RADIO'S *Complete* MAGAZINE

RADIO & TELEVISION

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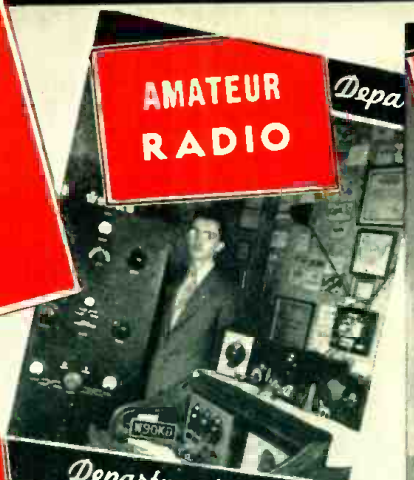

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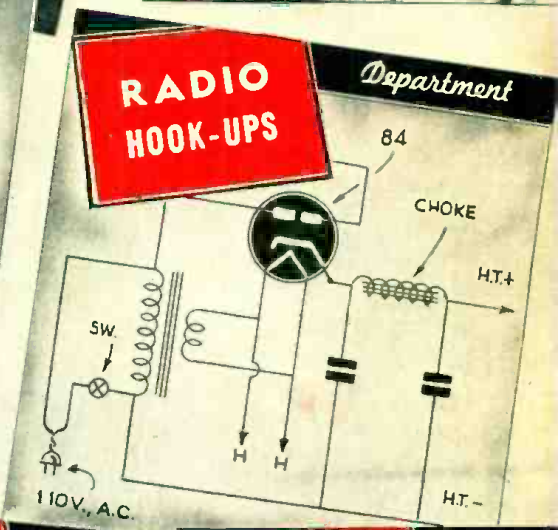

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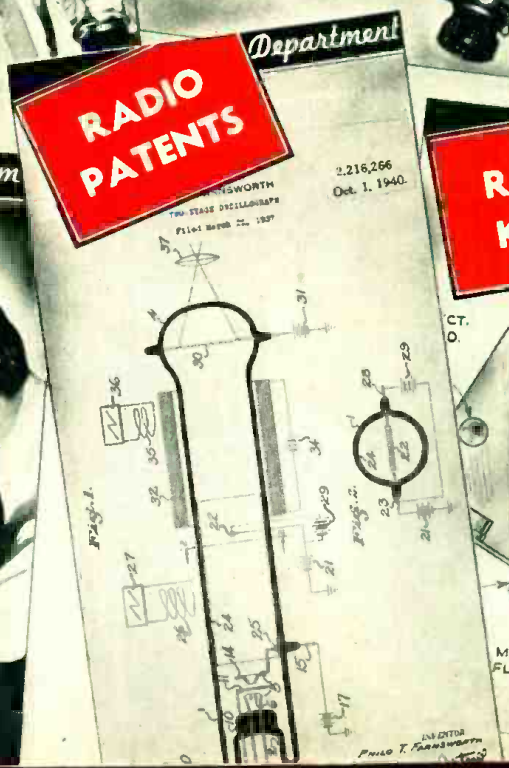

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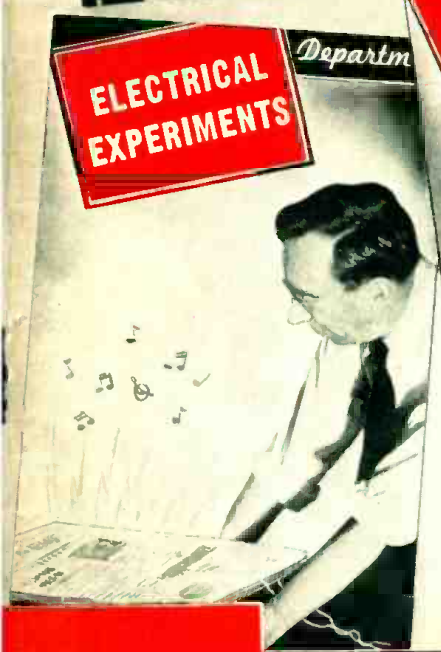

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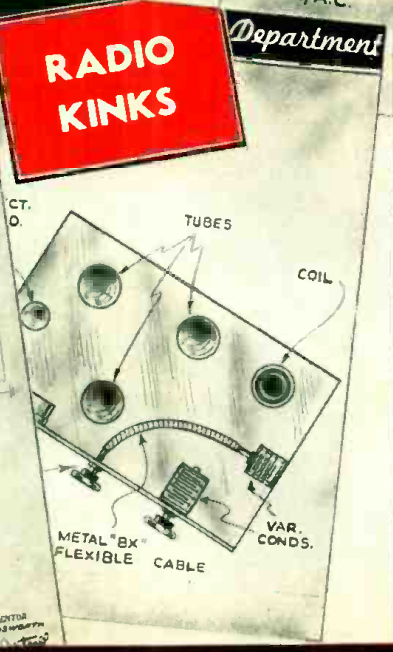

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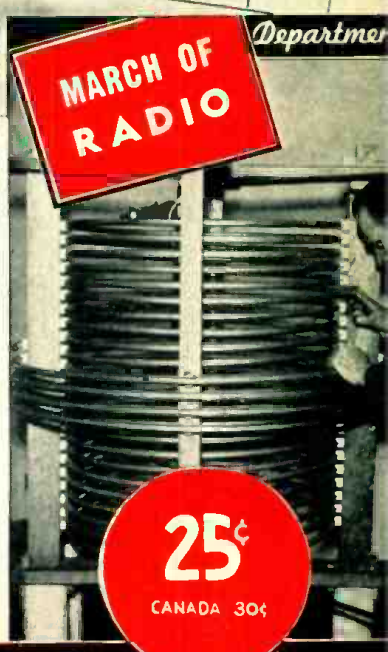

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HUGO GERNSBACK
EDITOR

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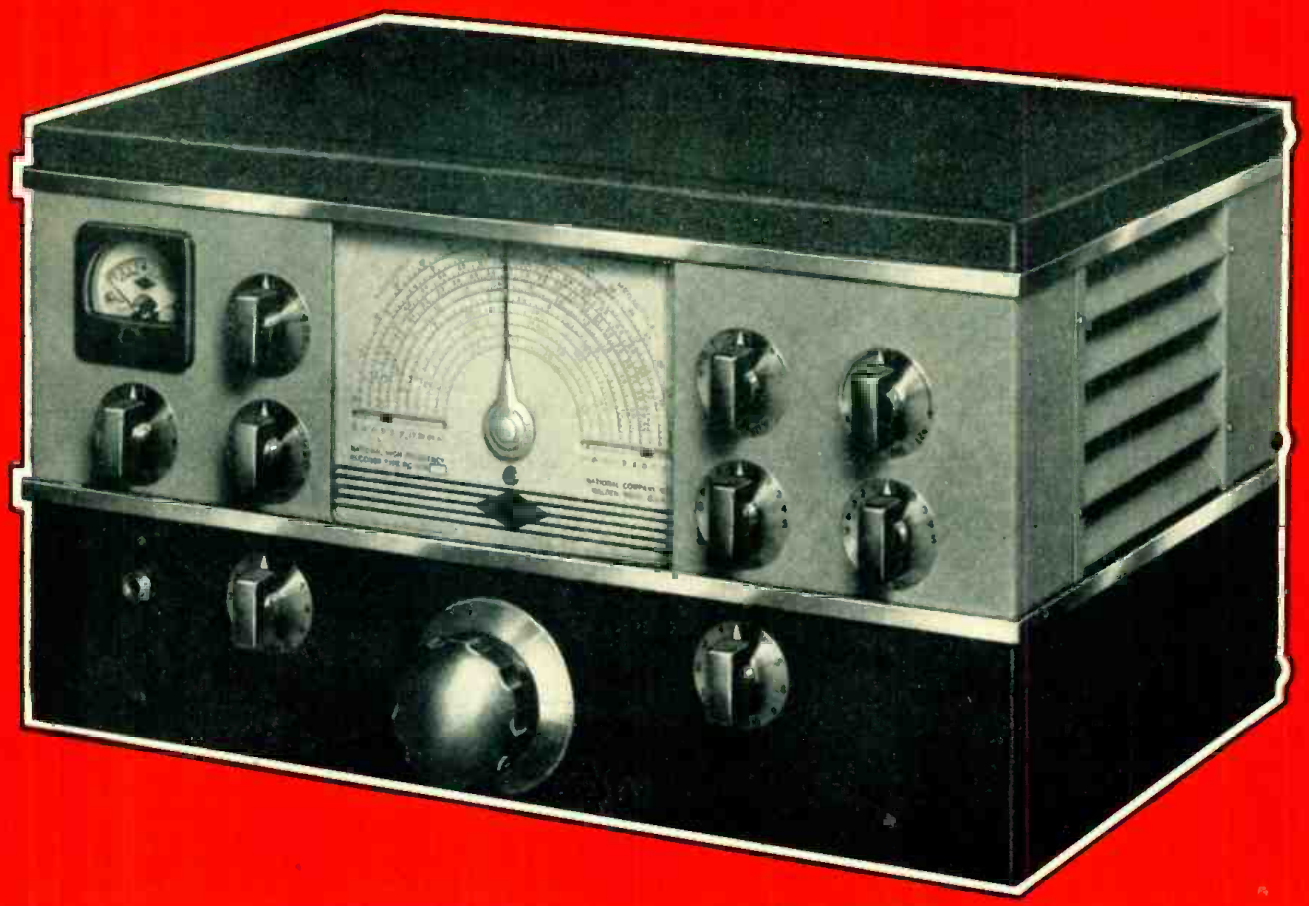

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Radio broadcasting stations employ Technicians as operators and maintenance men and pay well. Radio manufacturers employ testers, inspectors, servicemen in good-pay jobs with opportunities for advancement. Radio jobbers and dealers employ installation and servicemen. Many Radio Technicians open their own Radio sales and repair businesses and make $30, $40, $50 a week. Others hold their regular jobs and make $5 to $10 a week fixing Radios in spare time. Automobile, police, aviation, commercial Radio; loudspeaker systems, electronic devices, are newer fields offering good opportunities to qualified men. And my Course includes Television, which promises to open many good jobs soon.

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RADIO & TELEVISION

The Popular Radio Magazine

HUGO GERNSBACK, Editor
H. WINFIELD SECOR, Manag. Editor
ROBERT EICHBERG, Television and Digest Editor

December — 1940
Vol. XI No. 8

In January Issue

A Receiver for Beginners—In Which 3 Tubes Equal 5

Radio Beam Indicator

A New 7-Tube Superhet. of Interest to Set Builders—Emmett Brightwell

A Semi-Portable Television Receiver—R. H. Horn

The R. & T. Videophone, Part 3—Ricardo Muniz, E.E., and S. Morton Decker

In This Issue

Cover Composition by Hugo Gernsback and Thomas D. Pentz

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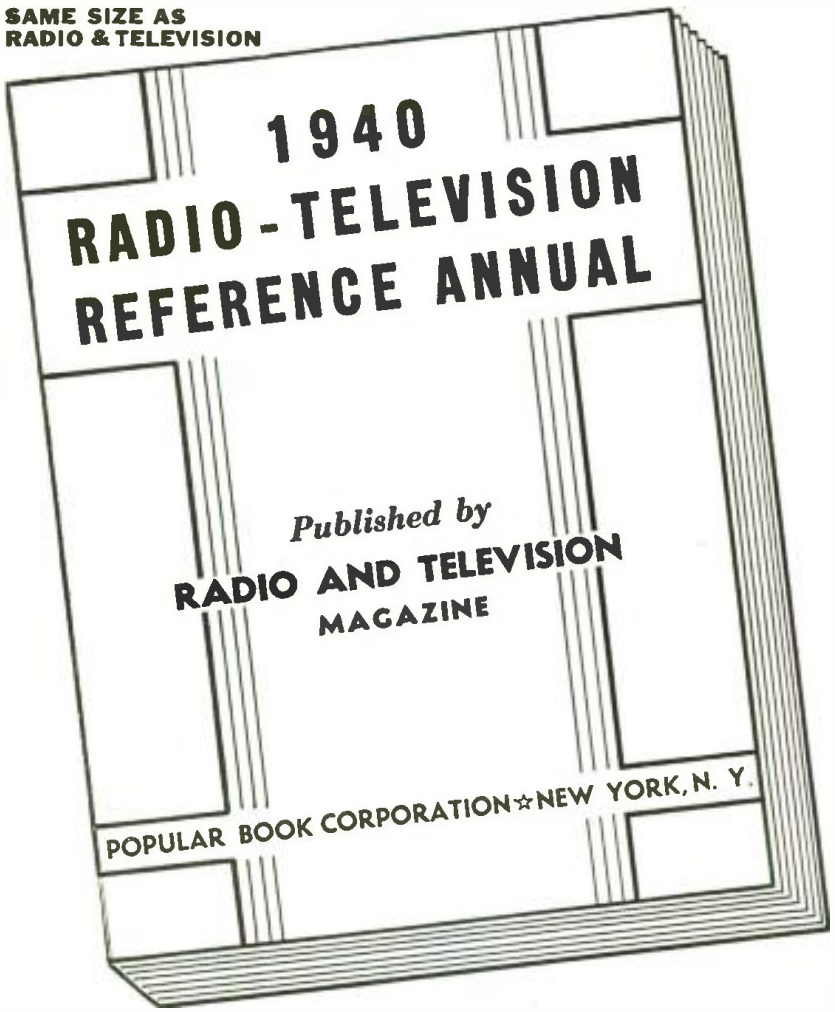

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RADIO & TELEVISION
20 VESEY STREET
NEW YORK, N. Y.

RADIO & TELEVISION

Editorial

AMATEUR INTOLERANCE

By HUGO GERNSBACK, Editor

PERHAPS it would be in order to title this editorial *Human Intolerance*, because what I am going to say does not pertain wholly to the Radio Amateur, but in a large degree to the human race.

It is a failing of human beings that once they have learned a thing well, they immediately begin to look down upon others who have as yet to climb to the top, or part way up the ladder. Not only that, but frequently we find that those in a profession, or in many other human endeavors, look with disfavor upon the newcomer.

The majority of automobile owners, even though they only have owned or driven a car for a year, look askance upon the new driver. The thought here is as expressed by most of these individuals—*"there are already too many cars on the road, so what is the sense of having more cars piled on us."* It does not occur to these people that they were once newcomers themselves, and they certainly would have strenuously objected if anyone had even remotely suggested that no more car licenses should be issued.

Most of the professions, whether they be doctors, lawyers, or engineers, once they have "arrived," have similar feelings regarding the newcomer. In all endeavors we have what may be called a professional jealousy.

This brings me to the Radio Amateur, where the conditions are similar to those I have just described. Week after week the editors of RADIO & TELEVISION magazine are in receipt of letters from "would-be" amateurs, who have as yet not made the grade and who complain bitterly of the lack of co-operation which they get from licensed amateurs. For twenty years past, many radio amateurs have been accused of being excessively clannish. Many of these amateurs resent the beginner bitterly, claiming that he takes up valuable space and time on the restricted amateur waves, and that it becomes more difficult for present amateurs to transmit intelligible messages. As a rule, most of these individuals refuse point-blank to co-operate with the newcomer and do not wish to be of any help whatsoever to him.

Let it be understood that there are many licensed amateurs who do not belong in this class of intolerance. Nevertheless, it seems that the percentage of those who do not favor new amateurs is quite large. Indeed, the percentage seems to be sufficiently great to make for a continuous stream of complaints from embryo amateurs.

If the amateur would stop and reason for a few minutes, he would of course arrive at the conclusion that his attitude is foolish in the extreme and, indeed, will hurt him in the long run. In radio amateurism as in every other endeavor unity makes strength and the more amateurs there are, the more their voices can make themselves felt. No radio amateur in his right senses, could deny that it would be far better for the entire cause to have 200,000 licensed amateurs, than merely 55,000. The reason is obvious. The greater the size of the amateur body the more attention the government, through the Federal Communications Commission, will pay to radio amateurs. The smaller they are the less important becomes our cause.

Leaving out the human angle entirely for a moment we might properly consider the scientific angle. Over a stretch of many years, it has been found that in every technical development, ways and means are always found to solve existing technical problems. And while the present-day amateur may not believe it, I for one, do believe that twenty-five years hence it will be simpler to accommodate 200,000 amateurs on the same wave bands than it is to accommodate 55,000 today. The answer is *technical progress!* There is nothing quite so insane as the man who wishes to stop progress. The more intense the competition, the quicker a given problem will be solved. A simple illustration will show this. For about thirty years before the advent of the automobile and airplane, the railroads were content to rest on their laurels. When the automobile and the airplane finally became big enough to threaten the very existence of the railroads something was done about it. The result was faster and better railroads, new types of engines, electrification, new types of roadbeds, and many other improvements. These have stepped up railroad progress tremendously and the end is not in sight.

Exactly the same with radio amateurism. New means will be found to accommodate four or five times as many amateurs, even on existing wavelengths, than is possible today. How this will come about I do not profess to know now. *But that it will come about I have no reason to doubt.*

More important than all of this at the moment, is that amateur intolerance right now becomes a serious menace; indeed, the intolerant amateur becomes downright unpatriotic.

Our country and our present mode of living are threatened as they have never been threatened before. During the next few years our armed forces will need several hundred thousand young men, who might be called *amateurs* or *radio technicians*. Most of them will require a knowledge of the code, and all of them certainly should be trained as radio operators under actual conditions.

And it behooves every patriotic American radio amateur to do his utmost to bring into life *new* radio amateurs, who will be of incalculable help to their country. Whether this newcomer will later on become an active amateur, is beside the point. No licensed amateur should put obstacles in the way of would-be amateurs, but to the contrary *he should go out of his way to teach them all that is to be known about radio.*

The danger at the present time to our country is still very serious, far greater than most people realize. Time is of vital essence.

For this reason I urge every red-blooded American radio amateur to do his part, and what is more important, go out of his way and do it.

GOVERNMENT SEEKS RADIOSONDE TECHNICIANS

In connection with the National Defense Program the United States Civil Service Commission has announced an examination to secure radiosonde technicians for Government service. The salary of the position is $2000 a year, less a retirement deduction of 3½%.

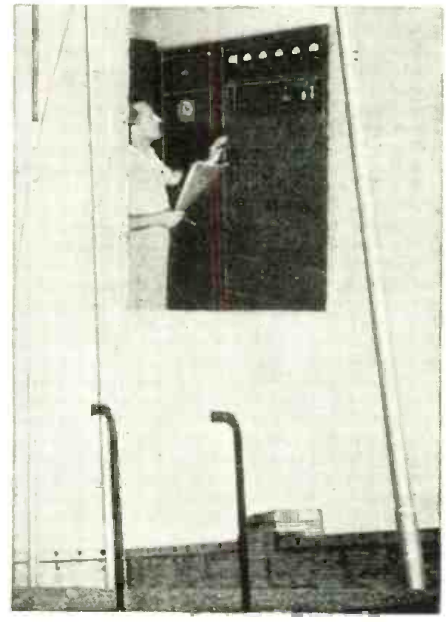
Persons appointed will have responsibility for the installation, inspection, and maintenance of radiosonde ground equipment at new stations in Alaska, the continental United States, and the Caribbean area. Applicants will be rated on their experience as shown in their applications, and on corroborative evidence. While experience in the installation, maintenance and repair of radio equipment forms the greater part of the requirement, applicants must have had at least 6 months of experience in the installation, maintenance and repair of radiosonde ground receiving and recording equipment. It is anticipated that it may be difficult to secure sufficient qualified eligibles because of this specialized requirement and the fact that this field of activity is new. The Commission will, therefore, rate applications as they are received at the Washington office until further notice. Applicants must not have passed their sixtieth birthday.

