference between that frequency and the resonant frequency of the tuned circuits whereby the coupling between the circuits is a minimum at said resonant frequency.



1,938,640. INTERMEDIATE FREQUENCY AMPLIFIER. KLAAS POSTHUMUS and THEODORUS JOSEPHUS WEYERS, Eindhoven, Netherlands, assignors to Radio Corporation of America, a corporation of Delaware. Application January 25, 1932, Serial No. 588,626, and in France and Belgium June 25, 1931. 2 Claims.

1. An intermediate frequency amplifier comprising a pair of cascaded amplifier tubes, a coupling network connected between the output electrodes of the first of said tubes and the input electrodes of the second tube, said network consisting of a step down transformer having its primary coil in the anode circuit of the first tube, a step-up transformer having its secondary in the grid circuit of the second tube, a condenser connected across each of the windings of said transformers to provide four resonant networks each tuned to said intermediate frequency, and a series resonant path, tuned to said frequency, connected between points of like potential of



the secondary of the step-down transformer and the primary of the step up transformer, the inductive reactance of said path being chosen to match that of the last named secondary and primary.

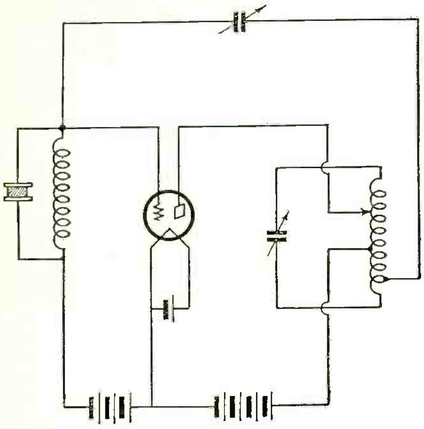
1,940,414. AMPLIFIER CIRCUITS. WALTER HAHNLE, Berlin-Siemensstadt, Germany, assignor to Siemens & Halske, Aktiengesellschaft, Siemensstadt, near Berlin, Germany, a corporation of Germany. Application February 19, 1932, Serial No. 594,055, and in Germany January 9, 1931. 4 Claims.

1. A distortionless amplification system comprising an electron discharge device amplifier having an input circuit and an output circuit, means for inductively feeding waves to be amplified through the input circuit of said amplifier, a load circuit, means for inductively feeding amplified waves in the output circuit of said amplifier to said load circuit, an auxiliary electron discharge device amplification system having an input circuit and an output circuit, means inductively coupling the input circuit of said auxiliary amplifier to the input and output of said first mentioned amplifier, the coupling being so chosen that for a desired ratio of amplification of said first mentioned amplifier substantially no currents are fed to the input circuit of said auxiliary amplifier, and means for inductively coupling the output of said auxiliary amplifier to said load circuit whereby departure from said desired ratio causes currents to be fed into the input circuit of said auxiliary amplifier and causes amplified currents of said auxiliary amplifier to

* Patent Attorney, Washington, D. C.

be fed into said load circuit from the output circuit of said auxiliary amplifier so as to maintain waves in said load circuit at a desired ratio to waves fed to the input circuit of said first mentioned amplifier.

1,939,070. TRANSMITTING SYSTEM. DONALD G. LITTLE, Longview, Mass., assignor to Westinghouse Electric & Manufacturing Company, a corporation



of Pennsylvania. Original application May 15, 1926, Serial No. 109,277. Patent No. 1,712,572, dated May 14, 1929. Divided and this application January 10, 1929. Serial No. 331,586. 9 Claims.

1. In an oscillation generator, an electron discharge device having an input circuit comprising a piezo-electric crystal, a tunable output circuit, and reactive means independent of the interelectrode capacity of said tube for incompletely neutralizing the transfer of energy between said circuits.

Short-Wave Success

(*Continued from page* 135)

the reasons why RADIO NEWS *pioneered* in appointing over 130 highly trained observers, located in more than 20 countries throughout the world, as Official RADIO NEWS Short-Wave Listening Post Observers, whose monthly logs of short-wave stations for world reception are used in checking our own results for publication in the Time-Table. These are also the reasons why RADIO NEWS maintains a monthly correspondence with the world's leading short-wave stations to obtain their official stated hours of transmission, frequency, wavelength, call letters, etc., for checking the Time-Table. Combined with these expert sources of short-wave information resulting in the Time-Table, is the co-operative mien of thousands of our readers who send in to our DOX Editors monthly reports of outstanding reception, new stations heard, changes in wavelength, changes in transmission time, special broadcast events, verification cards received from short-wave stations and other short-wave material of interest to the listener at large.

What more can be done in publishing a worth-while short-wave Time-Table? The DX Editors know of no other source or method of checking that would enable us to produce a finer Time-Table than that found each month in RADIO NEWS. It is brought up to date, monthly, and except for unannounced changes (after the magazine goes to press), we believe it to be the most accurate that can be found the world over.

Remember, this Time-Table is "triple checked." 1. By monthly logs of 130 RADIO NEWS Listening Posts in twenty strategic countries for world-wide reception of short-wave stations. 2. By daily logs by experts in our Westchester Listening Post. 3. By monthly official schedules from the world's leading short-wave stations.

Whether you live in Alaska or Australia, in China or South America, whether city, wilderness, Arctic or South Seas, the RADIO NEWS World Short-Wave Time-Table *will make any good short-wave or all-wave set worth many times its purchase price in enjoyment and in news of what's going on on this globe of ours.* Consult this Time-Table every month, to insure good short-wave reception. You will know just *when to tune,* and *how to set your dials* for any short-wave station.

Tell your friends about this great feature in RADIO NEWS. They will be grateful to you for the tip.

Five-Meter Tests

(*Continued from page* 155)

a telescope or searchlight, so too with these short waves.

Their practical applications are therefore limited to distances of 30 to 100 miles and to relatively open spaces, or at least those comparatively free from metal structures.

Another group of tests conducted by members of the Garden City Radio Club indicates the effect of steel structures quite effectively. Tests were run in New York City, between a downtown laboratory and Stuyvesant High School. Between these two points are numerous skyscrapers and other steel-frame constructions. When an attempt was made to work two-way communication, the results were highly unsatisfactory, although the separation is only about two miles. Signals were so weak as to be understandable only with numerous repetitions. Yet a car equipped with Depew's little transceiver, parked the same distance as the high school from the laboratory but in another direction, where there were many fewer steel buildings to intercept the signals, was able to carry on two-way communication with the laboratory at R-9 level. This in spite of the much lower power and less sensitive reception of the transceiver. Both the high school and laboratory stations were equipped with transmitters using -10's in push-pull and extremely sensitive receivers, while the transceiver employed only dry-cell tubes and dry-cell batteries.

These same tests were of special interest because the installation at the high school employed a half-wave doublet with a 365-foot transmission line feeder. This feeder used a new type of ultra-high-frequency cable now being developed by Lynch manufacturing Co. Tests of this cable to date indicate it to be highly effective for lead-ins of almost any length.

Another test and demonstration by the same group of amateurs was staged at Stuyvesant High School, at a regular meeting of the New York Chapter of the International Short-Wave Club. At this demonstration transceivers were set up in widely separated rooms of the building. In spite of the steel frame, communication was maintained without difficulty. This seems to answer the frequent question of contractors as to whether it is possible to use small 5-meter transceivers for communication purposes in large building construction jobs, during the early stages when steel is going up and when telephone communication by wire lines is not practical.

Thus one group of amateurs is making its contribution to the study and development of 5-meter communication, without thought of compensation except the fun they get out of it and the knowledge that they are gathering data which will be helpful to others, amateur and commercial interests alike.

RECEIVES RADIO GREETINGS FROM THE BAY OF WHALES
15-year-old Elaine Groves, of Cambridge, Massachusetts, convalescing from appendicitis, receives a letter from Stevenson Corey, of nearby Winchester, Massachusetts, who is supply officer with the Byrd Expedition. The radiogram came straight from Little America after a call over the fortnightly mailbag of General Electric's short-wave station W2XAF

The DX Corner
(Short Waves)

(*Continued from page* 144)

tions he has picked up: KAZ, JVF, JVE, GAG, J1AA, JVM, PNI, RIM, ZGE, ZHI, PMY, PLV. He reports the 25-meter band very good of late.