Further information regarding the examination is contained in the formal announcement, which, with the proper application forms, may be obtained from the Secretary of the Board of U. S. Civil Service Examiners at any first- or second-class post office, or from the U. S. Civil Service Commission, Washington, D. C.

WOR'S NEW FM ANTENNA COVERS METROPOLITAN AREA

Towering above the roof of a midtown Manhattan skyscraper is the antenna of W2XOR, the FM station which carries WOR programs throughout the metropolitan (New York) area. The transmitting antenna at the left of the picture extends nearly 50 ft. above the roof of the 42 story building on which it is mounted. The two other aerials shown are *receiving* antennas. All were manufactured by the Western Electric Co., for the broadcasting station. Inset shows Charles Singer, technical supervisor of WOR transmitters, making some final adjustments on the new FM job.

The other illustration shows J. R. Poppele, chief engineer of WOR, demonstrating the "innards" of the new Western Electric speech input, used in WOR Studio No. 1, to Alfred Wallenstein, orchestra conductor, who stands in the foreground. The new input is designed to give the station's frequency modulation broadcasts a range and fidelity of tone hitherto unmatched in radio broadcasting. WOR was the pioneer commercial station to use high fidelity on the standard broadcast band in the New York district.

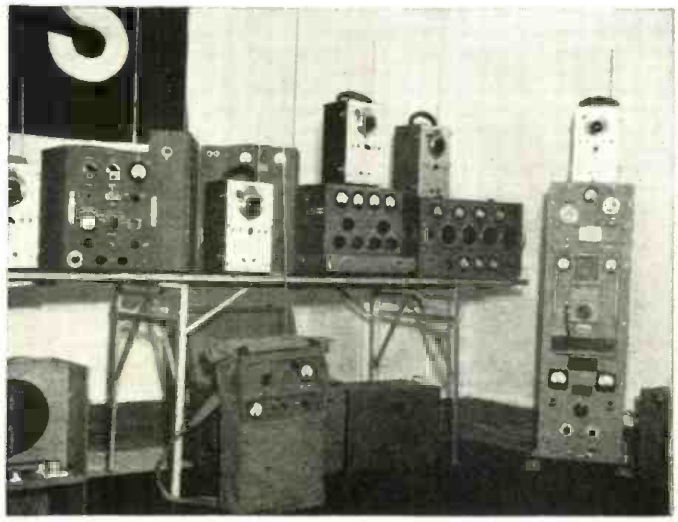


MESSAGES FROM HERE GO TO EUROPE AND SOUTH AMERICA

Since March 7, 1929, CBS has been sending short wave programs to Europe and South America for approximately 16 hours a day over its experimental station W2XE operating on 5 kw. In May, 1937, the station increased its power to 10 kw. and installed a directional antenna, greatly increasing its effective strength. In the summer of 1939, it received a regular license and was assigned the new call letters WCBX. Less than half of its programs are from the CBS network, the remainder being specially prepared for European and South American audiences.

Since January of 1939 this station and WCAB, owned and operated by WCAU in Philadelphia, have been operating on a co-ordinated schedule.

Columbia's budget for 1940–41 will make its own short wave investment total $400,000 —four times its total as of today. Part of the money will be spent to increase the power of WCBX to 50 kw. Other new features will include an improved antenna and augmented program service. The accompanying illustrations show part of the amplifying and measuring equipment used at WCBX, and its station shack at Freeport, L. I., whence its waves are directed across the Atlantic Ocean.



PIONEER HONORED

Dr. Frank Conrad, left, "Father of Radio Broadcasting," was awarded a diamond-studded gold emblem in recognition of 50 years' service with the Westinghouse Electric & Mfg. Co., of which he is Assistant Chief Engineer. Dr. Conrad, who was technically responsible for the world's first regularly scheduled radio broadcast on November 2, 1920, over Station KDKA at Pittsburgh, is seen receiving his service emblem from Dr. R. E. Hellmund, Chief Engineer of Westinghouse.

G.E. TAKES OVER WGY

General Electric has taken over the complete operation of WGY, 50-kilowatt broadcasting station established in Schenectady more than 18 years ago. Since 1931 this station has been operated by NBC.

Kolin Hager, manager of the station since its inauguration in February, 1922, with the exception of two years when he was associated with radio work in Buffalo, will continue as manager. Under the new arrangement WGY will be affiliated with NBC and will continue to utilize the red network.

The technical operation of the station will continue under the direction of another pioneer in the art, W. J. Purcell. At the time WGY went on the air, Mr. Purcell was named station engineer and he has been associated with its operation during the 18 years that have followed. Before entering the employ of General Electric, he was a "ham" operator in Cobleskill, his native town.

When WGY was started in 1922 it used but 1500 watts of power. This was soon increased to 5000 watts. In 1924 G.E. completed the construction of a great transmitter laboratory on a 54-acre plot at South Schenectady and the WGY transmitter was moved from within the Schenectady factory to the new location.

BRITAIN'S NEW COLOR CODE

According to *Wireless World*, color coding of resistors and condensers has recently been altered by the Radio Manufacturers' Association in Great Britain. Newly recommended "War Standards" cover a wider range of values and include markings to indicate percentage tolerations above and below the previously accepted standard of 10%. This latter feature is considered excellent by many American users of radio parts, who would like to know instantly by inspection, whether a resistor is within one or two per cent of its rated value —or perhaps 15% off.

THE BYRDS FLY HOME

The 59 members of the U. S. Antarctic Expedition commanded by Rear Admiral Richard E. Byrd will leave Little America about January 15, 1941, and will arrive in this country sometime in May. This statement is made by Clyde D. Wagoner of General Electric who has arranged and directed a series of biweekly broadcasts to the expedition since its departure last year. The programs are sent to the expedition over 100 kw. shortwave station WGEO and also carried on NBC from 11:30 to midnight on alternate Fridays.

AMATEURS ADOPT TELEVISION FOR 2-WAY PHONE TALKS

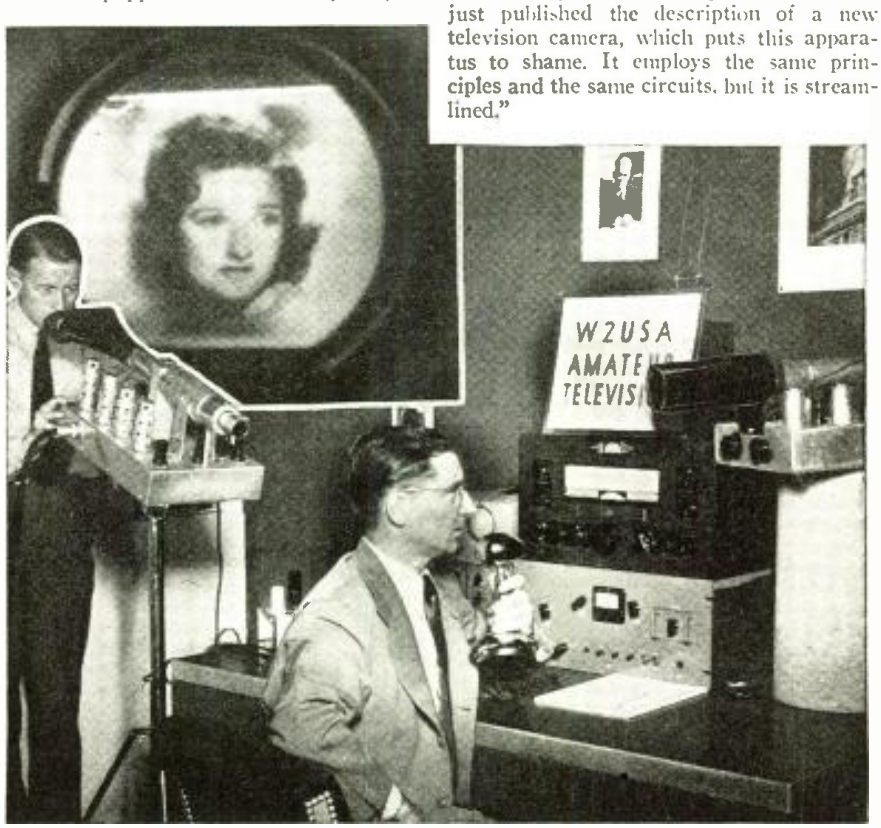
Two-way television using amateur equipment was demonstrated at the late lamented New York World's Fair by the W2USA Radio Club operating between the Communication Building at the World's Fair and their New York station. The large illustration shows Arthur H. Lynch, Managing Director of the W2USA Club, as he sat before the apparatus talking to Fred Cusick who was eight miles away but none the less visible and audible at Mr. Lynch's position. The television pick-up at the extreme left is being operated by Bill Meissner, W2AYJ. Lynch is observing Cusick in the receiver at the extreme right. The inserted picture is Lola Lane, film star, as she appeared over the television circuit.

Commenting on the two-way system Mr. Lynch said: "The picture circuit is operating in the 112-116 megacycle amateur band having one transmitter near the lower end, the other near the upper end. This band, if expressed in the more commonly used terms, would be said to be on 2½ meters.

"The system which we are using can never be made to compare in clarity with commercial television. We use a system which gives us but 120 lines, while the commercial standards are in the vicinity of five hundred lines. The difference in the result may be likened to the difference in printing between picture reproduction where a coarse screen is compared to a fine screen. The detail of the reproduction made with the finer screen is, of course, better. Then, too, the amount of power we use at our transmitters is only a very small fraction of the power used by the commercials. The cost of our equipment is extremely low, in comparison. A complete transmitter and receiver, of the type we are using on each end of our circuit, can be duplicated by any amateur for less than three hundred dollars. That includes all the tubes, but it does not take the voice channel into consideration.

"Our voice circuit operates on two frequencies in the 56-60 megacycle band, which is the equivalent of approximately 5 meters. The equipment used for that portion of our layout is of an ultra-modern form and both the receivers and transmitters are the engineering achievements of the National Company, of Malden, Mass. The transmitter is equipped with several crystals, so that one of several voice channels may be selected at will, while the receiver is made with an automatic noise-gate, which prevents any sound coming from the loudspeaker until the voice of the operator, on the other end of the circuit, is heard.

"It is doubtful that anyone would give much consideration to building equipment such as ours, even now, since the Director of Research of the American Radio Relay League, Mr. James Lamb, has just published the description of a new television camera, which puts this apparatus to shame. It employs the same principles and the same circuits, but it is streamlined."



DU MONT ERECTS ANTENNA FOR TELEVISION

In midtown Manhattan the Du Mont Labs have erected a steel frame-work rising 100 feet from the roof of a 42-story skyscraper in the midtown area. Atop this structure is a 50-foot mast, bringing the television aerial 650 feet above sea level. A winch permits the steel mast to be raised and lowered.

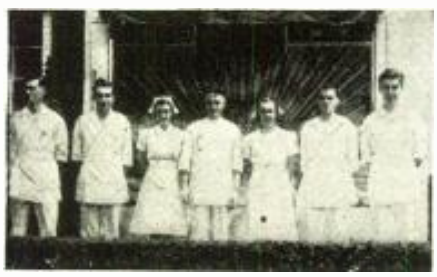
The company's engineers plan to experiment with various types of aerials for both horizontal and vertical polarization. These aerials will be provided with internal electric heating elements to prevent the formation of ice (and consequently reduced efficiency) in the winter time.

For several weeks a temporary 50-watt transmitter has been fed into a small dipole laid directly on the brick roof. Company engineers claim that test signals have reached most of the metropolitan district with satisfactory strength despite this highly inefficient test equipment. They believe that splendid signal strength will be had over a 35-mile service area when the station is completed. The program director is said to have lined up many film programs and outside pickups for use when the station is put into operation "sometime before the end of the year." The accompanying picture shows the tower and mast.

RADIO HOSPITAL GIVES SUPER SERVICE

If you see an ambulance with men and women clad as doctors and nurses draw up at the house next door, don't immediately dash around with a mess of calves' foot jelly—it may be the service wagon of Ernest C. Augsten, who runs a "radio hospital" at Hartford, Conn. Mr. Augsten got the idea back in 1935 and, during the first year, repaired 4653 receivers and installed 2801 auto radios with the aid of an assistant, and his wife who acted as bookkeeper. The company now occupies larger quarters and employs five "doctors" and two "nurses." When a call comes in to pick up

a "radio patient," a uniformed interne driving a white radio ambulance, as pictured herewith, speeds from the "hospital" to the location and takes out the "sick" set on a stretcher. The entire personnel wears white doctors' and nurses' uniforms and we'll bet they have more darn fun!—*Photos Courtesy RCA.*



AMERICAN PROGRAMS CHEER IN BLACKOUT

Swing music from American short-wave radio stations is cheering Londoners as they huddle in darkness to escape the bombs of aerial raiders.

English radio stations either go off the air or turn to record programs during blackouts, and listeners prefer the American entertainment, explained Peter J. Sallis of Southgate, England, in a letter to WGEA, General Electric short-wave station.

"We have had continuous attempts to upset our mode of life by air raids," wrote Sallis. "Apart from purely material damage, one of their drawbacks is that they have caused our wireless programs either to go off the air altogether or else we have had to listen to numerous record recitals.

"I tune in my receiver to the 19-meter band and listen to WGEA, and although I've done it plenty of times in the past, I must say that these days it's a boon."

Sallis praised normal English broadcasting but said "the instinct of self-preservation forces our officials to cut it off just when we need it most."

Broadcasting stations in both England and Germany have gone off the air often in recent weeks to prevent raiding planes using their signals as guides to bombing objectives.

LET'S READ THE FCC'S MAIL

The war has brought a new crop of complaints from radio listeners. Unfortunately the replies to all of the first eight following are that the commission has no jurisdiction in the cases.

A Toronto, Canada, woman objects to radio commentators who "spread terror by innuendo."

A San Francisco man dislikes the "hysterical broadcasting" of war news by a particular commentator.

A Macon, Ga., man would prohibit networks from carrying news reports originating in Germany.

A Philadelphia man suggests censorship of news and comment by radio and press during "continuation of the present unsettled world conditions."

A New Yorker asks the Commission to make radio stations broadcast a song he has written.

A Bismarck, N. Dak., man wants the Commission to require a network to carry a particular religious broadcast.

An Asheville, N. C., man would require newspapers owning radio stations to publish the programs of competing broadcast stations.

A Philadelphia man thinks he is entitled to a prize from one of the radio contest programs.

A New Jersey amateur wants to know if he is permitted to listen to foreign stations and whether he may exchange post cards with European Hams.

For your information—Yes, Yes.

By the way, Jimmy Stewart, the movie star, has been assigned the call letters KH*JM* for his transmitter on his private plane in Santa Monica.

A few harsh words were told by the FCC to a Pacific Coast ship captain who, in discussing position and weather by radio with another ship, could not refrain from giving his opinion of the weather in language which would set fire to a stone bridge.

Several people have complained about neighbors' radios playing too loudly. The Commission cannot act in these cases and suggests that the persons whose ears are thus afflicted put up a squawk to the local cops.

A gentleman in Ohio objects to certain programs he hears coming direct from Berlin. Of course the FCC has no authority over foreign stations and it might be that Hitler would not give heed to a complaint.

Somebody else wants stations prohibited from giving swing versions of the classics—and his only recourse is to complain to the station or to turn off his set.

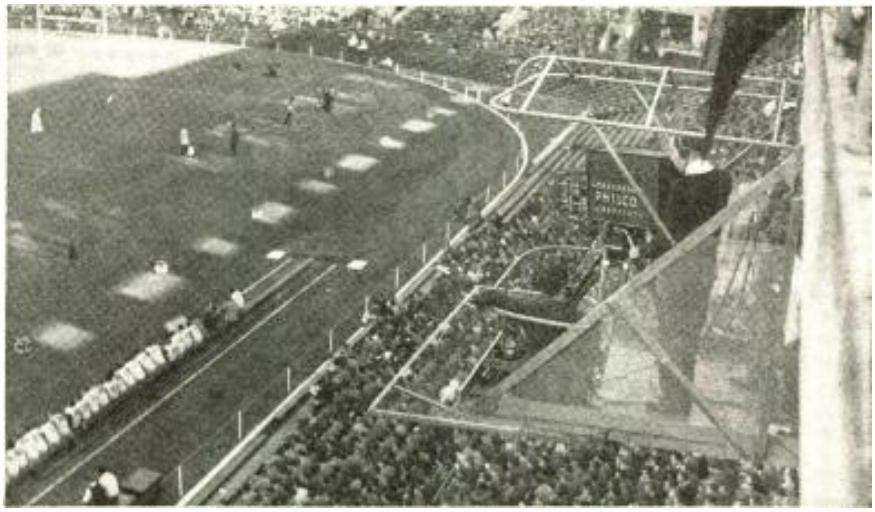
And now aren't you glad that you're not a member of the FCC?

50 KW. F-M STATION PLANNED

The application for permission to increase the power of F-M station W2XOY from 2500 to 50,000 watts has been made by the General Electric Co. The station operates on 43.9 mc. and is located on the Helderberg Mts., 1200 feet above the valley floor overlooking Albany, Schenectady, and Troy, and serving an area of 16,030 square miles with 1,560,000 potential listeners. The new transmitter will be a standard G.E. commercial unit, using a 250 watt and a 3 kw. transmitter as the exciter for the high power amplifier. Both the 3 kw. and 50 kw. units will employ new type transmitting tubes especially developed for F-M and television transmission. A special 3-bay turnstile antenna will be employed. The programs will include material relayed from Schenectady studios, electrical transcriptions and relayed F-M programs.

TELEVISION SHOWS SIGNS OF LIFE IN THREE CENTERS

The Philco television experts recently televised the Pennsylvania-Maryland football game from Franklin Field. The play-by-play description which accompanied the fleeting images was picked up from the regular broadcast of the game made by Bill Slater, popular commentator. Two pickups were used to follow the play at all times. These pickups were located on the two 20-yard lines and it was possible to telecast closeups and long shots by switching from one pickup to the other alternately. Ten engineers were required to operate the equipment.



Co-axial cable carried the television images and sound from the field to relay transmitter W3XP located on the roof of Convention Hall, 235 feet above ground. It was from this hall that Philco and NBC put on their history-making transmission of the Republican National Convention. From this point, waves were relayed over ultra-high frequencies to W3XE, Philco's experimental station, which operated on Channel No. 3 using 10 kw. and *detail of 525 lines.* The accompanying illustration shows the special "television box" in which one of the pick-ups was located for covering this game.

It is interesting to note that NBC, which shut down its New York station, W2XBS, on August 1, to make the change from 441 lines to the higher definition standard, had returned to the air on Oct. 27 at the old standard. This station, W2XBS, announced plans to televise the Democratic and Republican final rallies. Further, NBC has signed a lease for a television station and studio in the Wardman Park Hotel, Washington, D. C. The company has announced plans to broadcast television programs throughout the Washington area and eventually to transmit programs and other television scenes originating at that point to New York.

Niles Trammell, president of NBC, stated: "We hope also to make Washington the originating point of a television service that will link the national capital with Philadelphia and New York City. An automatic relay developed by the Radio Corporation of America promises to provide a satisfactory means for interconnection. When such relays are established, we will be able to experiment with the problems of television program syndication. Then it will be possible for televiewers in Washington, Philadelphia and New York to see events from any of the three cities.

"For the immediate future, however, we must content ourselves with carrying forward a broad program of experimental work here in Washington, laying particular emphasis on the artistic and technical problems involved in *television programs of governmental and national affairs.*"

According to present plans a 1000 watt station will be erected at the hotel. The main studio will be in the Wardman Park theatre which has a stage about 30 by 50 feet and seating arrangements for 500 persons. A film scanning studio is also to be used.

Meanwhile owners of television receivers eagerly await the often delayed opening of the CBS station now promised for January. Du Mont has made successful field tests and Mutual has received its license.

DEAF-MUTES "TALK" VIA NEW AMATEUR TELEVISION SYSTEM

Two deaf-mutes have held the first sign language "conversation" by radio in New York by means of the pioneering two-way television circuit set up by radio amateurs between a Manhattan skyscraper and the World's Fair, eight miles away.

Miss Bertha O'Donnell, of the Bronx, N.Y., and Miss Adele Costa, of Manhattan, carried on the conversation in the sign language while interpreters stood by to unfold the talk to bystanders in both studios. The image definition was very good, viewers asserted, and the women "talked" with as much ease as if in the same room.

Another remarkable television "first" was achieved during this broadcast when Dana A. Griffin (W2AOE), long-time radio enthusiast, received the sign-language images 17 miles away in Williston, L. I. He claims to have set a new "DX" record for *amateur* television reception.

WINS $4,000 SCHOLARSHIP

George Warner Swenson, Jr., of Houghton, Mich., is the winner of this year's $4,000 RCA scholarship competition, winning over approximately 2500 other science students from every state and territory. Young Swenson, who graduated from Houghton High School last June, was one of eleven finalists to pass with highest marks a difficult examination in mathematics, physics, and radio principles. Three others were so close behind him that it was veritably a photo finish. Swenson, pictured herewith, is the son of a college professor. He is also an amateur radio operator, an Eagle Scout, and a singer. He will use his $4,000 scholarship for tuition and maintenance for four years at Michigan College of Mining and Technology, located in his home town.

G. W. Swenson, Jr.

FINCH'S AERIAL JUNKET TAKES REPORTERS ALOFT

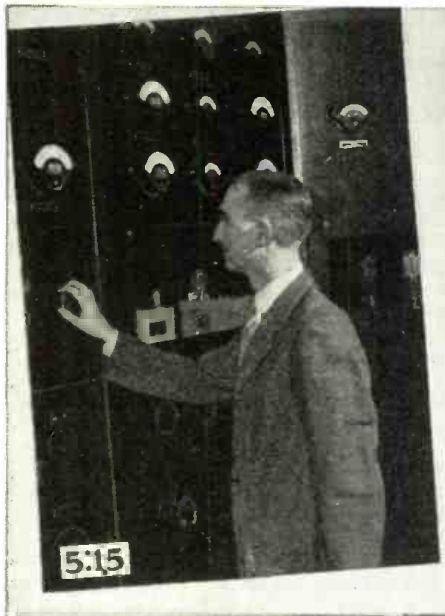
Members of the press were invited to witness a dynamic demonstration of Finch facsimile in use between a flying airplane and a ground station. At Bendix Airport, in Jersey, the Finch "flying laboratory," an eight-place Fokker plane, was used to carry the newspaper men aloft in relays. They took turns in writing messages which were transmitted to the company's field laboratory.

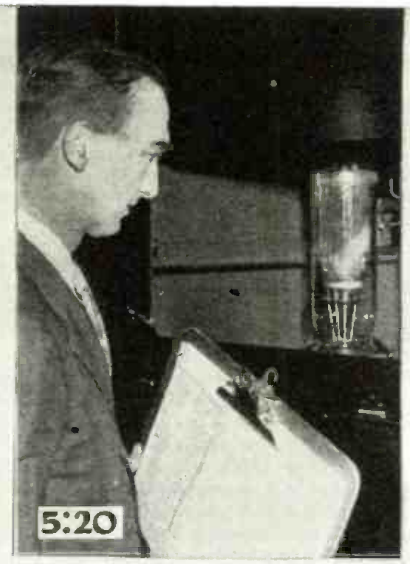
When the newspaper men were returned to earth, they were shown facsimiles of messages in their own handwriting. When they arrived at the company's plant 15 miles away, they again were shown their chirography as it was transmitted over telephone lines from the trailer to the factory.

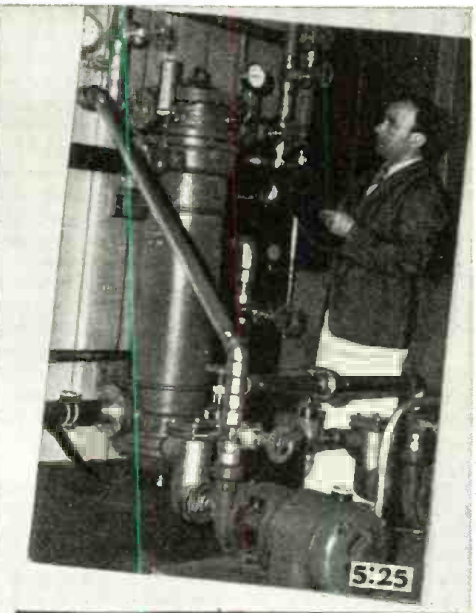
The instrument used in the plane measures slightly under 13x14x15 inches and weighs less than 50 pounds complete with power supply. Light beam scanning is used at the transmitter and an electro-chemical system is employed for recording at the receiver. The fact that the images are carried over phone lines with negligible loss of detail is considered an extremely important point by the inventor. The accompanying photograph shows the apparatus as installed in the plane.

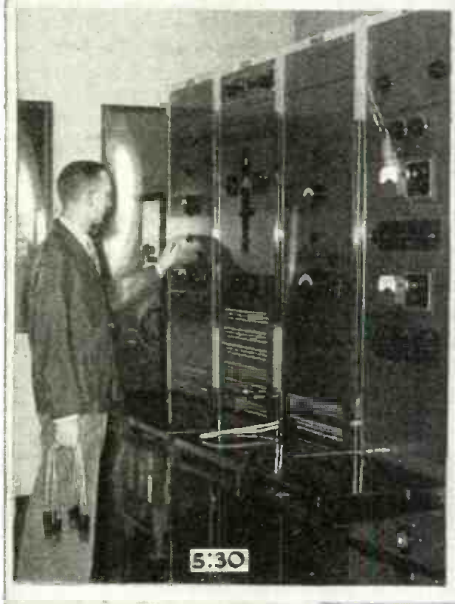
"Grooming" Big Radio Station for Day's Work

A picturized story of the daily routine at WOR, one of the nation's large broadcast stations







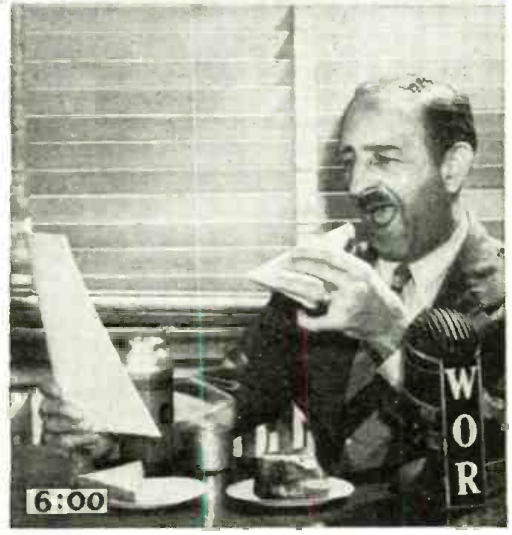


● The accompanying photos, reading across from left to right and following the *time labels* on the pictures, show the daily routine followed by the engineers at WOR, one of the nation's large broadcast stations. Those who have often wondered what happens in the early morning hours at a typical broadcasting station, will find their answer in this picturized story. Some of the engineers have to get on the job bright and early; in the case of WOR, they have to be at the station by 5 o'clock, in order to close the switches to the tube filaments so that the tubes may warm up gradually and be ready for the first broadcast at 6:00 a.m. The second photo marked 5:20 shows engineer Edmund Franke checking the big tubes.

The upper right-hand photo marked 5:25 shows Alexander Stanford, one of the engineers at station WOR, looking over the hydraulic pump which circulates cooling water through the large power tubes. The photo marked 5:30 shows us once again Edmund Franke, checking the control circuit switches to see that they are in working order.

At 5:45 a.m. we see one of the engineers closing the handle on the oil switch which feeds high voltage to the power tube. The high voltage meter often reads 17,000.

Photo marked 5:55 a.m. shows engineer checking with studio. The picture marked 5:59 shows the moment when all the engineers' checks have been finished, the station's carrier is on the air and supervisor Charles Singer, sitting at the main control board, will directly flash an "O.K." signal to the studio. 6:00 a.m. and WOR is "on the air" with the early morning broadcast. (The news announcer is finishing his last bite of breakfast prior to going on the air.) Cover photo shows one of the giant tuning inductances in the transmitter.



Radio Enlists for National Defense

THE RADIO INDUSTRY has answered the call to national defense with an "all out" acceleration of creative activities. In research, in operation, in production—from blueprint to wavelength—the watchword is Service for the Needs of Uncle Sam!

For radio today has attained front-line rank in the national defense program. Its magic voice keeps our citizens informed, unites our nation as a vast community for free discussion. It links together the 21 republics of our hemisphere in bonds of friendship and mutual interest. It enables us to communicate around the world, to reach out to ships at sea, and to guide our aviators through fog and night.

Whole-hearted Response

As a leader in radio research, as the only company that makes and does everything in radio, the Radio Corporation of America is proud of its call to duty. It eagerly enlists its facilities and personnel in the service of the American people.

The emergency finds RCA fully prepared. Months ago the "must" orders went to every subsidiary of the company, with the result that at the present moment it is making daily contributions through its great laboratories, ceaselessly active in research—through its manufacturing company, in the production of radio apparatus—through communications, flashing message traffic around the earth—through radiomarine, in all-round communication service at sea—and through the National Broadcasting Company, in nation-wide, world-wide broadcasting. To fill the need for men with technical skill, RCA Institutes is training radio operators.

Accepting the Challenge

Using all the resources at its command, the Radio Corporation of America is meeting every demand for service—with expanded facilities, increased production, with smooth functioning speed.

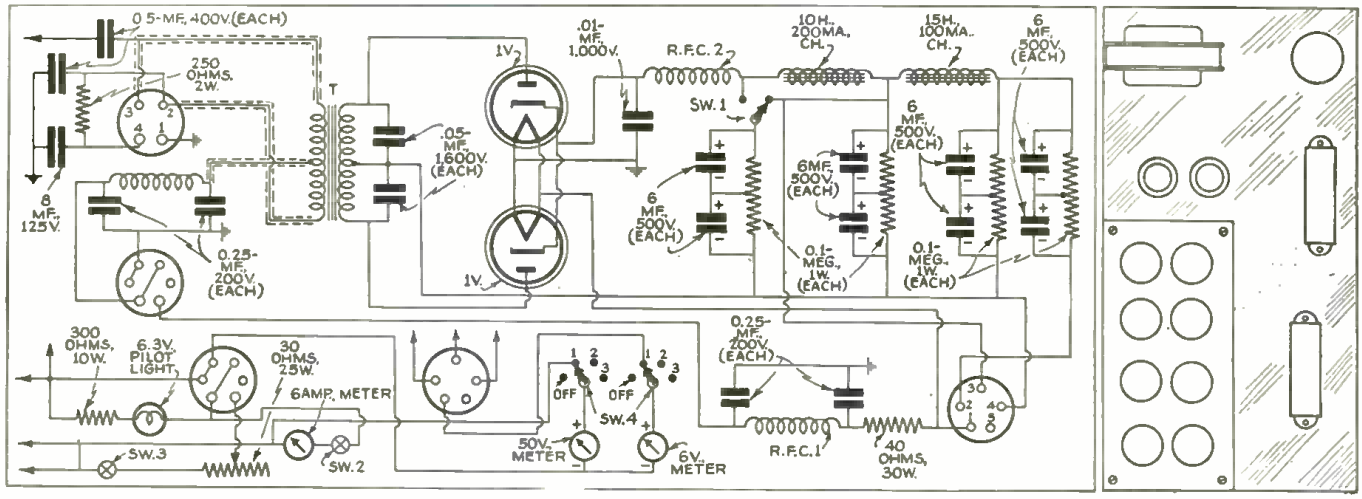
In assuming its vital share in national defense, RCA realizes it opportunity to help preserve the unity and integrity of our national life. Each of its thousands of employees pledges his energies and enthusiasm to producing all needed equipment on schedule, to making America's radio communication system the most efficient on earth.

RADIO CORPORATION OF AMERICA
RADIO CITY • NEW YORK

RCA Manufacturing Co., Inc. · Radiomarine Corporation of America · RCA Laboratories
National Broadcasting Company · R.C.A. Communications, Inc. · RCA Institutes, Inc.

Power-Supply for 32 Volts

● WITH so many farm power plants supplying 32 volts for house lighting, the 32 volt input high voltage output power supply described in *Radio Revista* of the Argentine, should be of especial interest to those in rural areas. According to the author, this piece of apparatus has numerous highly desirable features, not the least of which is its small size, for it can be built on a chassis no more than 12 x 7 x 2½". The suggested layout, also published herewith, shows how the 8 electrolytic condensers may be grouped in one corner to add to its neat appearance. These are all of 4 mf. capacity. A panel approximately 3 x 6 inches carries the control switch and the meters. This control panel may be mounted on the chassis or at a remote point, so that the power-supply can be located at a point where the vibrator will not be heard. If it is desired to wind the transformer at home, the primary consists of 110 turns of #18 d.c.c. wire and the secondary of 4800 turns of fine (No. 33 to 34) enamel wire, tapped at 2400 turns. The choke (RFC) consists of 100 turns of #18 d.c.c. wire wound on ¼" form. All parts are commercially available.



Hookup for 32 volt power-supply for operating a radio receiver.

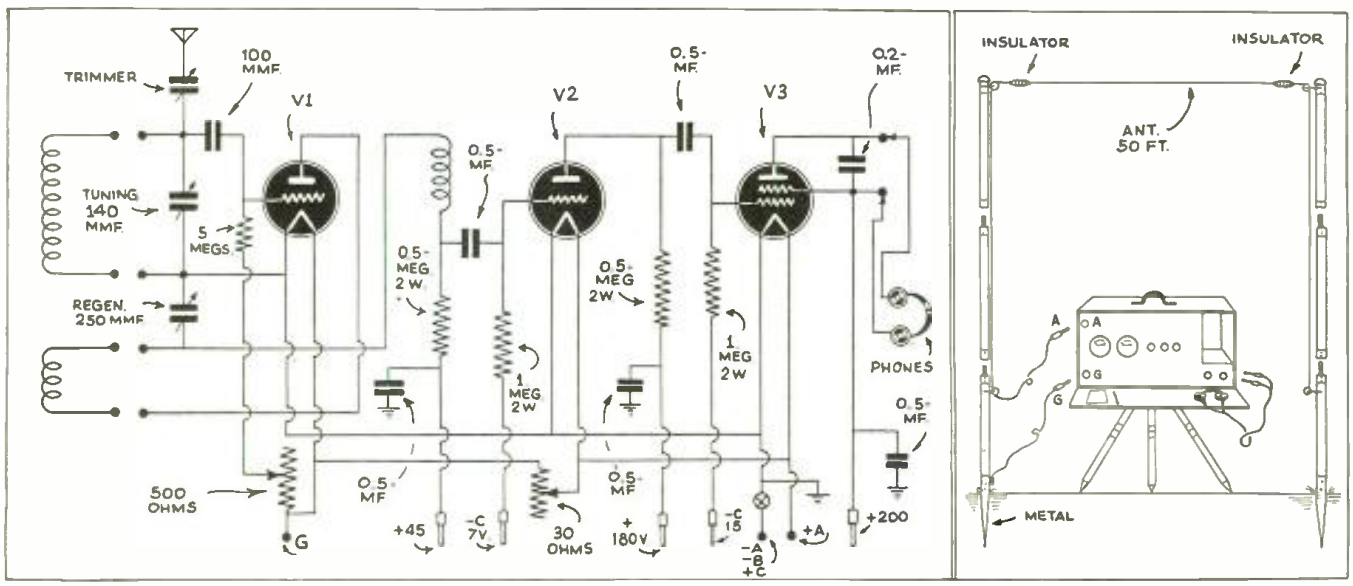
Portable All-Wave Set

● A PORTABLE receiver for use on both long and short waves is described in *Radio Revista* of the Argentine. According to the author, this set is extremely sensitive and efficient; it employs a simple plug-in system to cover the various frequencies desired, and makes use of the old but efficient regenerative circuit. While the tubes shown are not of American construction, any tubes desired can be used, depending upon the battery supply considered most convenient.

Extremely interesting in this receiver is the means of supporting the antenna. As the illustration shows, this antenna is supported on sectional rods which can be taken apart and carried in the case. One of these supports is provided with a metal point at the bottom, which forms an excellent ground when driven in the earth. It is suggested that aluminum tubing or hard wood be used for the supports. Also provided are three demountable legs and a collapsible stool for use in supporting the set and permitting the operator to work in comfort.

The main tuning condenser has a capacity of approximately .00014 mf. and the regeneration condenser about .00025 mf. One refinement on this set is the variable resistor used to control the bias on the grid of the detector tube. By moving the arm on this 500 ohm unit, either a positive or negative bias may be applied to the grid. The filament rheostat or the regeneration control may be used to regulate the volume.

A portable all-wave radio receiver, in which battery tubes of any desired type may be employed.



Amateur Direction Finding

● A SIMPLE direction finder, for use by the amateur who is interested in tracking down sources of radio interference or even in finding illegally operated transmitters, is described in *Wireless World* of Great Britain. Fig. 1 shows a circuit diagram of the receiver as used by the author of the article, Alexander Black. Fig. 2 illustrates a method of overcoming "vertical effect" by means of using a center-tapped shielded loop antenna. Fig. 3 shows the use of a differential condenser in balancing out this unwanted effect. The so-called vertical effect is due to the fact that a loop aerial acts as an ordinary aerial in many instances, due to its capacity to ground.

In use, the loop of the direction finder is rotated until it receives the signal from the station to be located at a minimum intensity. (This is known as the *null* point.) The location of the direction finder is plotted on a map, and this instrument is moved to another point as far distant as convenient, when the procedure is again repeated. Lines drawn on the map at right-angles to the plane of the loop will intersect at a point, and this point is the approximate location of the source which is sending out the signal to be traced. Further tests localize the signal source definitely.

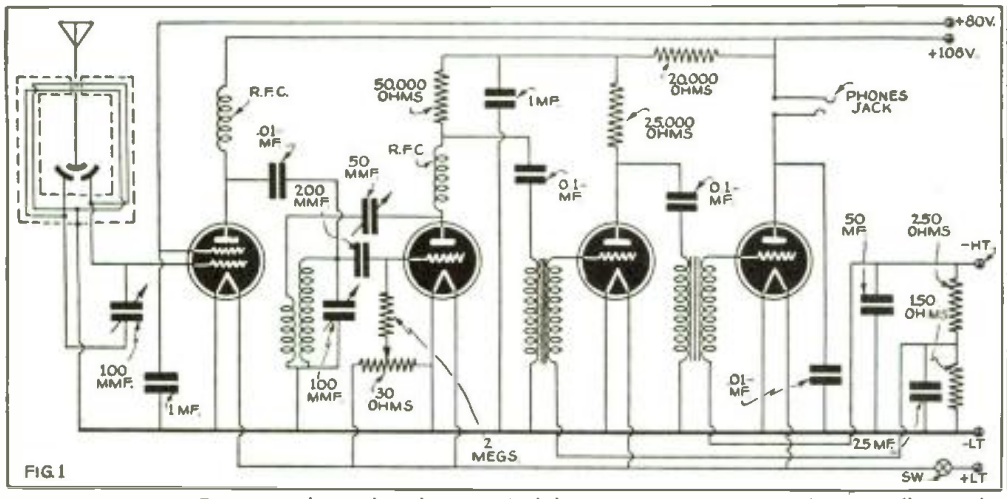


FIG. 1

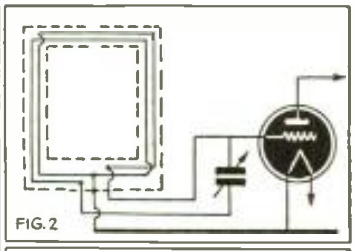


FIG. 2

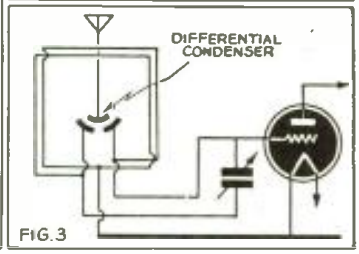


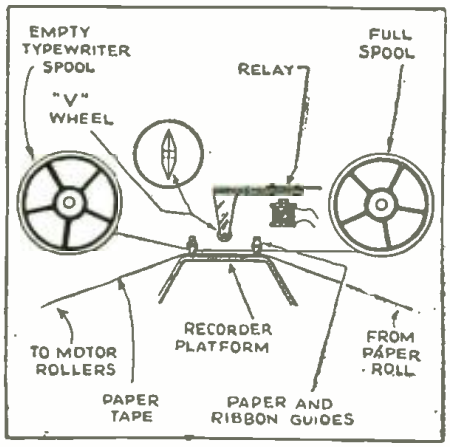
FIG. 3

Diagrams above show how an English experimenter constructed an excellent radio direction-finder.