PRADO on 19 Meters

Mr. W. H. Boatman of Atoka, Oklahoma, states that radio station PRADO, Riombamba, Ecuador, is now on the air Sundays from 4 to 5 p.m., E.S.T., on approximately 19 meters. They have not announced their exact frequency as yet. Last Sunday their program was directed to France.

Report from Honduras

O.R.N.S.W.L.P.O. R. Wilder Tatum of Trujillo, Republic of Honduras, C. A., sends in a fine list of stations heard at different times during the day with their frequencies, etc. Fine work.

Another Ohio Report

Observer Skatzes of Delaware, Ohio, reports that RNE on 25 meters gives a program in English on Sundays from 6 to 7 a.m. and from 10 to 11 a.m. Also on Mondays, Wednesdays and Fridays from 4 to 5 p.m. and on Saturdays from 10 to 11 p.m. (*Editor's Note*—This is presumably Central Standard Time. He also tells us that the Quixote Radio Club was organized in December with headquarters at P. O. Box 73, Hendersonville, N. C. Dues are $1.00 per ten-week period. The president is E. J. Shields.)

English Observers Busy and Accurate

Observers Maling, Styles and Kempster of England sent in three very fine reports, with needed information incorporated in our Time-Schedule.

We Hear from India

Observer Wadia of Bombay reports that conditions have been better of late in his location with the G stations coming in R7, R9. FYA, however, is still stronger. The star station at Bombay is RV59. He has also heard KAY, HVJ, REN, PHI, JOAK and JYK on 15.8 and 15.15 mc., respectively. The only North Americans he heard this month are W8XK, W3XAL, W2XAF. He writes that he has sent us the dope on VUB on 31.6 meters, but it has not been received as yet. (We are wondering if VUB is a long-wave station and we have been hearing it as a commercial relay by VUY.—*Editor's Note*.)

Radio Relay from the Arctic

ABOVE THE ARCTIC CIRCLE—Successful with transmissions from the Byrd Antarctic Expedition II, the Columbia Broadcasting System is extending its programs from exploration parties. The newest activity of this sort is the network's attempts to rebroadcast programs from Captain R. A. "Bob" Bartlett's expedition to Northern seas. Captain Bartlett's four-masted schooner, *Effie M. Morrissey*, is equipped with a 100-watt radio-telephone transmitter. The call is W1OXDA. Robert Moe, the radio operator, who has been on several Bartlett expeditions, was named supervisor of the programs. The ship left New York last June, expecting to be away four months. In the event the ship is icebound, it will be forced to remain away a year longer.

Our Real Sympathy

Observer Frank H. Kydd of Ceballos, Cuba, states that he has not been able to give much attention to short waves this month owing to the illness and death of his brother.

He reports, however, that the 49-meter band has lost some of its summer noise, although the 25-meter band is still much the best, generally.

Official Report from Wisconsin

Observer Jasiorkowski of Milwaukee states that he is now writing the short-wave column in the Sunday issues of the *Milwaukee Journal*. Congratulations, Walter! This makes the seventh O.R.N.S.W.L.P.O. who has landed a job on s.w.'s for local papers. His Best Bets are DJB, DJD, DJC, GSD, GSC, GSB, EAQ, FYA, I2RO, HBL, HIX, XETE, XEBT, HJ1ABB, YV3RC, YV5RMO, LSX, PSK, PRADO, HC2RL, VK3LR, VK2ME, VK3ME, HJ3ABD as well as American and Canadian stations. He reports two Japanese stations, one on 27.8 meters and the other one on 30.7 meters which he believes is old J1AA.

Best Bets in Nebraska

Mr. M. L. Browning of Omaha reports Best Bets for his location: VIY, VSF, GSE, GSD, GSB, GSC, DJB, DJD, PHI, EAQ, HJ1ABB, VK3ME, VK2ME and VK3LR.

Report from Nebraska

Observer H. W. Hansen of South Omaha states with many other readers of RADIO NEWS they heard XENT on 69 meters and 49 meters. They wrote to the station and found out that these frequencies are harmonics of XENT which is a long-wave station. He also has an official letter from VE9DN in which they state that their broadcasts are temporarily discontinued.

YVQ Data

Observer Clarence D. Hall of Chillicothe, Ohio, writes that YVQ, Maracay, Venezuela, is a commercial station and one of the frequencies on which it operates is 44.94 meters, for 6672 kc., and occasionally relays broadcast programs.

Readers Who Helped Log Stations for This Month's Report

We are indebted to the following readers of RADIO NEWS who furnished important information in their reports of short-wave reception this month: O. F. Sternemann, Honolulu, T. H.; R. Wilder Tatum, Trujillo, Rep. de Honduras; C. D. Hall, Chillicothe, O.; S. J. Emerson, Cleveland, O.; J. T. Atkinson, Minnedosa, Man.; S. R. Ruple, Flint, Mich.; W. P. Kempster, Rosside, Ulverston, Lancs., England; D. T. Donaldson, Kelty, Fife, Scotland; F. L. Saldana, Huamantla, Tlax, Mex.; A. E. Emerson, Cleveland, O.; W. A. Oker, Cincinnati, O.; A. J. Mannix, Portsmouth, N. H.; D. W. Shield, Roseville, O.; C. A. Steele, Port Arthur, Tex.; H. F. Polm, Harrisburg, Pa.; Mrs. L. R. Ledbetter, Vicksburg, Miss.; H. Adams, Jr., Baltimore, Md.; E. J. Ellwood, San Pedro, Calif.; C. H. Armstrong, Atlanta, Ga.; M. Teske, Sioux City, Ia.; C. W. Bourne, Council Grove, Kans.; Wm. Schumacher, Ellis, Kans.; A. J. Leonhardt, Brooklyn, N. Y.; L. G. Chavez, Los Angeles, Calif.; Bryant Scott, Corpus Christi, Tex.; K. A. Staatz, Aliquippa, Pa.; L. Eisler, Chicago, Ill.; J. Bews, Revelstoke, B. C., Can.; H. K. Jensen, Oakland, Calif.; C. Panariello, Coney Island, N. Y.; W. H. Boatman, Atoka, Okla.; W. F. Norton, Alapaha, Ga.; G. Brediyears, Seattle, Wash.; A. J. George, Neath, South Wales, Eng.; F. L. Rogers, Norcatur, Kans.; D. E. Bame, Copiague, L. I.; W. Bahn, Elgin, Tex.; M. H. Clary, Geneseo, Kans.; F. C. Balph, Indianapolis, Ind.; R. L. Weber, West McHenry, Ill.; E. L. Kimmons, Austin, Tex.; G. E. Gillett, Kansas City, Mo.; W. H. McKinley, Des Laces, N. D.; N. C. Smith and J. Parkinson, Sidcup, Kent, Eng.; R. B. Woods, Sand Springs, Okla,; J. M. Kelley, N. Bennington, Vt.; G. K. Harrison, Hobbs, N. Mex.; H. G. Dage, Jr., Highland Park, Mich.; A. Alexander, Tonawanda, N. Y.; C. Nick, Philadelphia, Pa.; M. Satow, Kojimachi-ku, Tokio, Japan; F. Waters, Charleston, Ill.; C. E. Roy, Montreal, Can.; H. Johnson, Big Springs, Tex.; L. Swenson, Eden, Idaho; J. E. Moore, Jr., San Francisco, Calif.; J. T. Spalding, Louisville, Ky.; W. L. Misner, Vintondale, Pa.; H. Myers, Colombia, S. A.; E. Garcia, Pampanga, P. I.; J. G. van Ommersen, P. E., Otrabanda, Curacao; F. J. Fritsch, Baltimore, Md.; A. Pellicer, Jr., Hastings, Fla.; W. W. Enete, Rio de

Janeiro, Brazil; F. Hilburn, Yoakum, Tex.; J. C. Kalmbach, Jr., Buffalo, N. Y.; A. B. Baadsgaard, Ponoka, Alta., Can.; D. H. Townsend, Fallon, Nev.; C. H. Skatzes, Delaware, O.; J. J. Maling, Norfolk, Eng.; L. C. Styles, Ingastone, Essex, Eng.; D. R. D. Wadia, Bombay, India; H. W. Hansen, So. Omaha, Neb.; F. H. Kydd, Ceballos, Cuba; W. A. Jasiorkowski, Milwaukee, Wis.; M. L. Browning, Omaha, Neb.

Send in Your Reports

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

All-Wave Design

(*Continued from page* 153)

list of the stations tuned in (all on the loudspeaker, of course). Many of these stations were tuned in each of the three days.

GSD—England
GSC—England
GSB—England
DJD—Germany
DJA—Germany
DJC—Germany
DJB—Germany
EAQ—Spain
FYA (25.6 m.)—France
W2XAF—Schenectady
W9XAA—Chicago
W3XAU (31.2 m.)—Philadelphia, Pa.
W3XAL (16.8 m.)—Bound Brook
W1XAZ—Springfield
HJ1ABB—Colombia, S. A.
YV3RC—Venezuela, S. A.
YV5BMO—Venezuela, S. A.
CJRX—Winnipeg
HBP—Switzerland
HBL—Switzerland
VK3ME—Australia
VK2ME—Australia
RNE—Russia

The results of these tests indicate a highly satisfactory combination of sensitivity and selectivity.

Scouts "Own" Set

(*Continued from page* 151)

stations, including amateurs, aviation, broadcast and police services all over the world. Some of the foreign broadcasting stations that he has logged most consistently are the German short-wave stations at Zeesen; VE9GW of Bowmanville, Ontario; the British Empire stations; EAQ, the Spanish station at Madrid; FYA, the station at Pointoise, France; and, of course, the other powerful short-wave stations on the American continents. He also lists the New York, New Jersey, Schenectady, Fort Wayne (Indiana), Rochester (New York), Philadelphia, Dayton, Detroit, Toms River (New Jersey), Toledo (Ohio), Cleveland (Ohio), Johnston City (Texas), Summerville (Massachusetts), Jacksonville (Florida), Washington (D.C.), York (Pennsylvania), Binghamton (New York), Baltimore (Maryland), Highland Park (Illinois), Providence (Rhode Island), and many other police stations. (The list on this reception log, I see, is too long to continue.)

When Bob first brought this set to me as his Scout Radio Examiner, he had it all wired and connected correctly except that the connections to the tickler coil, L3, were reversed and he could only get local stations. When this was corrected the regeneration worked properly and he started making his log and has literally "traveled around the world with it via the ether waves." I have described this set because I feel that many of Bob's other Scout associates and others boys throughout the world would like to try their hand to see if they could better his results in various locations. I can guarantee that, when built carefully, it works well, for I have listened to it for hours at a time myself and can verify Bob's results. (At that I got a couple of stations he missed half-way round the globe.)

A list of parts follows, giving the actual items used in Bob's model so that it can be copied exactly.

Parts List

C1—Hammarlund 5-plate midget variable condenser, .000025 mfd. with mounting lugs
C2—Hammarlund 19-plate variable condenser, .00014 mfd.
C3—Hammarlund 35-plate variable condenser, .00025 mfd.
C4—Aerovox fixed condenser, .001 mfd.
C5—Aerovox fixed condenser, .001 mfd.
L,1 L2, L3—Standard 3-winding, 6-prong, short-wave coils for the type -30 tube*
R1—Carbon variable resistance, 3 megohms
R2—Yaxley 30-ohm rheostat.
RFC—Hammarlund type CH-8 r.f. choke, 8 millihenries.
SW—Cutler-Hammer, single-circuit toggle switch
1 type -30 triode vacuum tube
1 Standard 4-prong socket for the type -30 tube
1 Standard 6-prong socket for mounting s.w. coils
8 binding posts, suitably marked for connections as shown in Figure 2
Miscellaneous—wood screws, wood for base, four gliders or mounting feet, hook-up wire, etc.

*These coils can be obtained in sets of four. They cover the various wavelength ranges in steps about as follows: Coil No. 1 covers the 19, 25 and 31-meter bands. Coil No. 2 covers from approximately this upper wavelength to around 70 meters. Coil No. 3 goes from approximately 70 to 130 meters. Coil No. 4 goes somewhere from 130 to 200 meters. These frequency ranges vary slightly with the make.

A standard set of 2000- or 3000-ohm phones is suitable for use with this receiver. Tuning is accomplished with condenser C2, after an approximate setting of condenser C1 for the aerial used. Regeneration is controlled with condenser C3. It should be rotated to the point just below the "oscillation point" for maximum loudness. When a station is tuned in, condenser C1 can be readjusted for best results. A slight variation of C2 may have to be made after adjusting the other two condensers.

Switch SW turns the set on and off.

Scout Crockett will be glad to help anyone building this set with their problems, as a part of his Daily Deeds of Helpfulness. He may be addressed in care of RADIO NEWS and letters will be forwarded to him. So, go to it, you fellows; let's see if you can match or beat Bob at his own game!

QRD? QRD? QRD?

CONDUCTED BY GY

ON the West Coast the P.T.P. men have been having little difficulty with representatives of the Mackay Radio and Telegraph Co. Their many requests were ironed out with everyone happy and a spirit of cooperation and morale has been manifested since. On the East Coast only one request was made and this was granted, because men at W.S.L., on Long Island, had to own an auto to get to and from work, and the company has agreed to allow $12.50 per month towards the extra expense. From past experience, this writer knows that the company will not lose by keeping *morale* at the highest peak. Operation is speeded up, which makes for efficiency. If more employers would take this into consideration, better results and happier minds would be the answer.

The R.C.A. is continuing to experiment and lead the way for others to follow. Not content with its new service of high-speed transmission by radio which was recently inaugurated, it plans shortly to open up a facsimile or photogram service by short-wave radio. According to General Harbord, they have received the necessary permission to construct stations for experimental purposes. The waves are to be less than 5 meters long.

Under the supervision of the I.B.E.W., radio operators and engineers of station WGAR recently settled the strike differences with the station management and have returned to work, winning an increase in pay. Dan Moley, business manager of local 38, stated that the six men called out would return to work immediately.

Report by Mr. M. H. Hodges, Government representative on the Code Authority for the radio broadcasting industry, shows that of all the stations under the NRA, who have complied with its ruling, there are about 135 stations *still defaulting in their obligations!* Upon reinvestigation, twenty-eight of these stations were required to make salary adjustments, retroactive to December 11, 1933, and nine other stations were to make salary adjustments, retroactive to February 5, 1934. There are still a few cases pending and others to be adjusted. "The second thing I have been able to do is to secure the endorsement by the Code Authority of the report made by the executive officer on the skill involved on the broadcast technician's job." This report was bitterly opposed by certain representatives of the bigger broadcast stations, but the report finally passed with a vote of four to three, with three members absent. It is believed that this report establishes for all time the fact that the radio broadcast technician's job is of first importance to the industry.

Much activity has been noted in the United Fruit Line, as almost all of the laid-up ships of this line, in New Orleans and Galveston, have been recommissioned and an extensive shifting of radio staffs has occurred. Several men have been assigned to ships which will make the Jamaica to Canada run for the next few months.

We see by the papers that one of the old-timers, a former Navy "op" and now heavy-duty "op" at WNYC, is reminiscing about old times through the columns of a local paper. It is a pleasure to read some of his stuff, but it might put ideas into the heads of some of those bright youngsters who can only see the glamour of the tropics, without visualizing the hellishness of mosquitoes, dry, airless heat, dusty clouds spreading all around, slow tempo of life and continual rainy seasons, all of which contribute to bring out one's nervous temperament. It all looks swell and dandy in writing or from photos, but living continuously with such conditions is another story.

Amongst other things stated in the bulletin of the I.B.E.W., it contains the remark that every day that goes by confirms the conviction that from the technician's standpoint, the code has failed completely to accomplish what it was meant to do. Many sections were full of ambiguity and loopholes and were readily seized upon by the employers, with the result that purchasing power of technicians as a class has remained practically unchanged. . . . The delay in calling a rehearing of the Broadcast Code has been the subject of much criticism. The conviction is growing that the technician, in order to improve his condition, must depend less on the code and more on *a militant course of action in his own ranks!* The danger to the public, of a disruption in the service of broadcasting, can be minimized only by a prompt compliance with Article VI, Section 4 of the Code.