Two Useful Ideas from Abroad

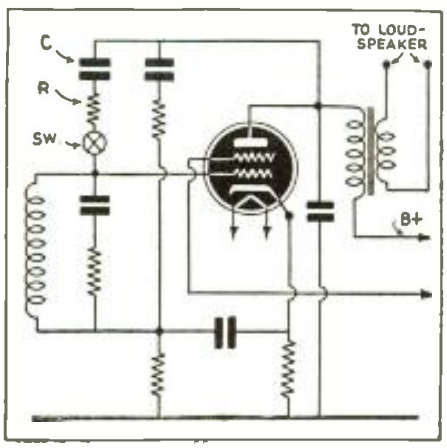
INKLESS CODE RECORDER

● A SIMPLE, clean code recorder is described in *Wireless World* of Britain by F. W. Smith, radio operator. Mr. Smith, objecting to "messy inks and very careful adjustment of stylus", has built a simple gadget, as shown in the accompanying illustration. In his apparatus, the paper tape of the recorder is fitted across a platform over which is a "V" wheel operated by a relay. When the windings of the relay are activated, the "V" wheel will press the typewriter ribbon against the paper tape on which the signal is to be recorded. Mr. Smith says that an R6 signal received on a 2-tube set provides sufficient output to actuate the relay.



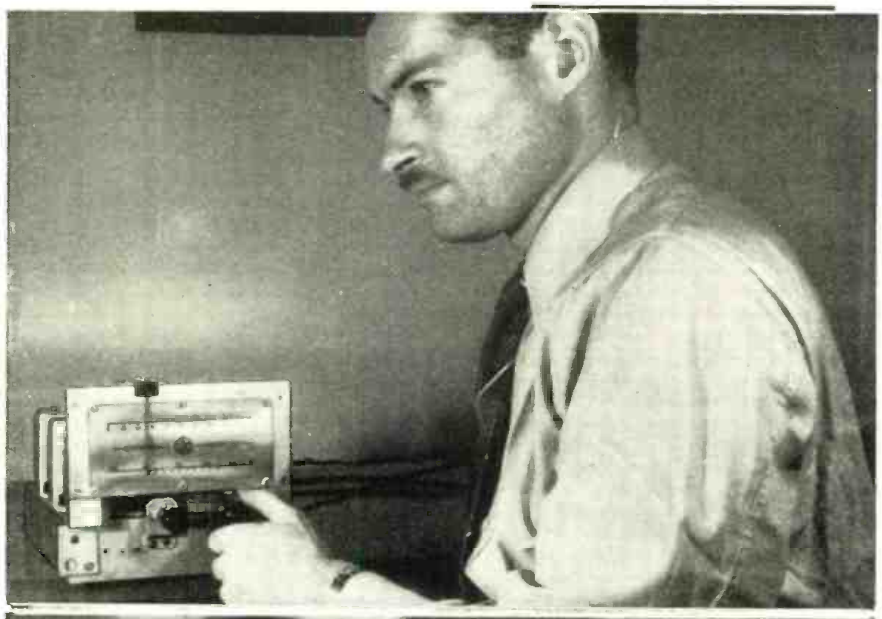
NOISE SILENCER

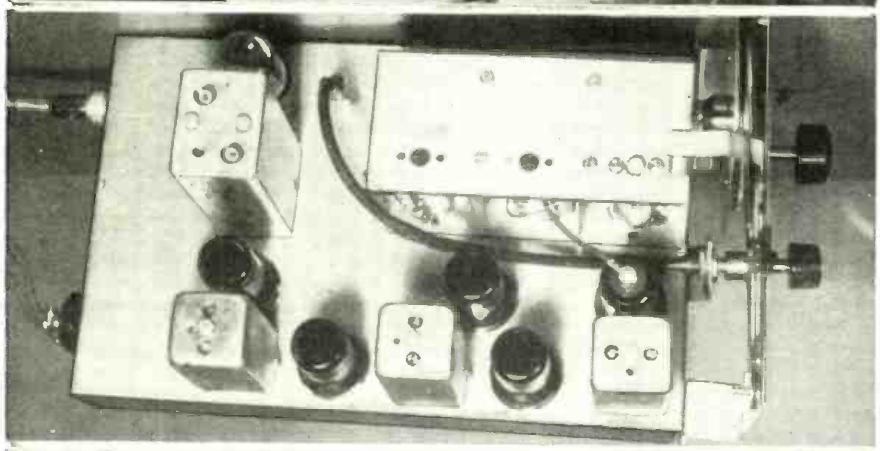
● A NEW muting circuit to make a radio receiver silent when it is being tuned from one station to another has recently been patented by N. H. B. Brown of England and is reported in *Wireless World* (London). This circuit uses negative feedback which, in effect, paralyzes one of the amplifier stages. It is suggested that it be used on the last A.F. stage although it will also work on the R.F., or I.F. As the diagram shows, negative feedback is automatically applied from the plate to the grid of a screen-grid tetrode through the condenser C. The resistance R and the switch S, while the set is being tuned. This switch is automatically closed by a rather tricky leaf spring contact on the shaft of the variable condenser. The contact is held closed only while the condenser is being rotated.

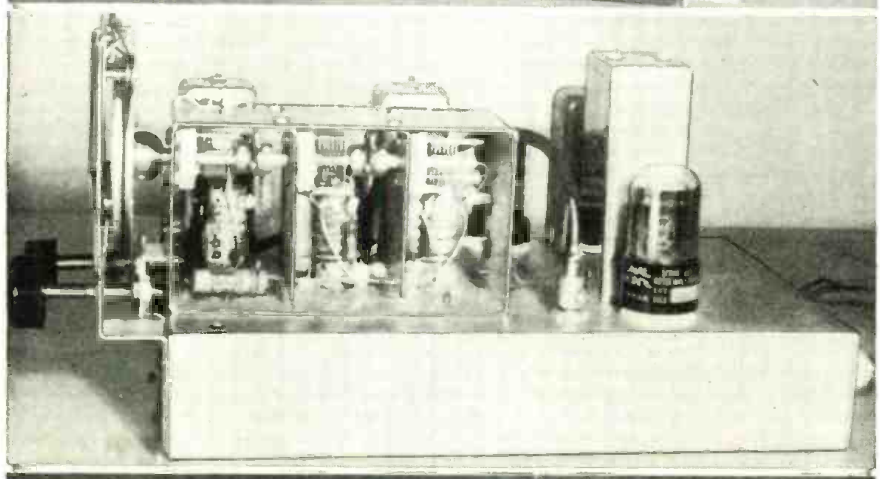


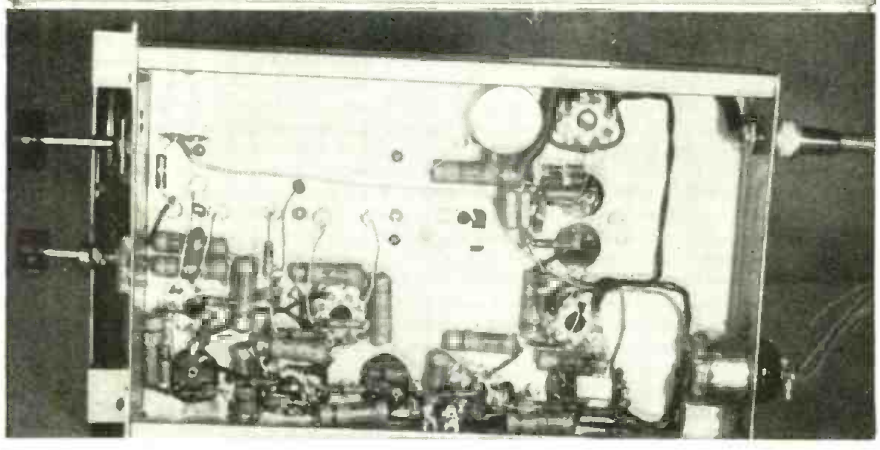
Can YOU Answer These Radio Questions?

1. What famous football game was recently televised and in what city? *(See Page 457)*
2. How long do the high power tubes in a modern broadcast station have to be turned on to warm them up, before the station goes on the air? *(See Page 458)*
3. Why is it desirable to connect resistors across both the primary and secondary windings of the I.F. transformers in a "frequency modulation" receiver? *(See Page 463)*
4. What effect does the power transformer have on the chassis of an audio amplifier? *(See Page 469)*
5. Name at least three advantages of "inverse feedback" in an audio amplifier. *(See Page 470)*
6. What is the advantage of a half-wave rectifier circuit over a voltage-doubling circuit in a transmitter? *(See Page 482)*
7. What is a simple rule for choosing the size of a choke to use in a filter circuit, so as to obtain adequate filtering? *(See Page 487)*
8. In designing the video amplifier for an amateur type television receiver, what band-pass at constant gain should the amplifier be built for? *(See Page 490)*
9. How may a simple Neon lamp be used for the purpose of talking over a light beam? *(See Page 498)*
10. What is the principle of the talking condenser and how is it made? (Front Cover Feature) *(See Page 503)*









A Frequency

Herman Yellin, W2AJL

Frequency modulation transmitters are increasing very rapidly across the country and more and more interest is being aroused in this static-free, high-fidelity transmission. The demand for receiver construction data grows apace.

From the economy viewpoint, a *converter* that will make use of a portion of the radio listener's existing equipment, namely the *audio amplifier* and *power-supply*, should be the best choice. Most F-M converters described heretofore have included a built-in power supply, but there is no reason for not using the power-supply of the existing receiver.

Pre-Selection Stage Used

A total of six tubes was used in the writer's converter, including a stage of R.F. *pre-selection*, using an 1852 tube. With the omission of the power-supply, the addition of this R.F. stage involves no great financial difficulty. Where the constructor lives within a short distance of the F-M stations, this stage can be omitted. However, the additional gain furnished by it makes it a worthwhile addition. For one thing, it will help make up for some of the deficiencies of the antenna system. The wide frequency range (42-50 mc.) makes it inevitable that stations near the frequency for which the antenna was cut, will have a greater signal strength than stations whose nominal frequency is far removed from that of the antenna's.

The R.F. stage is fed into a 6K8, acting as a combined detector and oscillator. The writer used a completely pre-assembled tuning unit, containing the three sets of coils, a three-gang tuning condenser and its trimmers. (See parts list.) Use of this tuning assembly greatly simplifies the construction of the converter, and since the coils are precision wound to very close tolerances, there is no difficulty in getting the coils to tune to the required frequency range. However, for those constructors who might care to try their hand at winding their own, complete coil information is appended. The R.F. and detector trimmers are ordinary isolantite-based mica trimmers, while the oscillator trimmer is an air-tuned unit, since oscillator *drift* would be highly objectionable. The oscillator padder is of the silver-plated mica type,

The photos in the group at the left show the frequency modulation tuner, designed and constructed very successfully by Mr. Yellin. The cost of building this tuner is very moderate and it may be connected to any "high quality" audio amplifier and loudspeaker.

Modulation Tuner

The author of the present article, Mr. Yellin, told the editor that he certainly was sold on the idea of *frequency modulation* programs after he had listened for awhile with the FM tuner here described. "The F-M quality is superb," he said.

which has a zero temperature co-efficient, eliminating any frequency drift from this source.

I.F. Amplifier

The I.F. amplifier consists of a pair of 1852 tubes and a 6SJ7. While the 1852 tubes can be replaced with 6SK7's at the sacrifice of some gain, the slight additional expense occasioned by the 1852's will amply repay the constructor in the ability to pull-in some weak station just over the horizon. Plenty of gain is desirable here in order to achieve effective limiting, without which noise-free reception is impossible.

With the recent introduction of I.F. transformers specially designed for F-M service, it is no longer necessary to rebuild standard units. Note the use of resistors across the primary and secondary of the transformers. These are used to *broaden* the frequency response as the I.F. channel must pass a band of frequencies about 180 kc. wide. The fourth transformer is the *discriminator* unit and is somewhat unlike the usual type of transformer. Those acquainted with broadcast band automatic frequency control however will readily recognize it.

Layout on Small Chassis

The converter was completely assembled on an 11"x7"x2" chassis which could have been a little smaller, but since this was the nearest stock size available, it was used in preference to having one specially made up. Careful attention should be paid to laying out the various components so that the shortest R.F. leads will result. The single-ended tubes have their grid and plate terminals at opposite points of the socket and the socket is so positioned that these terminals are just opposite the proper terminals on the I.F. transformers. *The constructor is earnestly advised to follow closely the writer's chassis layout.* Several photos clearly show the relative positions of all the parts. Deviations from this layout may cause regeneration or oscillation.

While the volume control could have been mounted on the front of the chassis, the two controls would have been unsymmetrical, so the volume control was placed at the rear of the chassis near the 6H6, and flexible shafting used to bring the knob to the front. This had the added virtue of

keeping the output leads at a minimum. By mounting the R.F. tuning unit further back on the chassis (about one inch) sufficient space could be made available for a symmetrical mounting of the controls. Use *shielded wire* in hooking up the volume control, preferably the low capacity type of wire.

Lining Up

Lining up this converter requires a somewhat different technique from lining up an ordinary *amplitude* modulated receiver. First, a signal generator—accurately calibrated at 2900, 3000 and 3100 kc.—will be necessary. If one is not available, a small bread-board oscillator can be built up and calibrated at the three frequencies. For aligning the *discriminator*, a high impedance indicator will be needed. Although a vacuum tube voltmeter would be ideal, an oscilloscope or high resistance voltmeter having a resistance of at least 5000 ohms per volt, can be used. With the indicator connected from cathode to cathode of the 6H6, feed a 3000 kc. signal into the grid of the 6SJ7 limiter tube. Adjust the secondary trimmer of the discriminator transformer for zero output, as shown on the indicator. Now change the signal generator frequency to 2900 kc. and note the magnitude of voltage shown on the scope or meter—the exact value is unimportant. Change the signal generator frequency to 3100 kc. and again note the voltage across the 6H6 cathodes. The two voltages will be of opposite polarity and for proper alignment should be of equal magnitude. Now the trimmer across the primary of the discriminator should be adjusted so that the voltage output will be *equal* for input frequencies of 2900 and 3100 kcs. Several runs will have to be made until this condition exists. Incidentally an insulated screw-driver containing absolutely no metal must be used for these adjustments, as the slightest bit of metal will cause hand-capacity effects. After properly adjusting the primary trimmer, the secondary trimmer may have to be readjusted so that a 3000 kc. frequency will produce zero output. Then recheck the output again for equal amplitude on the 2900 and 3100 kc. signals.

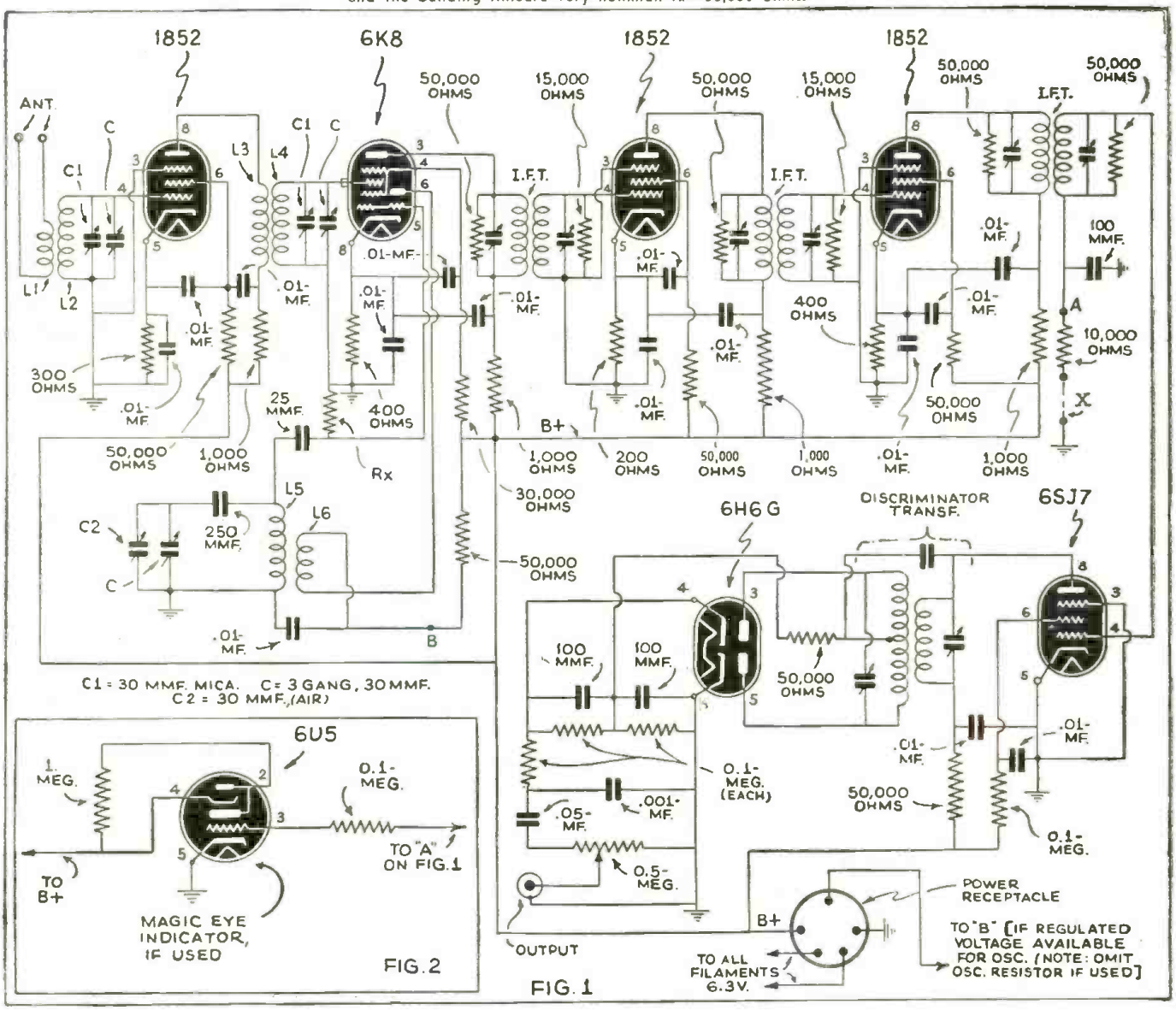
With the discriminator aligned, the other I.F. transformers can be lined up. For this we should use a 500 microampere (or 1 milliampere) meter connected at the point marked "X" on the diagram. A 3000 kc. signal is fed into the grid of the 1852 nearest the limiter and the two I.F. trimmers of the limiter transformer adjusted for maximum current indication. The other two I.F. transformers are similarly aligned by connecting the signal generator first to the grid of the other 1852 and then to the control grid of the 6K8 tube. Before starting the alignment, the converter should of course have been allowed to warm up for about 15 minutes.