In a recent issue of another publication, several suggestions were made for the betterment of conditions of broadcast technicians and one of the requests was that "technicians be paid in the currency of the United States," as some of the "ops" were being paid in potatoes. We have heard of some of the boys being paid in specie, clothing, real estate, etc. School teachers have been paid by their pupils in this way and tuition has been bought by anxious parents for their offsprings in carloads of wheat or eggs, but *"radio men being paid in potatoes"* is a new one. The next thing we'll hear is salary *in shoes* or some such thing. Being paid in *eggs and bread,* now that *is* something and also, it *is food for thought,* what!

Ah, mail, yes, and here are a few. . . . Don C. Good, formerly with KNTR, Hollywood, had to get away from fake holdups, riots, brickbats and such, so he joined up with police radio station KGZD at San Diego, for the *real* stuff. . . . Charley Pattes, formerly marine "op" with the M. & M. Line, is now "control op" at WTAR, Norfolk, Va. . . . Wm. B. Harty, from Findley, Mass., writes in to inquire about circuit diagrams for a new type of transmitter which, of course, is being forwarded to him by mail . . . which just goes to prove that you can't stump the RADIO NEWS "gang," so just keep shipping in those questions, and answers will be returned by yours truly. . . . 73 . . . ge . . . GY.

"Double Doublet"

(*Continued from page* 149)

"double-doublet" but does develop a voltage on the transmission line. Thus since both "in phase" and "out of phase" signals are transmitted with the switch in the "STD" position, greater signals are received from the local short-wave broadcasting station at this "STD" position.

A puzzling feature of the performance of this system is the marked improvement shown on automobile ignition noise. Where this noise is generated at a distance from the antenna, it would seem reasonable that it should be picked up on the antenna and transmission line equally, in which case no improvement in signal-to-noise ratio would be expected by eliminating the line pickup. Nevertheless a great improvement does result. There are two possible explanations of this unexpected fact. First, probably most of the auto-ignition radiation is vertically polarized and cannot be picked up efficiently by a horizontal doublet. Second, probably a good share of the automobile noise does not come in on the antenna at all, but is carried to the set by the power line.

The receiver coupling transformer of the system described here eliminates noise of this type completely. This can best be explained by the following paragraphs and illustrations by again referring to Figure 2.

"S" represents a signal generator such as a source of auto-ignition noise. (a) represents the capacity coupling from "S" to the transmission line. (b) represents the capacity coupling from "S" to the power supply line. (h) represents the capacity coupling from one side of the power supply line to the metal chassis. (f) represents the capacity coupling from "S" to actual earth ground.

(A) The noise voltage that would be induced by capacity coupling (a) into the transmission line would correspond to an "in-phase" signal and therefore would be coupled or fed through to the secondary of the receiver coupling transformer by the capacity (c) if this capacity were not eliminated by the special and highly efficient electrostatic shield (d). If it were not for shield (d) a noise voltage would be developed across "ant" and "gnd" of the receiver due to a completed circuit from "gnd" to chassis frame through (h) to the power supply line which is usually grounded on one side, and thence back to "S" through (f).

(B) The noise voltage that would be induced by capacity coupling (b) causes current to flow through the power transformer and develop a noise voltage from ground to the chassis through capacity (h). If no receiver coupling transformer were used this voltage would occur across the input terminals of the receiver and hence cause noise. When the antenna system includes a receiver-coupling transformer this voltage occurs between the primary and the electrostatic shield since capacity (c) has been eliminated. However, this does not produce primary current. Therefore this noise voltage does not induce a voltage in the transformer secondary.

(C) The electrostatic shield (j) provided with most power transformers serves to offset the capacity coupling (g) and thus prevents the introduction of r.f. noise voltages into the voltage supply of the receiver directly.

No doubt the above reasons (A) and (B) contribute to very real improvement in signal-to-noise ratio to be had with this system on auto-ignition interference.

Operating Tests

(*As conducted at the* RADIO NEWS *Listening Post at Fairfield Beach, Connecticut.*)

In the test installation at Fairfield the conditions were not ideal because the antenna, strung between the permanent masts at this location, points in a northeast-southwest direction and runs parallel to the road where motor traffic causes serious ignition noise interference. As a doublet antenna provides maximum pick-up for signals (and noise) approaching it broadside, it will be seen that this test antenna was so directed as to provide the minimum pick-up of signals from Europe and Australia and the maximum pick-up of noise from the nearby road. The photograph at the head of this article shows the installation, taken from the road.

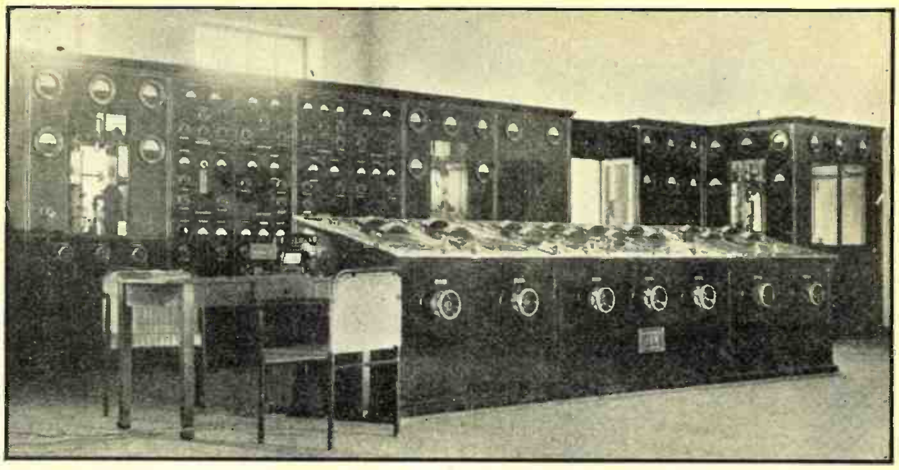
One of the first tests was to borrow a 4-cylinder Ford and "spot" it at different points along the road with its engine racing, to provide a source of ignition noise. An "L" type antenna with an ordinary single wire lead was also employed for purposes of comparison. The two antennas were controlled by a switch so that an instantaneous change-over could be made from one to the other. The Ford was stopped about 100 feet down the road from the house and its engine speeded up to provide maximum interference. With the "L" antenna the noise from the loudspeaker was sufficient to be heard outside the house but with the doublet antenna not a sound could be heard. This procedure was repeated, moving the Ford along the road a few feet at a time, but the results were the same each time. Even when the Ford was directly opposite the antenna no interference could be heard when the doublet was connected, while with the "L" antenna connected the din from the loudspeaker was such as to preclude any possibility of hearing stations through it.

A later test was made to determine the ability of the new antenna to eliminate electrical disturbances within the house. An a.c. operated oscillator (with a particularly raucous 60-cycle note) was hooked up and placed so that the transmission line from the "double-doublet" and the single-wire lead from the "L" antenna were equidistant from it. Under actual measurement, the noise (measured at the receiver output transformer) picked up by the "L" antenna was over 20 times as great as that picked up with the doublet connected.

In actual tests of foreign reception there was for the most part no ignition interference while using the "double-doublet." With the "L" antenna such noise was often sufficient to ruin reception.

So far as signal strength was concerned,

(*Continued on page* 184)



POWERFUL EUROPEAN BROADCAST TRANSMITTER

The broadcasting station known as Radio-Luxemburg using a powerful transmitter of from 150 to 200 kw. output. The illustration shows the power panels and the control desk for all of the apparatus. The station operates on a frequency of 230 kc.

The DX Corner (Broadcast Band)

(*Continued from page* 159)

used by Mr. Scott were of the spider-web type with 60 turns on each. Solenoid coils can be used just as well and may be wound side by side on a piece of cardboard tubing. A tap taken off at every 10 turns or so will provide the means for varying the inductance of L1.

For those who constructed the "Tenatuner," only to find that it would not work with their high-impedance input receivers, an adaptation of this idea is simple. Connect the input and output terminals of the "Tenatuner" to the antenna and ground. Then wind a coil of about 50 turns on a tube ½ inch or so smaller in diameter than the tube upon which the "Tenatuner" coil is wound. Slip this coil inside the one in the "Tenatuner" and connect its two ends to the "Ant" and "Gnd" terminals of the receiver.

The other suggestion for tuning the antenna used with receivers having high-impedance inputs comes from Peter Dowbor Musnicki of Luck, Poland. The arrangement he offers is shown in Figure 2. He employs a single coil of 66 turns, tapped at the 26th turn. The 26-turn section serves as the primary of this auto-coupler while the entire 66 turns serves as the secondary. With this combination connected between the antenna and the "Ant" terminal of the receiver, it is obvious that it will act as a wave-trap and will therefore eliminate or greatly reduce the signals from any station to which it is tuned. On the other hand, when tuned a few kilocycles above the frequency of a station to which the receiver itself is tuned, an actual increase in the strength of this signal is obtained. Because of this necessity for tuning the antenna unit slightly off resonance with the desired signal improvement in the strength of the desired signal is probably not so great as that obtained with

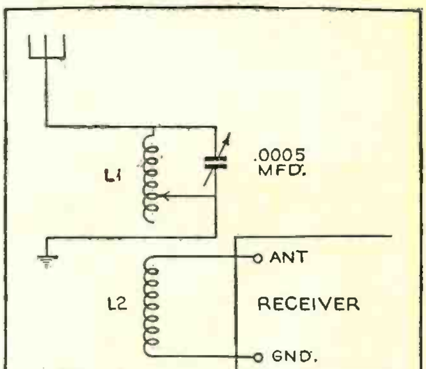


FIG. 1

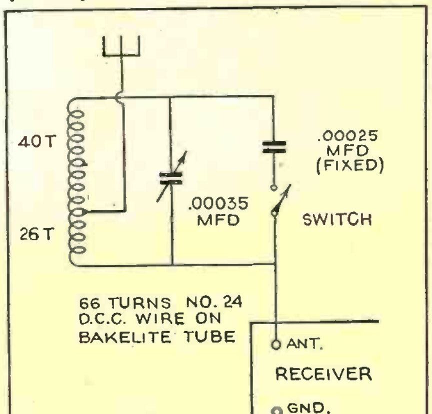


FIG. 2

"Double Doublet"

(*Continued from page* 183)

the conclusion arrived at after several days intermittent test, was that at wavelengths of 50 meters and below the double provided appreciably greater signal strength—except at 25 meters, where the "L" antenna provided a little superior signal. On all of the short-wave bands the signal-to-noise ratio was better with the "double-doublet." Considering the fact that the antenna as installed did not take advantage of directional qualities, the above findings were considered excellent. Had it been properly installed it is probable that the signal strength and the signal-to-noise ratio would have been still further improved.

In conclusion it is pointed out that the receiver used in these tests was not an RCA set, but one of a well-known "laboratory-built" make. This is an important fact because it indicates that the practical application of his antenna system is by no means limited to RCA receivers.

the method suggested above by Mr. Scott. However, Mr. Musnicki's unit has the ad-advantage that it can be used as a wave-trap when interference is encountered and at other times as an antenna tuner.

The 250 mmfd. fixed condenser and switch is employed to increase the tuning range when tuning for stations at the low-frequency end of the broadcast band. If a variable condenser having a capacity of 500 mmfd. or more is employed, the fixed condenser will probably not be found necessary.

The Editor of this department would be glad to have reports from readers who try out these ideas, or who have successfully tried out any other schemes for accomplishing the same end.

New Zealand DX Radio Assn.

The New Zealand DX Radio Association is an up and coming club with a rapidly growing membership. Organized to further the interest of New Zealand DX'ers, it nevertheless should be of interest to DX fans throughout the world if for no other reason than to keep up to date on information concerning the stations "down under" through the medium of the fortnightly organ which this association publishes. This little paper, called "Tune-in," contains a variety of information concerning stations all over the world but of special interest to American DX'ers is the information concerning the Australasian stations—hot off the grid, and authentic. For fans who expect to shoot for these stations when the season rolls around again, such information will be decidedly helpful.

There are other service features offered also. For instance, members may submit letters requesting verifications from Chinese stations to the club and there have them properly addressed *in Chinese* and forwarded to the desired stations.

Membership is open to all who have a real interest in DX reception. There are no dues. An initiation fee of 2 shillings, 6 pence (about 62 cents at present rate of exchange) entitles the applicant to *life membership*, a badge and a certificate of membership. The magazine "Tune-in," is mailed to members twice each month for a subscription price of 2 shillings, 9 pence (68 cents) per quarter, 5 shillings ($1.25) for 6 months or 9/6 ($2.37) per year. This publication is also available to non-members at slightly increased rates.

Requests for further information should be addressed to the Secretary at 29 Flockton Street, Christchurch, N. Z. Or to the Club's New York representative, Karl Halpern, 495 E. 3rd St., Brooklyn, N. Y.

The foregoing information was provided through the courtesy of Eric W. Watson, Vice President and Overseas Manager of the association.

Station Rome III Broadcasting

ROME, ITALY—The new transmitting station of Rome is now working on a wavelength of 238.5 meters. Its purpose is to give a second program to listeners near Rome. The radio center of Rome has three broadcast stations; station of S. Palomba (Rome I, wavelength 420.8 meters, power 50 kilowatts), which is used for national broadcasting. The second station is Prato Smeraldo (Rome II, I2RO, wavelength 25.4 meters, power 10 kilowatts), used for international broadcasting. The new station (Rome III) is intended especially for local broadcasting.

The new station has a power of 1 kilowatt and was installed in the home of the E. I. A. R. in Rome, which is on the via Asiago, at the corner of via Montello (near piazza Massini). It was built by the Radio Corporation of America and represents the latest progress in the radio field.

New P.A. System

(*Continued from page* 160)

parallel push-pull "A" Prime output stage. An important refinement in the design of this amplifier is in the use of the 1000-ohm resistors, connected into the grid circuit of each one of the 2A3 type tubes, acting as suppressors to eliminate the necessity for obtaining accurately matched tubes for parallel operation. The plate voltages for the tubes are obtained from a type 83 rectifier employed in a conventional full-wave rectifying circuit, using a double section filter.

The combination on-off switch and gain control which is shown mounted at the extreme left of the amplifier is a dual control device working between the grids of the push-pull 58 type tubes and the ground. The amplifier is designed for operation with two or more self-excited dynamic type speakers or for a number of magnetic type reproducers or both. Multiple dynamic type speakers can be connected in numerous series and parallel arrangements. The 500-ohm winding with a matching transformer can be used for connecting a dynamic type reproducer employed at a considerable distance from the sound system.

Backstage

(*Continued from page* 169)

dredth consecutive weekly broadcast. The programs—launched long before the existence of networks—are heard over NBC. The first program from the theatre was broadcast in 1922. The Capitol feature was known as "Roxy and His Gang" during the period when S. L. Rothafel (Roxy) was associated with the Capitol. Major Edward Bowes, managing director of the Broadway playhouse, succeeded Roxy at the microphone and serves as master of ceremonies for each Sunday broadcast over a 50-station hook-up. Major Bowes is also scoring in radio as director of Station WHN, New York, operated by the Loew's and Metro-Goldwyn-Mayer theatrical and motion picture interests. His versatility and capacity for work is astonishing. One night he appeared over WHN as a fight commentator, giving a summary of the Ross-McLarnin welterweight bout, and listeners agreed it was a good job.

SOON after Morton Downey rejoined the active list of CBS broadcasters, he left New York to appear at the Chez Paree night club in Chicago. The network promptly arranged to pick up his broadcasts from the Windy City rather than let the popular Irish tenor desert the air again. He is heard Tuesdays and Saturdays. Henry Busse's Orchestra and various guest artists are also heard on the Downey periods.

VIVIENNE SEGAL, singing star of the stage and screen, is a new featured soloist with Abe Lyman's orchestra on the Waltz Time series presented over NBC Fridays. Miss Segal succeeds Muriel Wilson in the Waltz Time assignment. Frank Munn continues as the male soloist. Listeners have commented favorably on the Lyman technique in the presentation of waltz tunes. Miss Segal is also starred with the Lyman orchestra in the CBS Accordiana series heard Tuesdays.