With the I.F. system aligned, the R.F. section can be aligned by tuning in an F-M signal and peaking up the detector and R.F. trimmers. The oscillator trimmer is used for spotting the F-M band on the proper portion of the dial.

Power Supply Considerations

Returning now to the subject of the power supply: about 45 milliamperes at 250 volts and 6.3 volts at 2.25 amperes will be required. Of course, the power-supply of most radio sets is insufficient to furnish power to both receiver and converter. But since the R.F. portion of the receiver is not needed when the F-M converter is used, power can be switched from the R.F. por-

The drawing below shows the connection of the various parts used in constructing the "frequency modulation" tuner. The cost of the parts and the building timeare very nominal. rx=50,000 ohms.



tion of the receiver to the converter. This is not as difficult as it sounds; it is merely necessary to place a double-throw switch in the 6.3 volt line to the receiver R.F. tubes. Switching off the filament voltage will also stop the plate current flow to these tubes, making that plate current available for the converter. In some cases, a little R.F. filament circuit rewiring may be necessary so that only all the R.F. tube filaments are switched off. However, anyone capable of building this converter should have no difficulty at all in performing this operation.

F-M stations must be tuned-in right on the nose! Turning the tuning dial to either side of resonance will result in marked distortion and a very high noise level. While stations can be tuned-in by tuning for the point of zero noise, the best method is to use some sort of indicator. The best and most accurate type would be some device operating from the output of the discriminator tube but this becomes somewhat complex. Second best method is to measure limiter current or voltage across the limiter resistor. A 6U5 magic-eye tube can be used to good advantage here and can be hooked up as shown in Fig. 2. The grid of the 6U5 is run through a .1 megohm resistor to point "A" on Fig. 1. Maximum closing of the eye will be indicative of having properly tuned in the station. If the discriminator and other I.F. transformers are not correctly aligned, the tuning dial position for maximum eye closing will not coincide with the position for minimum noise level. If this happens, then get ready for another session at alignment.

The Antenna to Use

The simplest and at the same time the most effective type of antenna would be a horizontal half-wave doublet. The writer is at present using one, each arm being 5 feet 3 inches long and with twisted-pair feeders. Where the lead-in will have to be very long, some form of *spaced feeders* should be used in order to minimize line losses. Incidentally this antenna length favors the stations at the *low frequency* end of the band, but in the New York area, all the F-M stations are located at this end. Direct the antenna for best pickup of the weakest stations where stations from several directions can be received.

Parts List

BROWNING LABS.
1—BL-40T tuner
1—BL-6D dial
3—BL-3M I.F. transformers
1—BL-3D discriminator transformer

BUD RADIO, INC.
1—11"x7"x2" chassis, No. 1193

I.R.C.
1—200 ohm, type BT-½
1—300 ohm, type BT-½
2—400 ohm, type BT-½
4—1,000 ohm, type BT-½
2—15,000 ohm, type BT-½
1—20,000 ohm, type BT-½
9—50,000 ohm, type BT-½
3—100,000 ohm, type BT-½
1—10,000 ohm, type BT-½
1—500,000 ohm potentiometer, type 13-1

NATIONAL UNION (Tubes)
1—6K8
3—1852
1—6SJ7
1—6H6G

Frequency Modulation Tuner—Coil Data
L-1—2 turns No. 18 interwound with L-2
L-2—5 turns No. 16 spaced to ¾" long
L-3—2 turns No. 18 interwound with L-4
L-4—5 turns No. 16 spaced to ¾" long
L-5—5 turns No. 16 spaced to ¾" length
L-6—3 turns No. 18 interwound with L-5

AMPHENOL
6—Octal steatite sockets, Type S8
1—5-prong receptacle in flush shell, No. PM5-1FT (power receptacle)
1—5-prong plug, No. PF5-1FT
1—Output chassis receptacle, type No. PC-1M
1—Female plug, No. MC-1F

CORNELL-DUBILIER
14—.01 mf., 400 volt condensers, No. DT-4S1
1—.05 mf., 400 volt condenser, No. DT-4S5
3—.0001 mf. mica condensers, No. 5WL-5T1
1—.001 mf. mica condensers, No. 1WL-5D1

BOOK REVIEWS

AMATEUR RADIO—A BEGINNER'S GUIDE, by J. Douglas Fortune. Stiff cloth covers, size 6¼x9¼, 158 pages, published by the Thordarson Electric Manufacturing Company, Chicago, Illinois.

An excellent book for the radio beginner who is intent upon obtaining an amateur operating station license. The book opens with an introduction on amateur radio, and then takes up the details of how to learn the code. Other preliminary subjects cover the elements of electric circuits, diode and triode vacuum tubes, receiver theory and construction, with some very nice drawings and pictures, etc. Later chapters deal with the why and wherefore of the crystal oscillator-transmitter, a 2-stage transmitter and finally a 3-stage transmitter. Other chapters cover the construction details with drawings and photos of a well-designed modulator for the 3-stage transmitter; the closing section covers transformer principles, action of condensers, regeneration, types of tubes, different classes of amplifiers, a table of Q-symbols and abbreviations, a table of radio diagram symbols, etc.

TELEVISION BROADCASTING, by Lenox R. Lohr, President of the National Broadcasting Co., with a foreword by David Sarnoff, (President of RCA.) size 6¼"x9¼", 274 pages; illustrated with diagrams and photos of actual television broadcasting, published by McGraw Hill Book Co., Inc., New York, 1940.

This is a very valuable book to the general student of television and it covers such interesting and vital subjects as the legal aspects of television service, the rôle of the sponsor in television, basic economic factors, the problem of network broadcasting for television, general aspects of outdoor television pickups, etc. Other topics discussed at length, in an authoritative manner, are motion picture film television, with diagrams showing how the images from the films are picked up by the iconoscope, etc., and a valuable section covers the production of studio programs, while an appendix contains a typical television script, with production directions. To round out the book the author has included a chapter on the technical elements of television systems, with diagrams and photos.

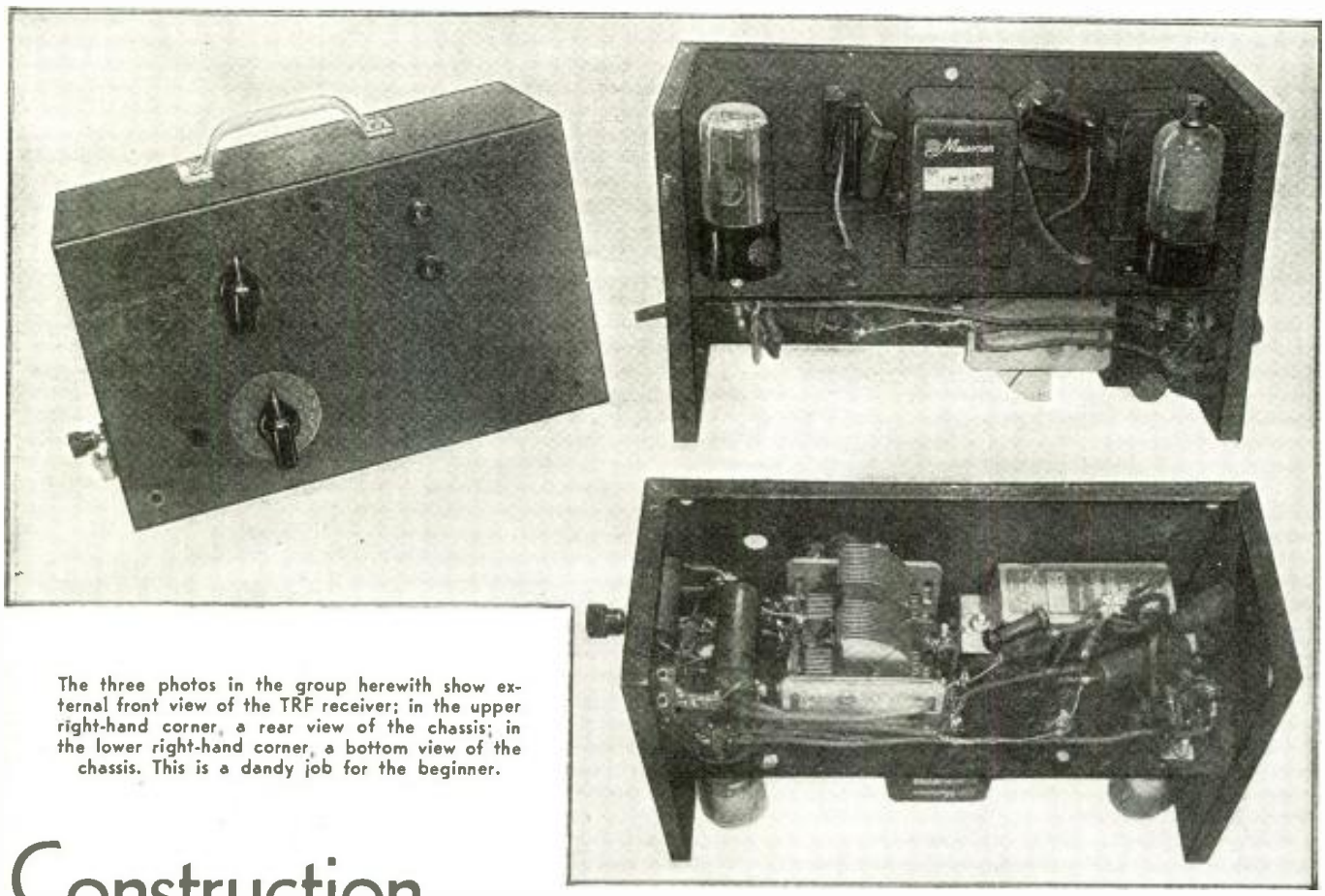
THE ART OF MODERN WARFARE, by Herman Foertsch, (Col. of the German General Staff) with introduction by Major Geo. S. Elliott. Size 6"x8⅜", 274 pages, published by Veritas Press, New York.

This book, written as it is by an outstanding expert on military matters, should be "must" reading for every student of the science of war. Those interested in radio and wire communication as applied to modern military maneuvers, will find some very interesting reading in this excellent work. In several places Col. Foertsch discusses the values of radio and also wire connection, the methods of catching and interpreting enemy messages, the rôle of the engineer in war, the importance of radio propaganda, etc.

TELEVISION TODAY AND TOMORROW, by Sydney A. Moseley & H. J. Barton-Chapple. Stiff cloth covers; size 5¾ x 8½ inches; 180 pages; with numerous illustrations. Published by Pitman Publishing Co., New York, N. Y.

This is the new fifth edition of this very useful television handbook. Every student of television should have a copy of this book on his reference shelf, and the young student of television will find many interesting and instructive chapters therein. This book will appeal to the general reader as it explains how a subject is scanned, how large television images have been produced, the interesting method of photographing a "live" scene on motion picture film, which is rapidly developed, dried and then passed through a television transmitter, etc. The method of synchronizing is described, together with circuits of a typical television receiver, the method of using interlaced scanning, different types of deflection for cathode-ray tubes, ultra short wave aerials, etc. Stereoscopic and color television are also discussed. A valuable appendix of television terms is provided, as well as an index to all of the subjects covered in the book.

(Continued on page 509)



The three photos in the group herewith show external front view of the TRF receiver; in the upper right-hand corner, a rear view of the chassis; in the lower right-hand corner, a bottom view of the chassis. This is a dandy job for the beginner.

Construction and Operating Notes on the TRF-2

Fred W. Smith, Jr.

This very simple and efficient receiver employs a 3A8GT and a 3Q5GT. The circuit employed is a tuned radio frequency hook-up, with diode detector, AVC, etc.

● RECENTLY, among the multitudes of GT "Bantam" type tubes being released, there appeared the 3A8GT, which includes within one glass envelope several elements capable of doing four operations at one time. These include R.F. amplification, diode detection, A.V.C., and audio amplification. The R.F. section consists of a remote cut-off pentode and the audio triode is a high mu unit. (Amplification factor: 65).

Following this lead the circuit shown here was designed to utilize the above tube's features. To complete the circuit a beam-power tetrode of similar type, the 3Q5GT, was employed in the power amplifier stage. This tube with 90 volts on the plate and screen is capable of delivering 250 mw. (milliwatts) output, which is comparable to the output of any modern commercial "portable."

The filaments of these tubes operate on 2.8 volts each and as they are wired in series in this circuit, they can be supplied by a small 6 volt dry battery, the drain on which is only 50 ma. The filaments also have center-taps which allow the tubes to be used with 1.4 volt dry cells, but in those applications the battery drain is doubled for each tube.

As may be seen from the circuit diagram, iron core antenna and R.F. transformers are used. These are absolutely essential if the circuit is to perform effectively. The circuit is a simple T.R.F. with diode detection and A.V.C. No loop was used as more gain is realized with the "ferrocart" antenna coil. 90 volts of "B" are used and the current requirement is only 9 ma. Bias for the 3Q5GT is obtained by the use of a 600 ohm resistor in series with the B-battery lead and the chassis, which acts as a common ground. The 1000 ohm resistor and the .1 mf. paper condenser in the plate circuit of the R.F. stage act as an R.F. filter to prevent parasitic oscillations. Either phones or a P.M. speaker may be used. In case a speaker is used, an output transformer having an 8,000 ohm primary should be used for a correct load impedance.

To align the circuit, attach an aerial to the antenna terminal, connect the batteries and a pair of headphones and tune in a station. Reduce the trimmer on the diode section of the tuning condenser to its minimum capacity and then adjust the trimmer on the R.F. section of the condenser for maximum volume.

No details are given here as to the position of the parts on the chassis as this is left to the discretion of the set builder. The receiver, as originally built, consisted of the circuit wired into a small, crackled finish cabinet 9"x5½"x3½", connected by a 4-wire cable to the batteries, which were strapped into a refinished cheese box. If the constructor so desires, he may place the batteries and the receiver circuit in the same cabinet.

The only precautions necessary in wiring this receiver are in keeping the R.F. leads as short as possible and the solder flux from dripping on wires and shorting them. To wire the R.F. pentode grid lead the antenna coil must be removed from its shield and a wire attached to the grid terminal of the coil. Then it should be brought through the hole punched in the top of the can, and finally, the grid cap should be attached to the lead.

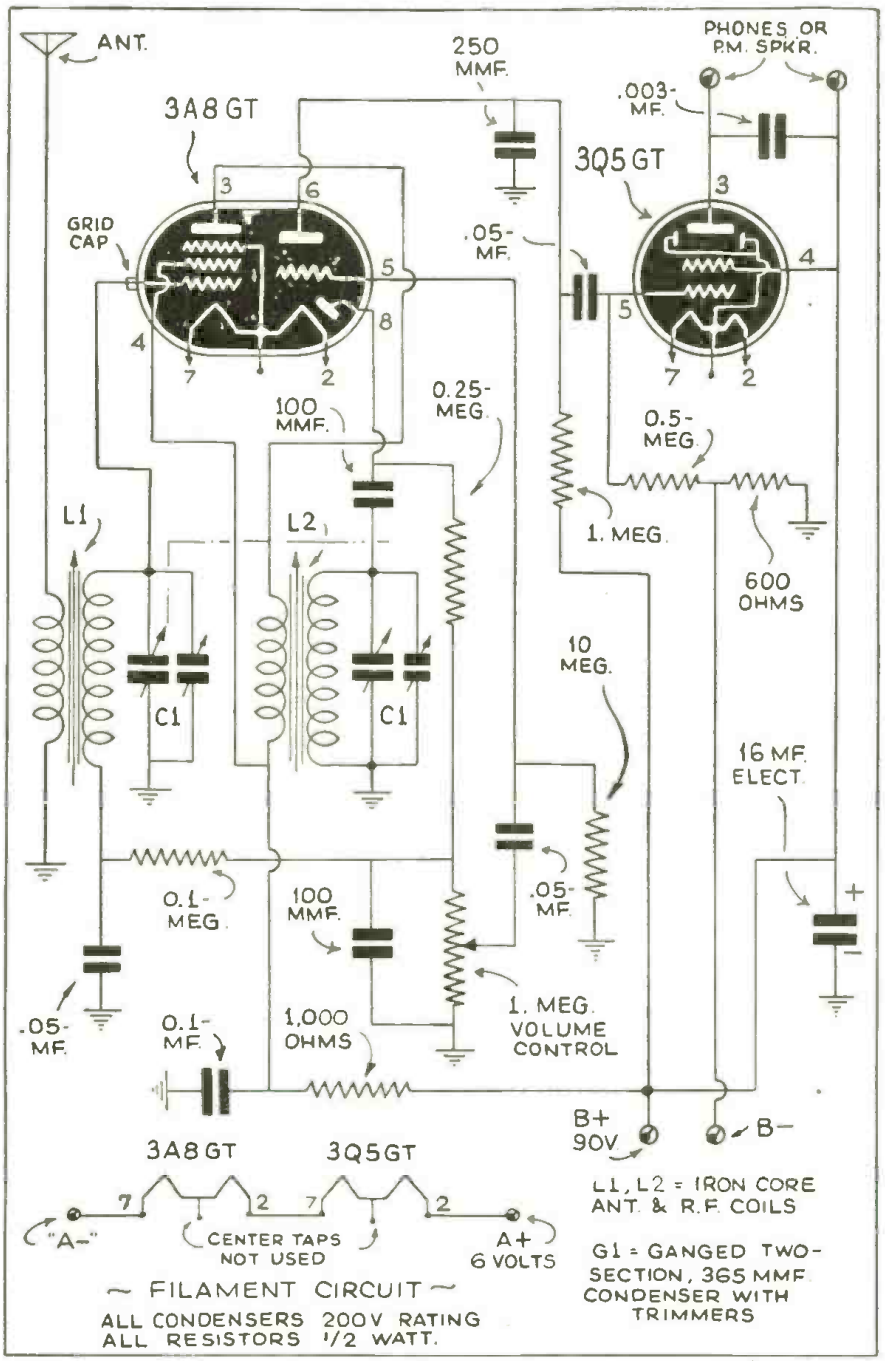


Diagram of TRF-2 Receiver.

Results: By merely placing a hand on the antenna terminal, good reception of "locals" can be obtained. With a 50-foot aerial and a ground, considerable DX is obtained and the receiver is driven to full output. In all cases a ground connection improves the volume immensely.

The "A" and "B" batteries will last about 200 hours with moderate use. The secret of long battery life with this receiver, as with all battery-operated equipment, is intermittent use of the equipment—with long and frequent rest periods for the batteries.

Parts List

MEISSNER
1—Ferrocart antenna coil, 14-1496
1—Ferrocart R.F. coil, 14-1497
1—2-gang 365 mmf. variable (with trimmers), 21-5214

RCA (Tubes)
1—3A8GT
1—3Q5GT

CONDENSERS
1—16 mf. dry electrolytic, 200 volts
3—.05 mf. paper condensers, 200 volts
1—.1 mf. paper condenser, 200 volts
2—100 mmf. mica condensers
1—250 mmf. mica condenser
1—.003 mf. mica or paper, 200 volts

RESISTORS
1—1000 ohm, ½ watt resistor
1—1 megohm volume control (potentiometer)
1—600 ohm, ½ watt resistor
1—1 megohm, ½ watt resistor
1—500,000 ohm, ½ watt resistor
1—10 megohm, ½ watt resistor
1—250,000 ohm, ½ watt resistor
1—100,000 ohm, ½ watt resistor

MISCELLANEOUS
2—AMPHENOL octal wafer sockets
2—EVEREADY 45-volt "Minimax" No. 482
1—BURGESS 6 volt "A"—F4PI
Hardware, binding posts, cabinet, solder, jacks, headphones, dial scale, knobs, hook-up wire, grid cap, etc.