WITH the moving of Guy Lombardo's orchestra into the Waldorf-Astoria Hotel, the popular conductor launched a series of several dance programs each week over the NBC. The famous orchestra, long a CBS headliner, includes Carmen, Liebert and Victor Lombardo.

Service Analyzer

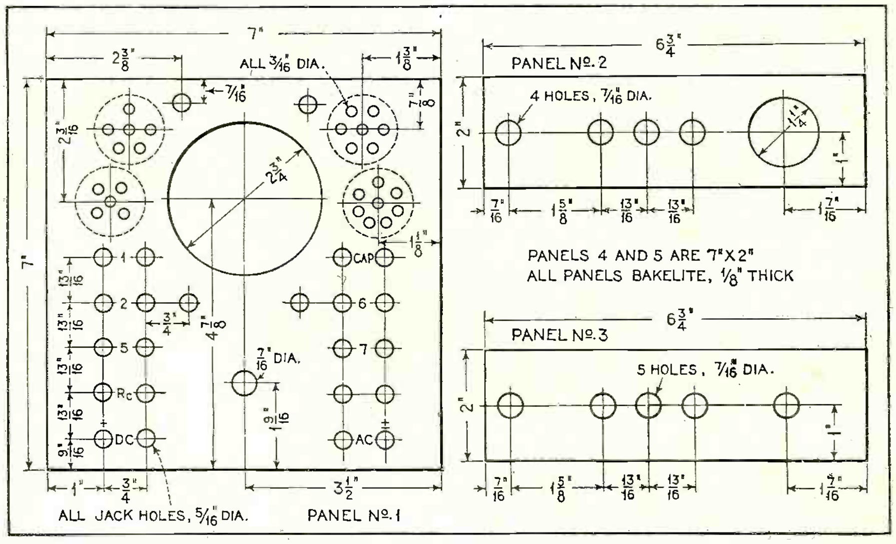
(Continued from page 165)

that the meter be placed in a perfectly level horizontal position. The light must be arranged in such a way that the needle does not cast a shadow either to the right or left of itself. This is to make certain that all readings may be read to within a quarter of a degree on the dial. A reading to ¼ degree will give a reading accuracy of ½ of 1% at full-scale deflection.

Next make the shunts. Cut three pieces of fibre or thin bakelite to 2¼ by ½ inches and drill as in Figure 3. Unwind carefully the wire from a 60-ohm wire-wound resistor. This is the wire to be used in the construction of the 2.5-5 ma. shunt. The resistance of the meter is 50 ohms, hence, the resistance of the 5-ma. shunt will be 12.5 ohms and the resistance of the 2.5 mil shunt 33⅓ ohms. Connect the meter in series with a 45-volt battery, 40,000-ohm resistor, and a 6,000-ohm rheostat. Adjust the rheostat to full-scale meter deflection. See Figure 4. Connect one end of the resistance wire to post A (Figure 3) on the shunt form, then wind tightly on the form between A and B what you assume to be 12½ ohms (this is a little less than ¼ of the total length of the 60-ohm resistance wire) leaving leeway for winding on more wire if necessary. With small battery clips connect the shunt across the meter at Y and Z. Unwind or wind on wire until the meter drops to exactly .2 ma. It is easy to see that with 1 ma. flowing and the meter reading .2 ma., with this part of the shunt in place, 5 ma. will be required for full-scale deflection. Continue the winding from B to C, winding on what you judge to be 22 ohms. Connect the total shunt to the meter at Y and Z; adjust the resistance until the meter drops to exactly .4 ma.

The most practical method for obtaining the higher ranges will be to use an external circuit with close to 5 ma. flowing. For example, using the completed analyzer section with the 5-ma. shunt across the meter (the smaller section of the shunt), select a plate circuit which has a high resistance (a type 24, for example). Construct the 10-ma. shunt so that the reading corresponds with the reading taken on the 5-ma. shunt. Be careful to open the meter circuit between each adjustment in order not to damage the meter.

Now for the a.c. voltmeter ranges. With several exceptions, the same multipliers are used for both a.c. and d.c. This does away with the necessity for odd-sized resistors. In order to get identical full-scale deflections, it was decided to use 500 ohms per volt for the a.c. ranges. But, since our meter is a 50-millivolt meter, the needle will go off scale unless some method is used to reduce the rectifier output, or raise the capacity of the meter. Since the rectifier delivers only about 86% of the input, at 500-ohms-per-volt ranges, the output of the rectifier will be 1.72 times 50 millivolts, but we can deflect some of the current around the meter with the shunt R1. Using any a.c. potential, adjust the shunt so that the meter reads correctly on the a.c. scale.



PANEL SPECIFICATIONS

The next step will be to cut and drill the multiplier panel. Mount the multipliers, shunts, and rectifier as in Figure 5. With the equipment face downward, wire leads from the rotary switch to the back of the panel. Follow the schematic diagram carefully, making absolutely certain that each lead connects to the right resistor. In order not to retard the construction, it may be found necessary to use resistors which will not be quite 2% accurate. It is advisable to keep a list of the values required and the values in use, and then as the user comes across resistors more nearly 2% accurate, they should be exchanged for the resistors in use temporarily.

Any good analyzer plug and cable may be used, with a small 7-prong plug and clip to connect to the analyzer. The screw that holds the wafer socket may be used as a stud to contact the "cap" circuits.

The writer will try to answer all requests for further information, provided a stamped, addressed return envelope is included. He may be addressed in care of RADIO NEWS.

List of Parts

M—Weston model 301 Milliammeter 0-1 ma.—adjusted to 50 millivolts
Rect.—Copper oxide meter rectifier
R1, R2, R3, R4, R5, R6, R7—Homemade shunts made from 3—60-ohm wire-wound rheostats, 1—10-ohm wire-wound rheostat, and 1—2-ohm wire-wound rheostat
R8—Wire-wound resistor, 50 ohms
R9—Carbon resistor, 500 ohms
R10—Carbon resistor, 500 ohms
R11—Carbon resistor, 1500 ohms
R12, R20—Carbon resistors, 2500 ohms
R13—Carbon resistor, 5000 ohms
R14—Carbon Resistor, 1500 ohms
R15, R21—Carbon resistors, 2500 ohms
R16—Carbon resistor, 50,000 ohms
R17—Carbon resistor, 150,000 ohms
R18—Carbon resistor, 250,000 ohms
R19—Carbon resistor, 500,000 ohms
R22—Carbon resistor, 4,000 ohms

R23—Rheostat, 600 ohms
S1—3 pole, 10 point switch, shorting type
S2, S3—Double-pole, double-throw toggle switches
S4, S5, S6, S7, S8, S9—Single-pole, double-throw toggle switches
22 phone tip jacks
4 Na-ald button sockets, 4, 5, 6 and 7 prong
1 Wafer socket, seven prong
1 Na-ald analyzer cable with plug and adapters
1 Cable-plug, seven prong
1 Van No. 4 dial
Bakelite cut to size, wires, etc.

Cap't Hall's Page

(*Continued from page 152*)

catches in a big way. On about 20 meters we picked up a powerful carrier and a man finally spoke. He said, "Hello, hello, Japan. This is the League of Nations. Calling Japan. Hello, Japan. We are on 20 comma 64 meters. This is Geneva calling. Ah! How are you hearing us? We are getting you fine."

That was enough. If the League of Nations was hearing Japan, why not we? A quick consultation of time charts told us that it was about 7:30 p.m. in Japan; therefore we thought Japan would be on a medium frequency, probably 38.5 meters. But no Japan was on that wave! We combed the dials and, to our surprise, there was our sought-for Jap pounding in on 19 meters. We had heard numbers of Oriental stations before, but never one coming in like this! An idea came to me, why not record this program? For the last few months I have been experimenting with a recording outfit which, in my opinion, revolutionizes a hobby that many thought beyond their financial means. This recorder is attached, permanently, to my short-wave receiver, and just by throwing a switch I can make a phonograph record of any program coming in.

In less time than it takes to tell you, I had the record on the turntable, the motor running, and our weight adjusted and then began. A full, twelve-inch record was made, and so clear and perfect was it that we rebroadcast it over my regular Sunday night DX broadcast over WBNX, 1350 kc., from 6:15 to 6:45 p.m.

Our DX blood was aroused and we went after more and better "fish." Next heard was a woman's voice on about 19 meters. This was the same female heard on other mornings, but on this particular day the signal was far clearer and she was heard very well calling, "Hello, Taska. Hello, Taska." This we identified as Moscow calling Tashkent. When the contact was made we started to hunt for "Taska." That is one great thing about commercial phones; when you hear one side of the attempted contact calling any city or country and they start a conversation, you can be fairly certain the other country is coming back to them or else why the conversation?

So we tuned around and on 19.70 meters a man was heard talking. After a while this stopped and another man's voice started to call, "Hello, Moskva. Hello, Moskva," and an animated conversation sprang up between "Mr. Taska" and "Miss Moskva" or between stations RIM and RKI.

On 24.4 meters another man's voice was heard (men were busy that day). He was calling Cairo and counting from one to thirteen in Dutch and in English. Upon his contacting Cairo the balance of the tests were conducted in scrambled speech. Bandoeng, Java (PLM), also was logged.

How many fans have been hearing that almost daily Japanese program on 27.8 meters? It consists of Oriental music, talking in Japanese, singing in that same language and announcing in English as "JOAK." Any time from 5:30 a.m., E.S.T., to a little after 7:00 you may hear this station. JOAK, as all fans know, is the long-wave station of Tokio, but this station's programs are commercially transmitted over J1AA's short-wave transmitter for Japan's colonies.

Well, that's all for now. See you next month for another DX pow-wow!

Capt. Horace L. Hall

Technical Review

(*Continued from page 171*)

new Supreme testing instruments such as the new Model 85 tube tester, the new Model 91 analyzer, the Model 333 radio analyzer, the Model 35 tube tester, the Model 60 oscillator, the precision multi-wave signal generator Model 180, the new standard diagnometer, the Model 222 multometer and the Model 111 d.c. volt-ohmmeter.

57. *How to Build a High-Quality Condenser or Ribbon Microphone.* Describes the Amperite microphone kit with which it is possible to build, easily and quickly, a condenser or ribbon microphone.

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

60. *Audio and Power Transformers and Choke Coils for Use in Public-Address Amplifiers and Radio Receivers.* Information on the characteristics of a wide variety of Amer-Tran DeLuxe and standard audio and power transformers and chokes.

63. *Moderate Priced, High Quality Transformers and Chokes.* Descriptions and prices on the new Amer-Tran Silcor line of moderate priced audio and power transformers and chokes designed for original and replacement use in radio receivers, amplifiers, public address systems and amateur transmitters.

64. *How to Make Money on Condensers and Resistors.* A plan whereby servicemen can make real money by using Micamold condensers and resistors. Data on this line of mica, paper and electrolytic condensers, auto-radio interference suppressors and micamold carbon resistors is included.

With the Experimenters

(*Continued from page 175*)

greatest volume. To tune to the higher frequencies, move switch arm RHT, Figure 1, clockwise 1 to 3 points before advancing LFT arm at all.

Parts List

Detector—Puretone, Rotorit or any good galena
C1—.0005 mfd. tuning condenser
C2—Fixed condenser, .001 or .002 mfd.
L1, L2—Coils as per text
Tap switches (LFT and RHT)—any available, with 11 switch points
Baseboard—7 inches by 12 inches by 5/8 inch, wood
Panel—7 inches by 7 inches by 1/4 inch wood or bakelite.

J. M. NIGHSWANDER,
Eugene, Oregon.

Phenomena

(*Continued from page 157*)

importance of one inverse effect, namely, the inverse piezo-electric effect. In general, the experimenter and the inventor will do well to be on the alert and prepared to apply the principal of reversal. Running a principle or process "backward" has revealed important theoretic relations and also has resulted in many practical inventions.

"All-Star" Set

(*Continued from page 147*)

complete foundation kit, consisting of a drilled and punched metal base and panel for the All-Star Super-Six six-tube superheterodyne circuit. It has been prepared and distributed throughout the trade for your convenience and will cost you but $2.50. Next you will want complete instructions for building the set. These can be obtained by writing to RADIO NEWS, care of the Blueprint Department and asking for the complete four-page descriptive folder including a large-size schematic-wiring diagram, a large size pictorial-wiring diagram, a complete parts list, complete instructions for assembly, instructions for wiring, instructions for final adjustments and tuning. This will be sent you free of charge.

And now a few words about what the set will do. As soon as I had the completed set in hand, I obtained the proper loudspeaker for it and brought it up to the Westchester Short-Wave Listening Post to try it out in a few preliminary tests. The loudspeaker was plugged into its proper socket and the set was connected to the 110-volt a.c. lighting lines. After the antenna and ground connections were made (I used a bi-pole antenna), the tubes were placed in their respective sockets and the set was turned on. Next the coils L1 and L4 were placed in the sockets. These are the coils that cover the highest frequency band, 10 meters to approximately 24 meters. A number of stations in Europe were tuned in on the 19-meter band with one African station on about 23 meters as well as W3XAL on 16.8 meters and W8XK on 13.9 wavelength. They came in clear and strong after the final adjustment had been made and could be tuned from one to the other by simply controlling the middle knob.

The middle set of coils, L2 and L5, which overlapped with the first set and go down in frequency to include the 40-meter band, yielded a station in South America on the 31-meter band as well as stations in Spain, Australia, Portugal and Japan. Both of these sets of coils brought in innumerable "ham" transmissions at the proper settings.

The third set of coils, L3 and L6, were used for the 49-meter band, bringing in all the American stations, many South American stations and amateurs from 75 to 80 meters. It was found that in logging the two "tank" condensers at the proper settings at the highest frequency end of any particular band, the middle dial could also be calibrated so that the same stations could be found, again and again, at the same points. In other words, setting the middle dial at 100, say for the 49-meter band, and tuning in, with the two "tank" condensers to the proper settings to get YV3RC on 48 meters, we could then use the central dial to swing through the 49-meter band and this setting could be re-made any number of times, with YV3RC

All-Star Set

(*Continued from page* 188)

as the control. This same plan was also used on other frequency ranges; some station is picked out that is on the highest frequency end of the band desired and then it is used as a control for logging. In this way the setting is easily logged after a few control stations are spotted on the dials and their settings written down for reference.

The set was also tested on a straight aerial, without a transposed lead-in, and it brought in a similar array of stations although the noise-reducing antenna arrangement, with a doublet feeder, was found to be considerably better in eliminating pick-up noise.

All in all, the set acted very well in preliminary tests, with good tone quality and excellent sensitivity even on the most distant station received. The best catch of all was probably the Japanese transmitters on 7880 kc. and on 10740 kc., respectively. After I have made a more comprehensive test on the receiver, trying it in a number of different locations, I will write an operating and reception report in more detail, giving additional information, to be included in the October issue of RADIO NEWS.

The Service Bench

(*Continued from page* 173)

but being all in the day's work, I took a deep breath and decided to tackle it.

"After inspecting the RCA layout, I found it contained three –27's, one –24, two –71A's, one –20 and an –80. All tubes tested okay. But the –20, which lit in the tester, would not light in the Theremin. I tried my analyzer and, expecting no filament voltage, switch in the 5-volt scale and, whoops—she went clear off! The filament potential was 75 volts! It was with trembling fingers that I trusted the tube to the socket—even though it hadn't burned out in the Theremin—and the po-

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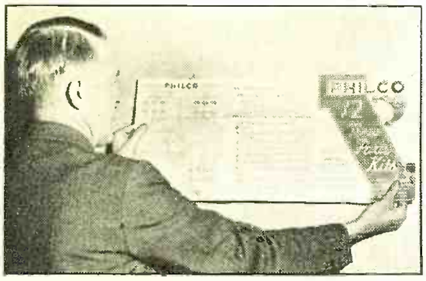
tential dropped to 2.5 volts! (Naturally enough, still no light.)

"Time was getting short, and the bystanders were very helpful with suggestions that maybe it was the speaker and did I have the ground on! Finally, a fellow leaning on the volume control—the shepherd's crook—moved away, and, presto, the -20 lit up like nobody's business. It would go out as one's hand approached the rod. Further inspection showed that it was lighted by the plate current through the last -71 tube, which varied with the proximity of the hand to the volume control.