A General Purpose AUDIO AMPLIFIER

Bert Kelley

● THERE are no doubt, many experimenters who wish for a low cost, high gain, high fidelity amplifier but think that it is impossible to obtain satisfactory results with a low price unit. The uses for a good amplifier are legion. It may be used for public address in small auditoriums, as an amplifier for a radio tuner, phonograph reproduction, for testing radio circuits, as a call system, and for experimental uses, such as talking on a light beam, etc. For those with limited bank-rolls, this amplifier is dedicated.

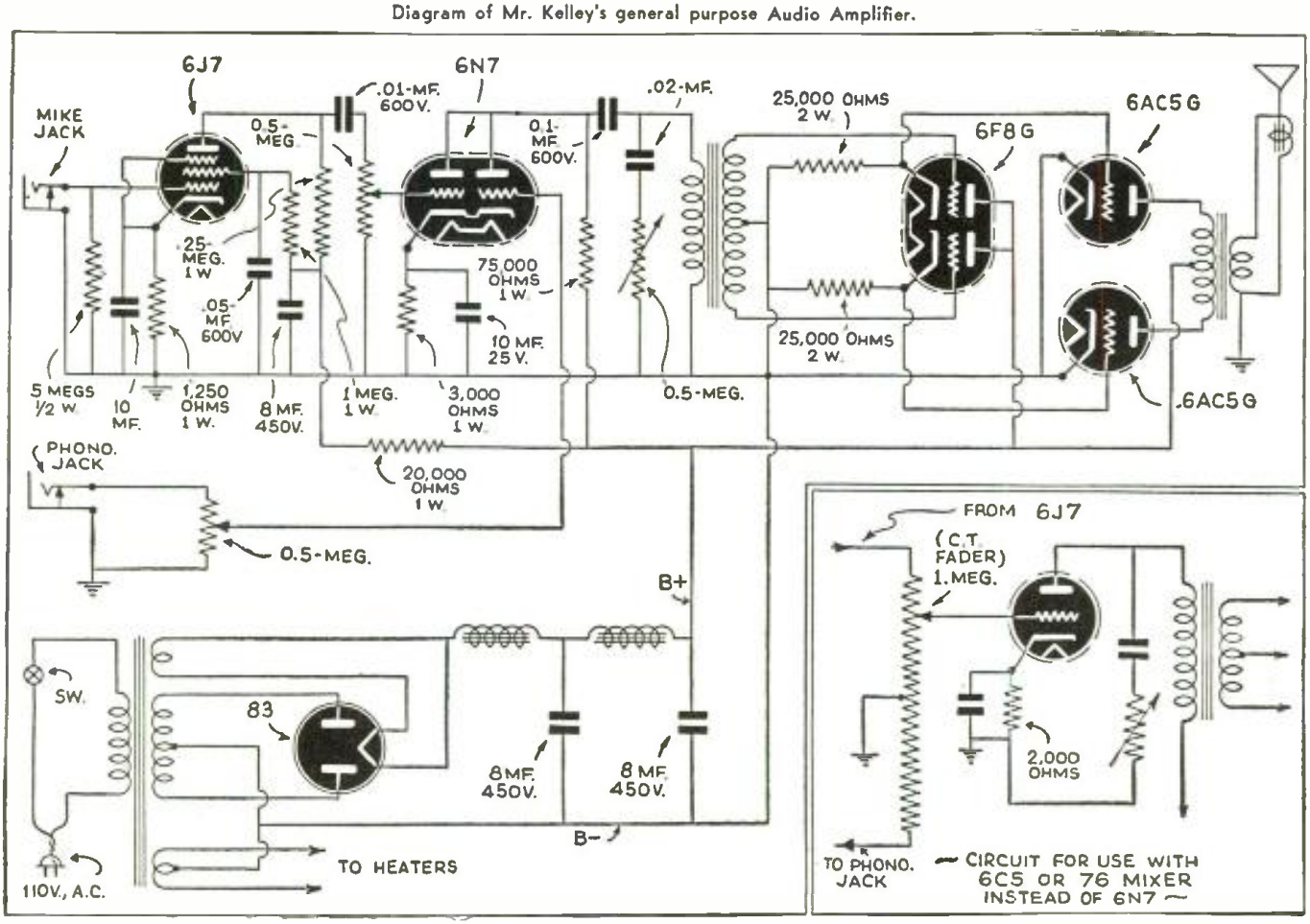
It features flexible design. Inputs may be from one to four in number, depending upon the constructor's desires. The system has plenty of output for experimental and entertainment purposes, as it is rated at ten watts output, undistorted. The amplifier has high enough gain for any common crystal, velocity, or capacity mike, but in spite of its high gain it is as stable as the Rock of Gibralter. By using the low gain input from a radio tuner or pickup, there is enough sock to overdrive the final stage. Last but not least, the output is of very good quality.

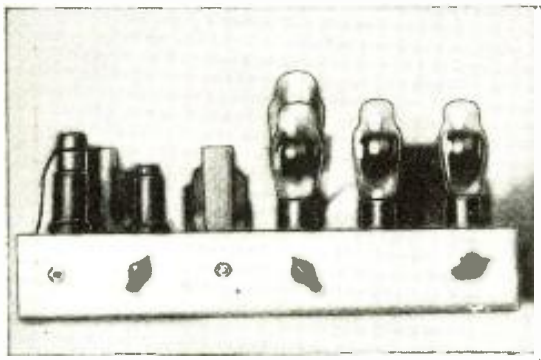
The tube lineup is a 6J7 pre-amplifier, resistance-coupled into a 6N7 mixer transformer, coupled to a 6F8 which drives the push-pull 6AC5's. These 6AC5's were originally designed to operate in a direct coupled circuit using 76's as drivers. As the 76's supplied 13.5 volts positive bias to the output tubes grids, it was important that if different type drivers were substituted, that they have the same characteristics as the drivers which were originally meant to operate in this position. It was thought desirable to eliminate one tube from the lineup by using a dual triode here. A search through the tube manual showed that the 6F8 was the closest approach that was possible, with the tubes now available.

The 6N7 mixer provides the hub on which the flexibility of the amplifier centers. It provides for mixing the microphone input with one, or possibly two, inputs. If the mixing feature is not wanted, a 6L5, 6J5, 6C5, 76 or other triode of similar type, may be used and a center-tapped control substituted for the straight gain control, following the 6J7 pre-amplifier. In this hookup, high gain or low gain input may be selected by turning the control knob to the correct position. The 6N7 could be used as shown and center-tapped controls substituted for the two straight gain controls. In this manner one high gain input and 3 low gain inputs can be had. It will be noticed that no plate current can flow through the primary of the input transformer because of the blocking condenser. It is important that the 6N7 be connected in this way. It results in higher output and better tone than the other method, because there is no D.C. polarization. If a single triode is used, it may be connected in the usual manner, using the transformer primary to carry the plate current without too much loss in quality. A tone control is shown so the operator can adjust the tone to suit his taste. The input transformer should be of high quality because it is in an important circuit position. Good tubes should be used in the amplifier to minimize microphonics.

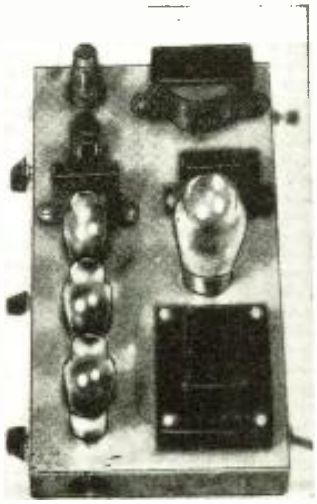
The complete amplifier was built upon a 7X13X2 inch steel chassis. This size provides enough room to mount the parts without crowding. In laying out the circuit, it is perhaps best to mount the tubes in a line across the front of the chassis. In this manner, the controls and jacks are very near to the circuit positions they affect. This makes wiring easier and, more important, it enables short leads to be run from the controls which keeps hum and feed-back down. The power transformer should be mounted at a remote corner of the chassis to prevent a low-level inductive hum from being picked up in the input transformer.

Diagram of Mr. Kelley's general purpose Audio Amplifier.





Front and top views of audio amplifier.



Fair power-supply regulation is desirable in any amplifier circuit. For this reason, choke input from a mercury vapor rectifier is used in a conventional hookup. Layout of the chokes is not so critical; mount them at the rear, wherever there is room. The two-section filter does a splendid job of smoothing out the plate voltage. This is proved by the fact that the gain control may be turned way up, with no hum evident in the speaker. The 83 shown should be replaced with an 80 if the system is to be used with a radio tuner. The 83 puts out a "hash" that is very annoying. Good quality filter condensers should be used. In the event that the amplifier "motorboats", the trouble may be remedied by doubling the size of the output condenser. The decoupling resistor in series with the plate lead to the 6J7 should not be left out. Its use tends to stabilize the system and filter the plate voltage even more. If the constructor intends to use the amplifier as a power-supply, he should use oversize transformers and chokes. Also it would do no harm to increase the capacity of the filter condensers. A socket on the end or rear of the chassis would be a very convenient method of connection. A voltage divider across the output would enable one to take off different voltage values. Each tap should be bypassed with a one or two microfarad condenser.

Now for pointers on wiring the unit. Shielding should be used on all signal leads as far as the 6N7 grids. The lengths of leads are not so critical as in a receiver, but they should not be excessively long. Make sure they are well insulated. Shielding to the 6J7 grid should extend to within ⅛ inch of the grid cap and a shield cap should be placed across the top of the tube to prevent hum. It is well to make sure that there is *positive contact* between this shield and the shell of the tube. While we are on the subject of *grounding*, it is well that we observe a few rules that are important. The first is that the constructor use only one common ground *to the chassis*. The reason for this is that the power transformer induces eddy currents in the chassis, just as it induces voltages in the transformer windings. These eddy currents are small, it is true, but they have a way of showing up and causing trouble with hum in an amplifier, that is unpredictable and mystifying. The best point to make the common ground to is the 6J7 input jack. In this way it is not necessary to insulate the jack from the chassis. From the jack run a wire to one lug on each octal socket and run wires from these lugs to the various other components that are grounded. The point is—do *not* use the chassis as a ground conductor. Its only electrical purpose is for *shielding*. The second rule is to ground the bypass condensers at the end marked outside foil or black ring. This lends more stability.

The filaments should be wired first. It is not necessary to transpose the wires, but it is well to keep them close to the chassis. The amplifier should have a "ground" binding post mounted on the rear.

The output transformer should be 10,000 ohm push-pull—voice coil secondary to the speaker.

Get a speaker that can handle the output easily. A larger speaker generally has better tone than a small one. To make it easy to set up the amplifier, sockets and plugs should be used instead of terminal strips.

This amplifier has been thoroughly tested and came through these tests well.

Parts List for Amplifier

RCA (Tubes)
2—6AC5G
1—6F8G
1—6N7
1—6J7 (or 6C5)
1—83

THORDARSON
1—Push-pull input transformer
1—Output transformer
1—Power transformer, Type 13R14
2—Filter chokes—for rectifier

I.R.C. (Resistors)
1—5 megohm, ½ watt resistor
1—1250 ohm, 1 watt resistor
1—3000 ohm, 1 watt resistor
1—75,000 ohm, 1 watt resistor
1—.5 meg. variable resistor
1—1 megohm, ½ watt resistor
1—.25 megohm, 1 watt resistor
1—20,000 ohm, 1 watt resistor (decoupling)
2—25,000 ohm, 2 watt resistors
2—.5 meg. potentiometer

AMPHENOL
5—Octal sockets
1—4-prong socket

SOLAR
1—.02 mf. 600 volt condenser
1—.1 mf. 600 volt condenser
2—10 mf. 25 volt condensers
1—.01 mf. 600 volt condenser
1—.05 mf. 600 volt condenser
1—3-section (8 mf. each) 450 volt condenser

CENTRALAB
1—1 meg. ohm center-tap fader resistor

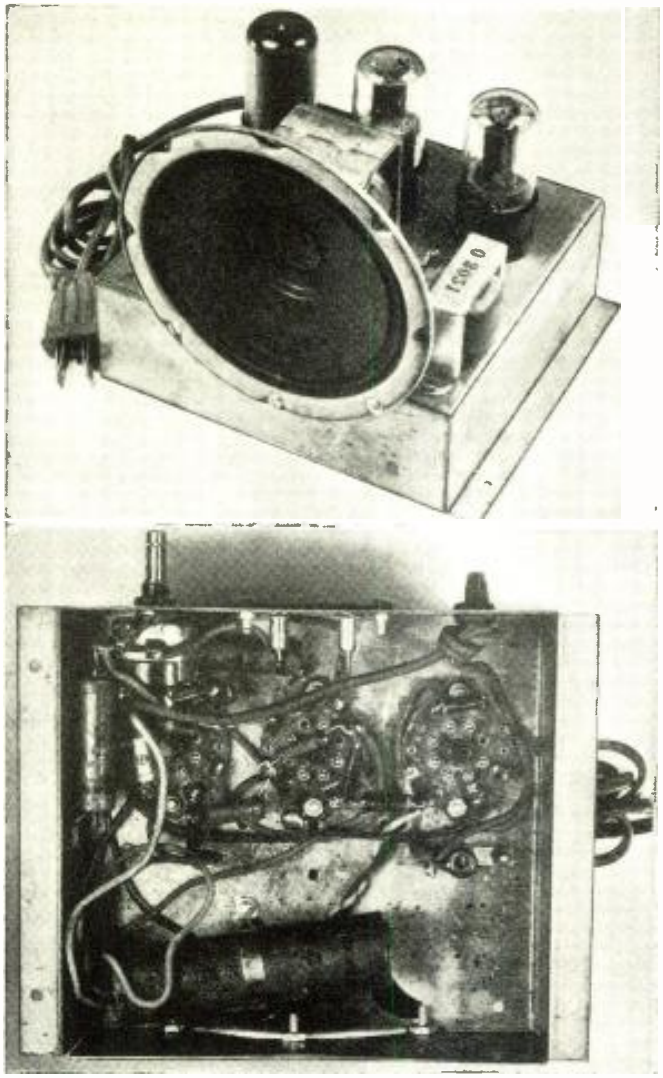
MISCELLANEOUS
2—Grid caps and shield cap
1—Metal chassis, 2x7x13 inches
2—Shorting jacks
1—A.C. switch and line cord
1—Fuse and holder
3—Knobs and plates
Nut, bolt and washer assortment

A 3-Tube

PHONO-AMPLIFIER

L. M. Dezettel, W9SFW*

Here's a low-cost, highly-efficient phono-amplifier—it can be used for many other purposes. Will work with any type electrical phono pick-up. A type 50L6GT beam power amplifier drives a 5-inch permanent magnet speaker. Three tubes used in all.



The two photos at the left show front and bottom views of the three-tube phono-amplifier, here described by Mr. Dezettel. This makes a very compact amplifier at a reasonable cost.

● AFTER many years of comparative dormancy, the interest in phonograph recordings has in recent times reawakened with renewed enthusiasm. New improvements and inventions in recording and playback equipment have stimulated this popularity. Most of the reproductions of recordings is done by electrical means. Electrically driven turntables are available now which will operate from almost any type of voltage which you may have. Tremendous sales of the 110-volt 60-cycle type has made it possible to produce turntables to sell for as low as $2.45. The same low price prevails for crystal-type pickups.

The amplifier we are about to describe is one of the latest additions to the amplifier family of circuits; and because of its many features, it is one of the most outstanding circuits ever designed from the standpoint of economy of construction. Greater power output and increased amplification are obtained by using separate tubes for each function. A type 12J5GT tube is used as an audio amplifier. Sufficient amplification is realized so that any type of electrical *pickup*, regardless of how low its output may be, will drive the power tube to full output. A type 50L6GT beam-power amplifier tube drives a five-inch permanent magnet speaker. A full two watts of output, which is more than enough for average room volume, is obtained with negligible distortion. A type 35Z5GT tube is used as a separate rectifier, delivering approximately 135 volts of rectified plate supply to the other two tubes.

The most outstanding feature of this amplifier is the use of the modern technique called "inverse feed-back." This is accomplished electrically by feeding some of the energy of the speaker voice coil leads back to the cathode of the first tube. A resistor network takes a portion of this voltage, about 10%, and superimposes it upon the input signal. "Inverse feed-back" has many beneficial effects. *It reduces hum, extends the frequency response of the amplifier, and above all, decreases substantially the amount of distortion present.*

This unit is designed to operate from either an *alternating* or *direct current* supply. Although we speak of the input voltage being 110 volts, any voltage from 105 to 125 volts may be employed. The filter circuit is designed to operate from a 60-cycle supply with very low hum. The amplifier may also be operated from a 25-cycle supply, but a slight amount of hum may be heard. By adding a small, tubular, dual 20 mf. electrolytic condenser to the filter circuit, quiet operation from a 25-cycle supply will result.

Assembly and wiring are extremely simple. Mount all of the parts securely on a punched and drilled chassis, as shown in the pictorial diagram. To protect the cone of the speaker during handling, it is a good idea to cover the face of it with a piece of cardboard cut into a circle 5 inches in diameter. Fasten the cardboard to the speaker with a few strips of tape.

Obviously, you may make your own chassis, following the general layout indicated in the pictorial diagram. But if a punched and drilled chassis, which may be purchased, is used, the only tools required for the entire job are a screw-driver, a side-cutting long-nosed plier, and a soldering iron.

Wiring is straight-forward, and placement of leads is not critical. You may follow either the schematic diagram or the pictorial diagram. In either case, it is a good idea to use a colored pencil to check off each lead or the diagram as connections are made in the amplifier. In this way you will avoid overlooking one or more connections. Be sure to observe the proper color-coding of the leads from the filter condenser. It is very important that all joints be properly soldered. With a hot iron, the tip of which has been properly tinned, apply heat to the joints. Use a good grade of rosin core solder, and apply it to the hot joints, not to the soldering iron. When soldering is done in this way, very little solder is required, and the bond between wires or between wire and terminals is stronger. Do not use so much solder that it will flow over to another terminal or down to the chassis. Be especially careful when soldering wires to terminals at the sockets.

*Engineer, Allied Radio Corporation.

Now you are all set to go. Connect your leads from the pickup arm to the input jack of the amplifier, turn on the amplifier, and get your phonograph unit going. If the hum seems a little excessive, reverse the leads on the input jack. This applies also to the power plug of the 110-volt outlet. Use the position which gives the least amount of hum. In D.C. operation there is only one plug polarity which will operate at all. A trial will determine the position of the plug.

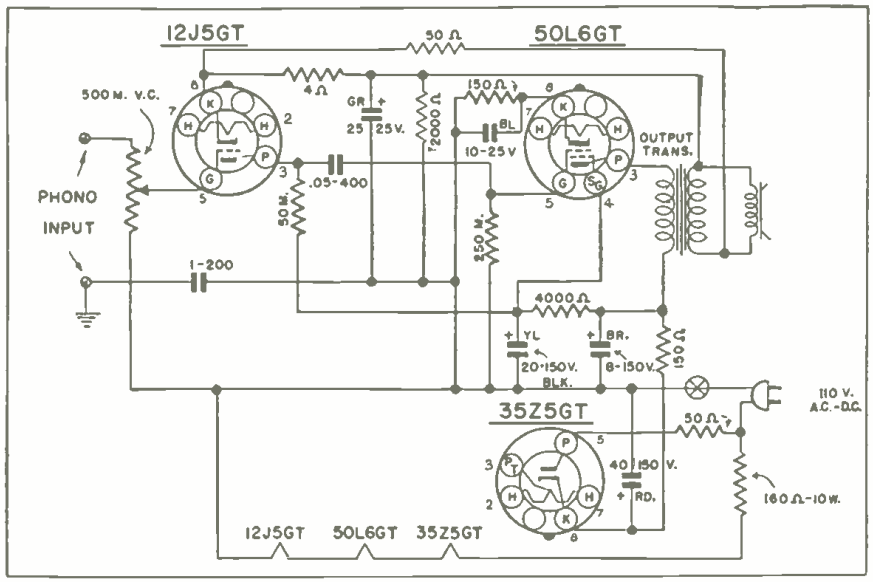
Just a word or two about electrical pick-ups and their use. Electrical pick-ups fall into two classes: the crystal type and the magnetic type. Both types give excellent results, but the crystal pick-up represents the greater value among the lower-priced units. Crystal pick-ups over-emphasize the bass notes, which most people seem to prefer. Whichever type is used, its weight should not exceed 2¾ ounces; otherwise excessive needle and record wear will result. Do not use needles for more playings than are recommended on the package. Needles are inexpensive; and for minimum record wear and faithful reproduction, change them often.

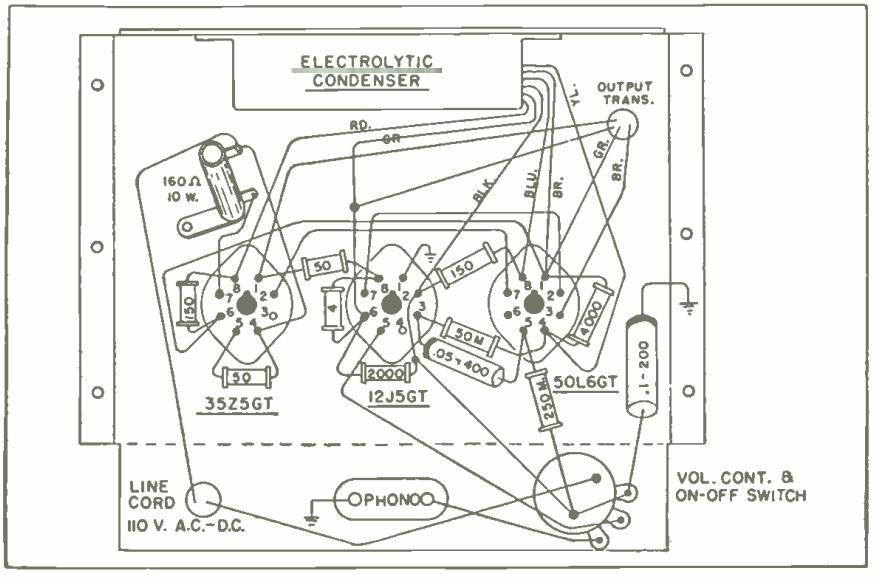
It is not absolutely necessary to use an electrical turntable. If you still have an old phonograph with the wind-up type of motor, it will do the job very well, if you don't mind "cranking" it. The speed of the turntable must be exactly 78 revolutions per minute; otherwise reproduced music will not sound right. A large number of the synchronous or semi-synchronous turntables are available at very reasonable prices today. This type of motor does not require regulating. Be sure they are rated to operate on the frequency of voltage you have available.

3-Tube Phono-Amplifier Parts List

3—Octal wafer sockets
1—500,000 ohm volume control and switch
1—5-in. P.M. speaker
1—Speaker matching transformer
1—Phono input jack strip
1—Line cord and plug
1—Special Knight punched and drilled chassis
1—5-section filter condenser
1—160 ohm, 10 watt resistor
2—50 ohm, ¼ watt resistors
1—4 ohm, ¼ watt resistor
1—2000 ohm, ¼ watt resistor
1—250,000 ohm, ¼ watt resistor
1—50,000 ohm, ¼ watt resistor
1—4,000 ohm, ½ watt resistor
1—150 ohm, ¼ watt resistor
1—150 ohm, 1 watt resistor
1—.1 mf., 200 volt condenser
1—.05 mf., 400 volt condenser
Hardware and hook-up wire
1—Volume control knob
1—12J5GT tube
1—50L6GT tube
1—35Z5GT tube

Below—The hookup for the three-tube phono-amplifier.

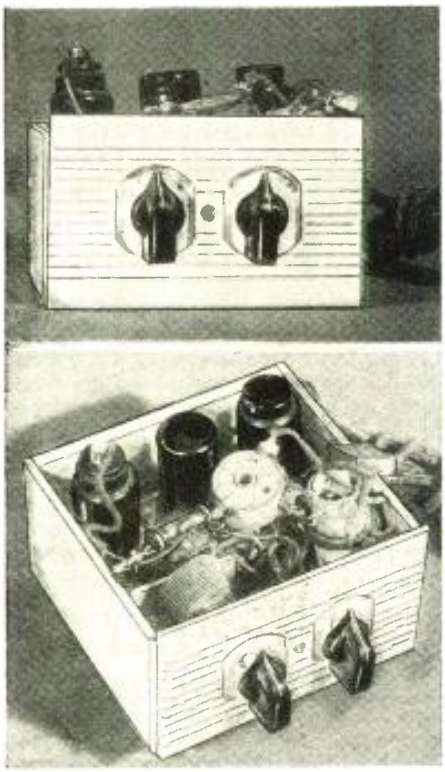




NOVEL MIDGET 3-TUBE RECEIVER

Homer L. Davidson

The radio dabbler who would like a "personal" receiver for his own use, will welcome this 3-tuber. It will prove ideal for listening in on the *broadcast* band with a pair of head-phones. The set can be made very attractive by mounting it in a colored molded cabinet.



Above—Two views of the Midget 3-tube "broadcast" receiver.

● THIS set is ideal for the beginner and can be used for "silent listening" on the *broadcast* band. The set uses three tubes, 6J7 as detector, 6J5 as amplifier and last stage, and 6C5 as a low-powered rectifier. Filament heating for the 6.3 volt tubes is connected in series with a 330 ohm resistor in the line cord.

The little set has a novel idea in which an ordinary receptacle outlet plate, used in every home and which can be purchased at any dime store, is used for the front panel. The two holes in the receptacle are used for dials of the tuning condenser and volume control. A piece of cardboard was used as the dial itself, and was marked out with pen and ink mounted between panel and receptacle plate.

A small chassis is employed about 2½ inches wide by 4¼ inches long. All three tubes are mounted in a line and condensers and resistors are mounted beneath the chassis. The entire receiver measures 4⅝" wide by 5" long.

The coil is an antenna coil, of the type now used in commercial midget receivers, in which 35 turns of 28 D.C.C. are wound over the secondary coil. In testing the set, turn on switch and a click is heard in the headphones. By feeling the line cord, you can tell by its warmness if the tubes are heating up. Turn up the volume control and a plop will occur. Then rotate tuning condensers and every squeal heard in the phones will indicate a station. Readjust the volume control until the whistling noise has stopped and the station can be tuned in without a squeal.

The set itself can be wired in a few hours. In the case of the receptacle plate, which was ivory, the cabinet was also painted ivory to match. The top panel was cut with tube holes in it, and the tubes project slightly above the panel.

This receiver has sufficient pick-up so that an ordinary short aerial strung around the picture molding, or laid on the floor behind furniture or under a rug, will bring in "local" stations with sufficient volume. The stronger stations will operate a sensitive loudspeaker, but it is presumed that the average builder of this set will probably want to use it with a pair of head-phones.

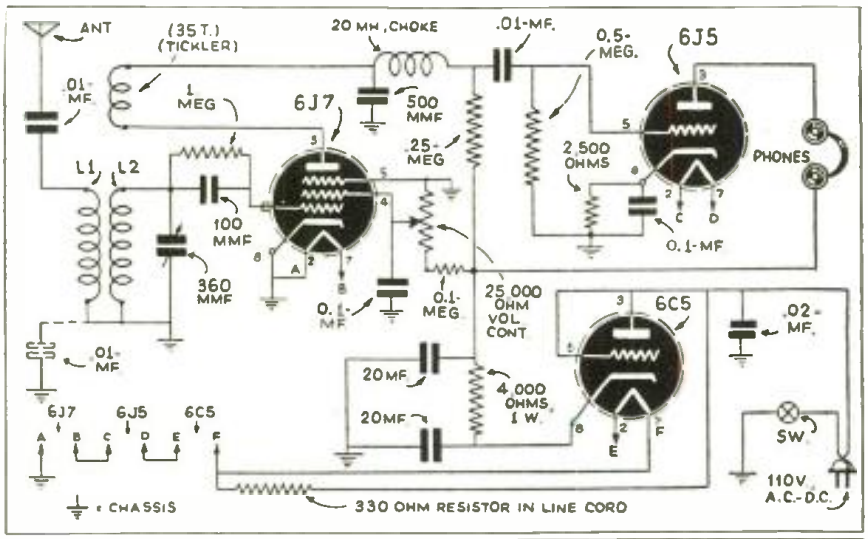
Parts List

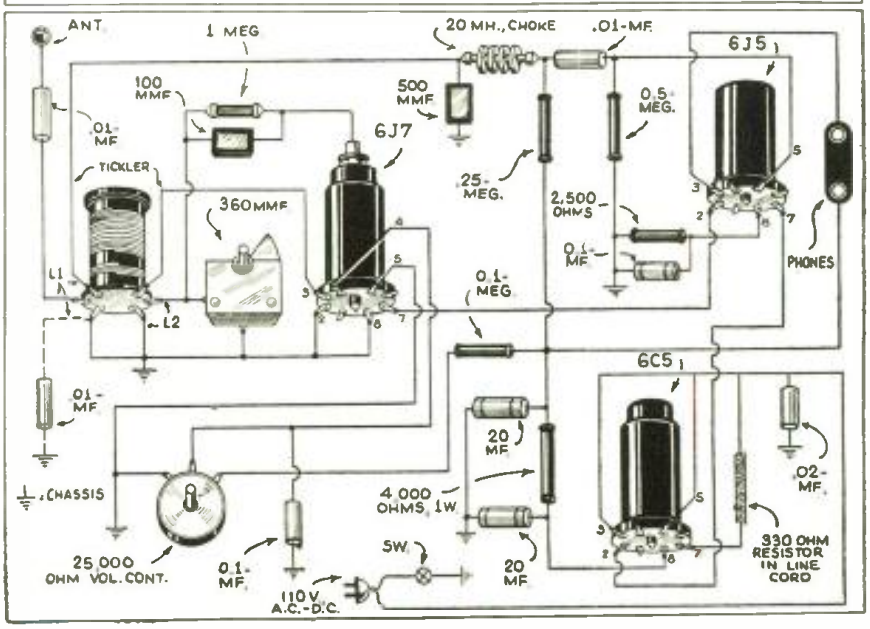
CONDENSERS
1—.0001 mf.
1—.0005 mf.
2—.01 mf.
1—.02 mf.
2—.1 mf.
1—Dual atcm type elec. cond. 20-20 mf.
1—Variable .00036 mf. cond.

RESISTORS
1—1 megohm
1—100,000 ohm ½ watt
1—.25 meg. ¼ watt
1—500,000 ohm. ¼ watt
1—4000 ohm. 1 watt
1—Volume control 25,000 ohms, without S.W.-baby control
1—2,500 ohm. ¼ watt
1—330 ohm resistor cord

MISCELLANEOUS
Tubes—6J7. 6J5, 6C5; sockets, screws, bolts, wire, etc.

Wiring diagrams for the 3-tube receiver are given below and smooth operation is obtained.





A Low-Cost High-Power Transmitter

Larry LeKashman, W2IOP

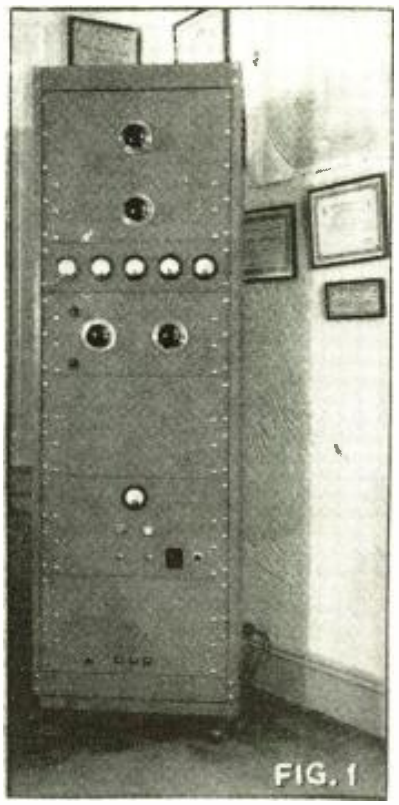


FIG. 1

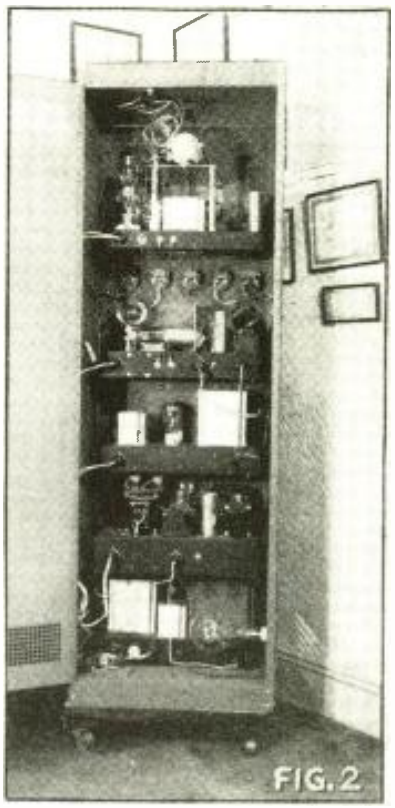


FIG. 2

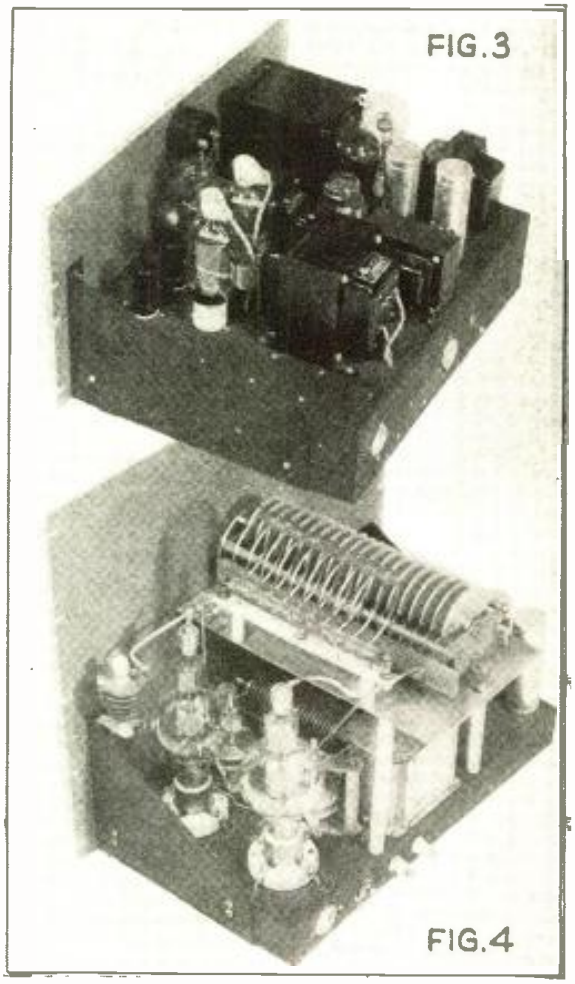


FIG. 3

FIG. 4

1—Low-Cost High-Power transmitter in its completed stage. Note the control cable which operates the relay for single-switch operation.
2—Looking behind the panels. The control relay may be seen in the lower left-hand corner.
3—"Ultra-compact" hardly describes the complete modulator unit. The balance of the transformers not shown are mounted below the chassis deck.
4—"Two-deck" construction in the final gives short leads and a symmetrical layout.

● HIGH power is never really inexpensive and when we say *low cost*, it is in comparison with other transmitters of similar ratings. Really cheap high-power rigs are seldom anything to flaunt in the parlor and rarely deliver maximum performance of all components. Expensive kilowatts which include all the "gingerbread" we are familiar with, usually means a second mortgage on the old homestead.

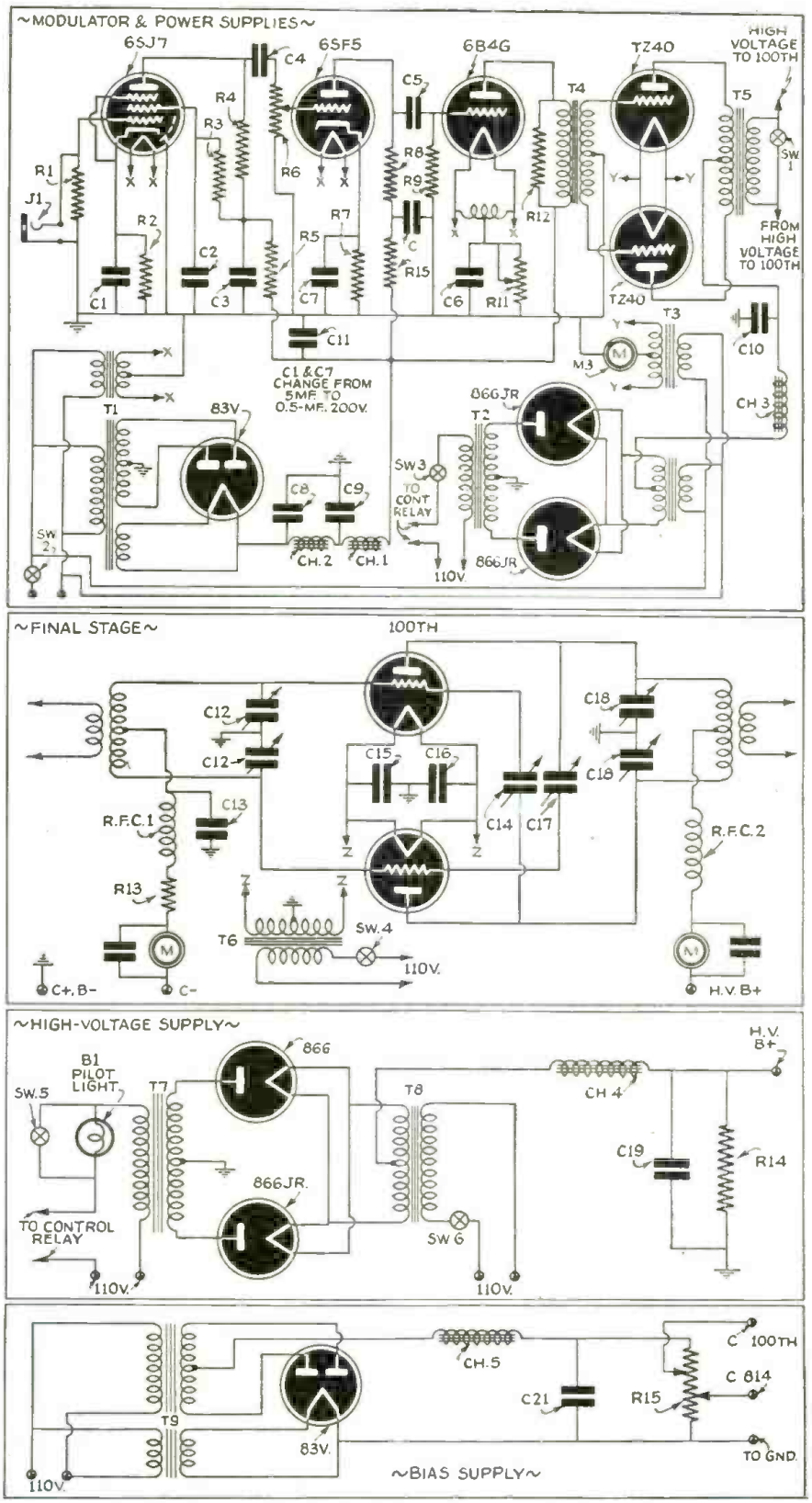
Not having the homestead and being fond of showing off the rig, high power at W2IOP developed into this example of "kitchen" construction. For a transmitter that can be completely assembled for well under $200 it leaves little to be desired. The only power tool involved in its construction was an inexpensive hand-drill. The rig, from feed-throughs on top to the high voltage supply, was built with hand tools in the kitchen and parlor of the house. As a point of interest to shuddering XYL's, the total damage to furniture was nil—the only destruction being the OW's nerves.