"The trouble was finally traced to a -27 which tested all right but would not oscillate on low frequencies. A new -27 started the concert only ten minutes behind schedule."

Free Parts Kit Catalog

Readers of RADIO NEWS will be interested in a new Philco folder announcing and describing 12 new replacement part kits. Those who are interested may obtain a copy of this folder describing the service



kits in detail by addressing a card to RADIO NEWS, Department P12, 222 W. 39th St., New York City, and asking for this folder.

A Multimeter

(*Continued from page* 163)

diagram shown last month. These have been necessary to adapt the circuit to capacity and inductance tests. Also the original meter, an experimental model, has been supplanted with the final model, which has but two terminals. The rectifier is sold with the meter and is intended for external mounting; in this unit it is mounted on the sub-panel. The constructor is cautioned not to attempt to use any rectifier other than that supplied with the meter. The meter scale readings are dependent upon the characteristics of the rectifier and its associated shunt (R25) and series multiplier (R26), and must be matched to each meter at the factory.

The front panel layout and suggested engraving is shown in Figure 4 and presents no difficulties. Figure 5 shows the sub-panel layout. The sub-panel may be of 3/32 or 1/8 inch bakelite. If 1/8 bakelite is used the holes shown for mounting the resistors may be drilled slightly smaller and tapped for a 4/36 screw, obviating the need for a nut and lock washer.

After the panel and sub-panel have been drilled, the meter and all other apparatus which shows on the front panel should be mounted. The 1.5 volt battery is mounted by a heavy insulated bus-bar strap which loops over the battery carton and has each end fastened around the shafts of the 3 deck and 4 deck switches. Connecting leads for the battery are soldered directly to the battery. Care should be taken not to hold the iron too long against the battery. The lead connecting to the 15,000 ohm rheostat should be of coiled insulated flexible wire so that the battery may be easily removed for replacement. The 13.5 volt battery may consist of 3- 4.5 volt flashlight batteries mounted in the bottom of the cabinet, or, if more frequent replacement is not objectionable, 9 miniature "Penlite" cells may be connected in series, soldering to the terminals to form the connections, and mounting same between the sub-panel and front panel.

The resistors should be mounted on the sub-panel in the order shown in Figure 5 and partly wired as shown.

To operate the meter, adjust the circuit selector to the type of measurement desired. Capacity measurements are made with the circuit selector switch set to E-a.c. and the range selector switch at the proper range for the capacity (or inductance) to be tested. Make sure both these switches are properly set before applying voltage. Connect the a.c. supply to the outer top terminals and temporarily short the two inner top terminals. See that the switch S3 is closed and adjust the meter, by means of the battery adjustment, until full scale deflection is obtained. Open the connection across the two inner top terminals and place the unknown impedance across them. The meter will then give a deflection which is a measure of the impedance of the unit under test. Curves may be made up and used to interpret this reading in terms of capacity and inductance.

With the values of C2 and C3 specified the capacity ranges of the model were:

Range 1: .0005—.1 mfd.
Range 2: .005—1 mfd.
Range 3: .1—20 mfd.

The scale will be crowded at both ends so plenty of overlap is provided which makes it possible to measure capacity with better accuracy. Electrolytic condensers cannot be measured with this type of circuit and may be damaged if it is attempted.

For voltage tests, make sure that the switch S3 is open, adjust the circuit selector to a.c. or d.c. and set the range selector to the proper scale. For voltages below 100 d.c. the second position on the circuit selector should be used. For higher voltages, use the third position and multiply the reading of the range selector scale by 10. For all a.c. ranges, set the circuit selector switch to the first position and multiply the voltage scale calibration on the range selector by 10. The two lower jacks on the right hand side are used for the test prods.

For resistance tests, set the circuit selector to the 5th position, and if the resistor under test is believed to be over 100,000 ohms, set the range selector switch to the 5th position and insert the test leads in the jacks marked "common" and "high." If the meter indicates low resistance, shift one test lead to the jack marked "intermediate" and move the range selector switch to position 4. If the reading is still near full scale deflection, continue switching the range selector switch until a readable drop in reading occurs. Before making any precise resistance measurements, short the test prods and adjust the battery adjustment rheostat until full scale deflection is obtained.

Current measurements are made following the same general procedure used for voltage tests, but using the two "MA." jacks for the leads. The fourth position on the circuit selector switch is used for this type of test.

Output measurements may be made by setting the circuit selector switch to E-a.c. and placing the test leads in the "output" jacks.

The 100 microampere range is also available through tip jacks, adapting the apparatus to tube voltmeter and other applications requiring a highly sensitive meter.

Parts List

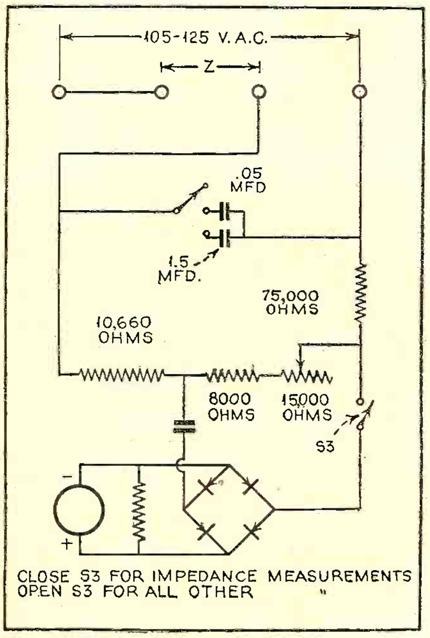
Weston Model 301, Type "S-21702-Modified," microammeter, 0-100 microamperes, supplied with factory-matched external rectifier, 5 volt a.c. multiplier (R26) and .85 ma., a.c. shunt (R25)

C1—Cartridge type condenser, .25 mfd., 400 volts

C2—Cartridge type condenser, .05 mfd., 400 volts

C3—Two cartridge type condensers, in parallel, 1 mfd. and .5 mfd., both 400 volts

Weston wire-wound, non-inductive, spool type resistors, accurate ± ½ percent, as follows: R1—222.2 ohms, R2—40.82 ohms, R3—20.22 ohms, R4—8.033 ohms, R5—4.006 ohms, R6—2.0 ohms, R7—0.4 ohms, R8—5000 ohms, R9—15000 ohms, R10—25000 ohms, R11—50000 ohms, R12—150000 ohms, R13—250000 ohms,



MEASURING CIRCUITS

Figure 7. The unknown impedance is connected at "Z" and the 110-v. line to the outer terminals. Close S3 for impedance measurements, for all other measurements it should be open

R14—500000 ohms, R15—1263 ohms, R16—113.7 ohms, R17—12.5 ohms, R18—15000 ohms, R20—10660 ohms, R21—112500 ohms, R22—1800 ohms, R23—3000 ohms, R24—222.2 ohms

R19—Carbon resistor, 7000 ohms, accuracy ± 10 percent

R27—Carbon resistor, 75000 ohms, accuracy ± 10 percent

S1—Yaxley non-shorting rotary switch, 10-point, 4-gang

S2—Yaxley non-shorting rotary switch, 5-point, 3-gang

S3—Cutler Hammer s.p.s.t. toggle switch

1—Bakelite panel 8¾ by 7 inches, ⅛ or 3/32 inch thick

1—Bakelite sub-panel, 5½ by 6½ inches, ⅛ or 3/32 inch thick

13—Na-ald insulated pin jacks (4 red, 9 black)

2—Pointer type switch handles (for S1 and S2)

1—1½ volt flashlight cell

3—4½ volt flashlight batteries

New Things in Radio

(*Continued from page* 161)

fitted with tubular vistors to protect the lenses in front of either the cell and lamp, or both, to overcome the difficulties normally caused by rain, snow or extraneous light. A variety of photoelectric circuits can be furnished with this unit to provide the best operation for a given installation.

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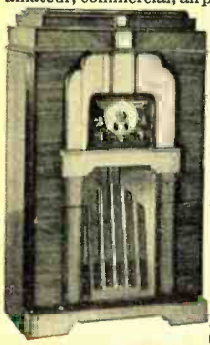

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