Reasonably conventional, the lineup consists of a 6L6 crystal oscillator-buffer driving an 814, which in turn pushes a pair of Eimac 100TH's. A not-so-conventional modulator utilizes a 6SJ7-6SF5-6B4G and PP TZ40's. Running an input between 400 and 500 watts the TZ40's supply ample audio, and what you can't work with a half kilowatt you won't work at all. 866's supply the high voltage for the PA; 866JR's supply B plus for the 814 and TZ40's; while 83's take care of all the remaining voltages.

The exciter using the 814 has already been treated in detail in the past issue of RADIO & TELEVISION. The success of the 814 as a transmitter made it an obvious choice as the buffer in my high-power transmitter, since it is often used as the final without the 100TH's. In order that the 814 may be utilized as a transmitter with a minimum of effort there are individual switches for turning off the 100TH's; modulators; and high voltage supply. In each case the switches are interlocked with the control relay, so that one switch can operate all stages.

A high-class transmitter well within the spending power of the average Ham beginner. Rating—about ½ KW. The line-up consists of a 6L6 oscillator—buffer driving an 814, which pushes a pair of 100TH's. Modulator uses 6SJ7—6SF5—6B4G and PP TZ40's.

For reasons of economy, involving both space and cash, the entire modulator was built on one large chassis. Surprisingly little R.F. feed-back was experienced, and after some experimenting with *grounds* it was possible to turn the gain completely up on all bands, *without feed-back*. An unusual situation was encountered at this stage, when it was discovered that leaving the common side ground off the modulator removed all feed-back. In this modulator, despite the lack of A.M.C., I.F., etc., quality was excellent and far superior to average amateur phone band speech. W2HXS—a neighbor and excellent audio man—doctored the rig, which absolves me of all blame or credit, in so far as phone performance is concerned. It is obvious that the next increase in audio equipment would require at least twice as much space as this modulator and would not be practical in this rig.



Wiring diagram for the LeKashman transmitter is shown above.

For 80 and 160 meter operation a padder was necessary on the 100TH's grid coils. The large electric bulb in series with the primary may be switched in and out of the circuit at will. It serves the dual purpose of giving instant Q.R.P. operation and prevents excessive off-resonance currents for tuning. However, the Guardian overload relay is a priceless investment in "mind ease" and certainly represents cheap insurance for high power-high cost gear. Experiments carried out with various inputs using the bulb and light loads produced conflicting, but conclusive evidence that high power *does* make a difference.

E

Resistor 15 in the bias supply is equal to—.

I

E is equal to the bias deficiency, if there is any. I is the rated grid current. From this formula the exact value of R13 may be determined in each individual case. The bias supply bleeder should be adjusted to deliver 200 volts for the 100th's, then the 814 should be adjusted. Total bias in each case should be at least twice "cut off"—preferably more.

No dimensions are critical, the general layout being of prime importance. This transmitter has been "air-tested" with most satisfactory results. Forty-six states on phone in 15 days, using a 14 mc. quarter wave; and 3.5 mc. half wave is a good performance for any rig. On CW similar results were experienced with some excellent reports from outlying Pacific possessions.

I.R.C. (Resistors)
(For Modulator, unless otherwise marked)
R1—5 meg. BT1
R2—1700 ohms BT1
R3—2.5 meg. BT1
R4—500,000 ohms BT1
R5—50,000 ohms BT1
R6—¼ meg. potent. type C
R14—25,000 ohms, 150 watt
R13—Optional dependent upon bias voltage used
R7—4500 ohms BT1
R8—½ meg. BT1
R9—1 meg. BT1
R10—50 ohms CT, 1 watt
R11—800 ohms var. type EP
R12—50,000 ohm BT1
R15—25,000 ohm, 75 watt, tapped and adjusted with voltmeter—under load (bias supply)

NATIONAL
RFC1—R100†
RFC2—400 ma. RFC

TRIPLETT
M1—221 0-150 ma. bypassed with .002 600 volt mica**
M2—221 0-500 ma. bypassed with .002 600 volt mica**
M3—221 0-300 ma. (modulator)

ALLIED
Control relay, type K4

STANCOR (Transformers and Chokes)
CH1—C2305 20H 100 ma. mod.
CH2—C2303 10H 130 ma. mod.
CH3—C1404 5-25H 400 ma. mod.
T1—P6335 mod.
T2—P3535 mod.
T3—P6138 mod.
T4—A4762 mod.
T5—A3829 mod.
T6—P6335 bias supply
CH5—C2303 bias supply

CORNELL-DUBILIER (Condensers)
C21—8 mf./450 EY9080
C19—TQ30020
C13—250 mmf. 600 volt
C15, C16—.01 600 volt tubular
C6—25 mf. 50 volt, type BR*
C7—5 mf./25 volt, type BR*
C8—8/500 elect. EY11080*
C9—8/500 elect. EY11080*
C1—5 mf./25 volt, type BR*
C2—.05/600 volt, tubular*
C3—8/450 elect., type EY*
C4—.01/400 volt, tubular*
C5—.01/400 volt, tubular*
C10—2 mf. 1500 volt, TJU150-20†
C11—8 mf. 600 volt, ET11080†

U.T.C. (Transformers)
T7—S50*
T8—S57*
CH4—S35*
T6—S59**

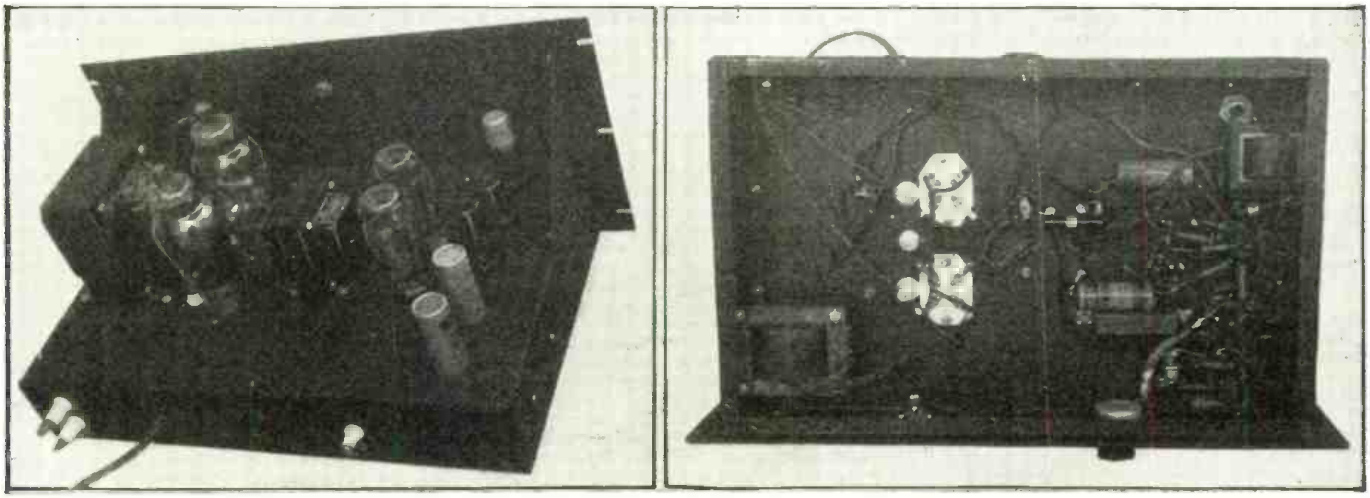
CARDWELL
C12—MT 100 GD
C14—17 type ADX**
C18—XG 110 XD†

GUARDIAN
X—Model X100 relay*

MALLORY
J1—Microphone jack

MISCELLANEOUS
S1—H.D. SPST, for 100TH fil.**
B1—300 watt bulb (lamp)*
S6—H.D. SPST for 866 fil.*
S5—H.D. SPST for 866 pri.*
S1—H.D. SPST—to cut modulator out for CW-mounted on chassis rear (modulator unit)*
S2—H.D. SPST—modulator fil.*
S3—Modulator plate H.D. SPST†
(H.D.—Heavy duty)

†Modulator
*High voltage supply.
**Final amplifier.



Rear and bottom views of the cathode modulator.

CATHODE MODULATOR for the W8KPX XMITTER

Harry D. Hooton, W8KPX

A 60-watt audio (modulator) speech amplifier. Also complete data for making the proper adjustments to the cathode-modulated phone transmitter. A pair of 45's in push-pull drive the Class B 809's.

● THE radio frequency portion of the new W8KPX 5, 10 and 20 meter transmitter and the power-supply units were described in the October issue of RADIO & TELEVISION. This month we describe the 60 watt audio unit and give complete data for making the proper adjustments to the cathode-modulated phone transmitter.

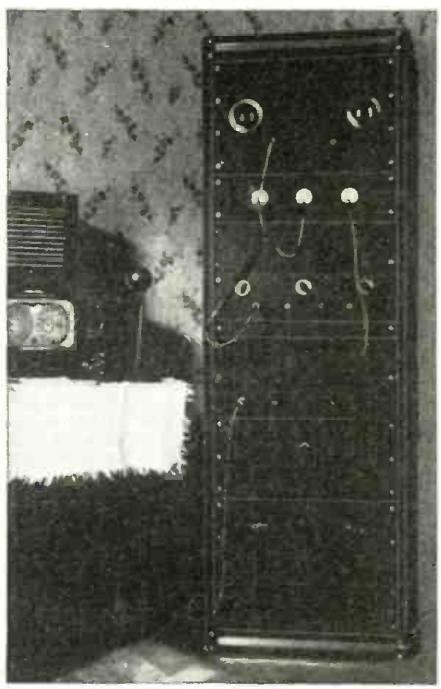
A cathode modulation unit, basically, is not very much different from any other modulator or audio frequency amplifier. The only radical change in a cathode modulator is in the output or modulation transformer; most cathode modulators have an output impedance of from 500 to 3,000 ohms, while the plate modulator may have an impedance of from 2,000 to 10,000 ohms or higher. Otherwise, the circuit arrangement is the same.

In our original design we had planned to use a pair of 6L6G's in Class B as the modulator tubes. In fact, we did build a modulator using the 6L6G's. Various experiments with both the beam power tetrodes and triodes, however, soon convinced us that for our own particular purpose some of the low power triodes such as the HK-24, TZ-20 or 809 types as Class B modulators would be ideal. We finally selected a pair of 809's with 600 volts on the plates, giving 60 watts audio output, as modulators for the push-pull HK-54 final amplifier.

Modulator Tube Line-up

As shown in Fig. 1, the modulator tube line-up is as follows: A 6J7 or 6SJ7 input from a crystal or dynamic microphone, a 6C5 second speech amplifier, a 6N7 or 6SC7 phase inverter and a pair of 45's in push-pull driving the Class B 809's. All stages up to and including the 45's are resistance-capacity coupled. All plate circuits are carefully filtered with decoupling resistors and condensers to insure good stability and to prevent any stray A.C. hum from reaching the high-gain grid circuits. The *phase inverter* is the new self-balancing degenerative type, developed in the R.C.A. laboratories and used in many up-to-date amplifier and public address systems. The gain developed up to the 45's is entirely sufficient for use of the lowest level crystal microphones on the market. When using high level microphones, such as the Brush "HL" type shown in the photograph, the 6C5 stage may be eliminated altogether if desired. In this case the *gain control* must be turned nearly all of the way on in order to drive the 809's to full output. The quality of the audio, however, will be very good.

Front panel view of the transmitter, complete with modulator.



The construction of the modulator is not at all difficult. The wiring must be kept *short* and *direct*, mount the various bypass and coupling condensers and resistors as close as possible to the socket terminals and use copper braided shielding on all of the wire leads indicated by the dotted lines in Fig. 1. Ground the shielding to the chassis at regular intervals of two or three inches. Do not depend upon the metal chassis as a common ground return conductor; run a piece of No. 14 tinned copper bus wire around to the shell or grounding lug on the tube sockets, making all negative connections to the wire. The bus wire should be grounded to the chassis at one point only. This method of construction prevents stray audio frequency currents from circulating in the chassis keeping down noise and instability. The voltage applied to the plates of the tubes in the speech amplifier portion of the modulator is taken from the 400 volt oscillator power supply and is adjusted to approximately 350 volts, measuring from the B-plus end of the decoupling filter resistors.

45's in Push-Pull Ideal Drivers

The 45's in push-pull make ideal drivers for the 809 Class B modulators. The driver

transformer must be adjusted for a ratio of 4:1 primary to ½ secondary winding. Both the driver and modulation transformers shown in the photographs are of the *universal* type, which will operate with any tubes in any type audio circuit. Bias for the 45 drivers is obtained from the voltage drop across the 780 ohm, 10 watt resistor in the B-minus lead between the center tap of the 2.5 volt filament winding and ground (chassis). This resistor may or may not be by-passed by a 10 mf., 50 working volts electrolytic. In the original model the condenser had very little effect, so far as voice range operation was concerned, but may be used if a greater bass response is desired.

Class B Output Stage

The Class B output stage is extremely simple, as shown in Fig. 1 "b." Fixed bias for the 809's is obtained from a small 4.5 volt dry cell "C" battery. A voltage of 4.5 volts is indicated on the diagram. This value is correct for a plate supply of 750 volts, but probably will have to be reduced to 3 volts for the 500 volt supply. The plate-to-plate load impedance of the 809's, with 500 volts on the plates, is 5,000 ohms. The secondary impedance of the modulation transformer will be in the order of from 500 to 1,000 ohms, according to the adjustment of the final R.F. amplifier. This adjustment will be treated in detail later on in this article.

The adjustments for *cathode modulation* are no more critical than for plate modulation—and far less critical than for grid modulation. The power output from a cathode-modulated radio frequency amplifier is nearly *three times as great* as that obtained from the same tubes in a grid-modulated circuit, operated with practically the same D.C. plate voltage. The carrier output will be from 10 to 50 per cent less, according to the amount of grid modulation used, than when using plate modulation and operating with the same plate dissipation. Cathode modulation, however, when properly adjusted, will give nearly as high efficiency as that obtained by plate modulation in the average amateur transmitter.

Adjustment of R.F. Amplifier

Briefly, for proper cathode modulation, the R.F. amplifier must be adjusted as follows:

(1) Make absolutely certain that the final amplifier is *perfectly neutralized*. You can check this by swinging the final tank tuning condenser through resonance *with the plate voltage removed* and with excitation applied to the HK-54 grids. If the amplifier is *not* neutralized, the grid current *will fluctuate sharply* when the resonant point is reached. Another method is to check for R.F. voltage on the final tank circuit with a neon lamp at resonance. Adjust the neutralizing condensers for minimum glow in the neon. This method, while satisfactory in some respects, is not very accurate because the lamp must be placed very close to the coil or condenser, in order to obtain any indication whatever, and the removal of the lamp may upset the distributed capacity sufficiently to make accurate neutralization impossible. Rough adjustments can be made with the neon

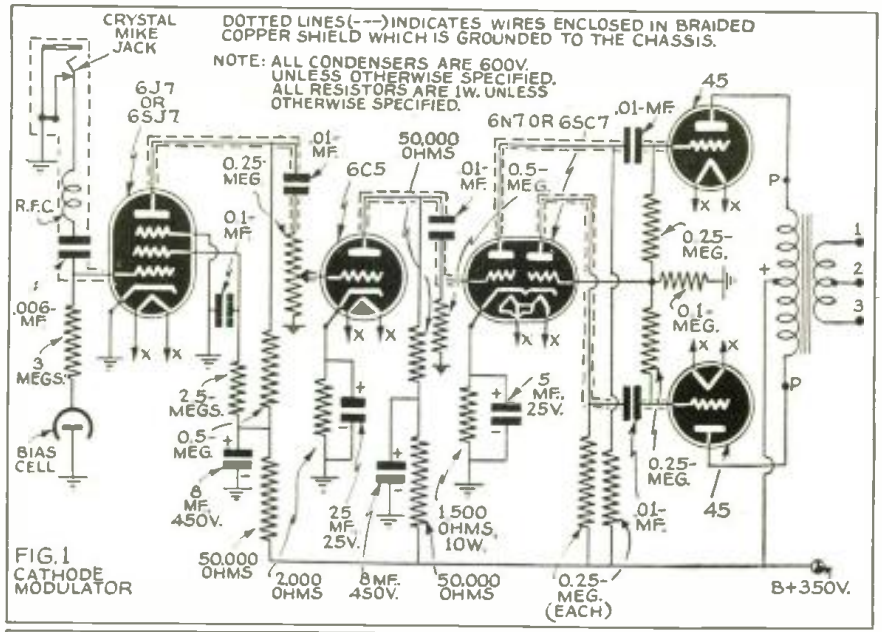


FIG. 1 CATHODE MODULATOR

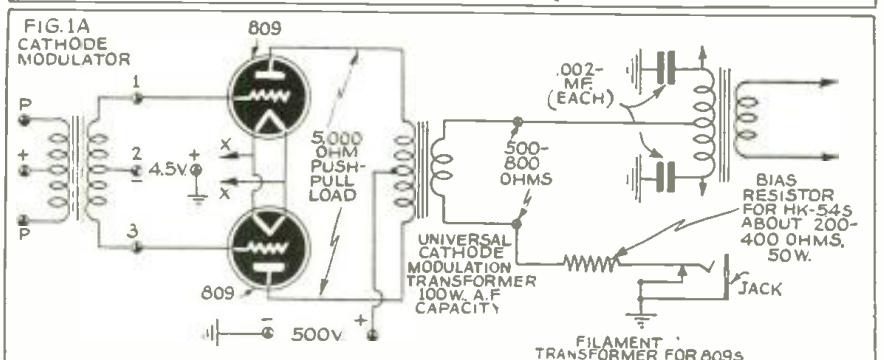
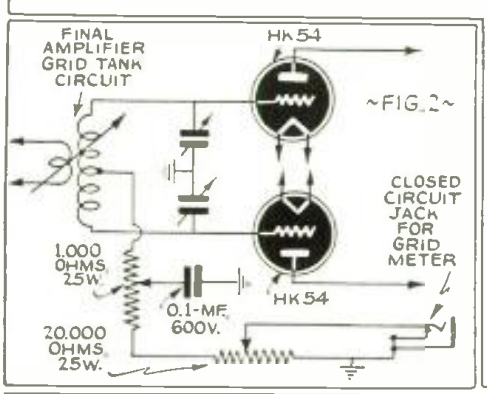
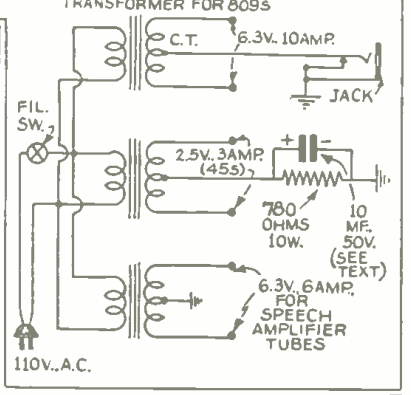
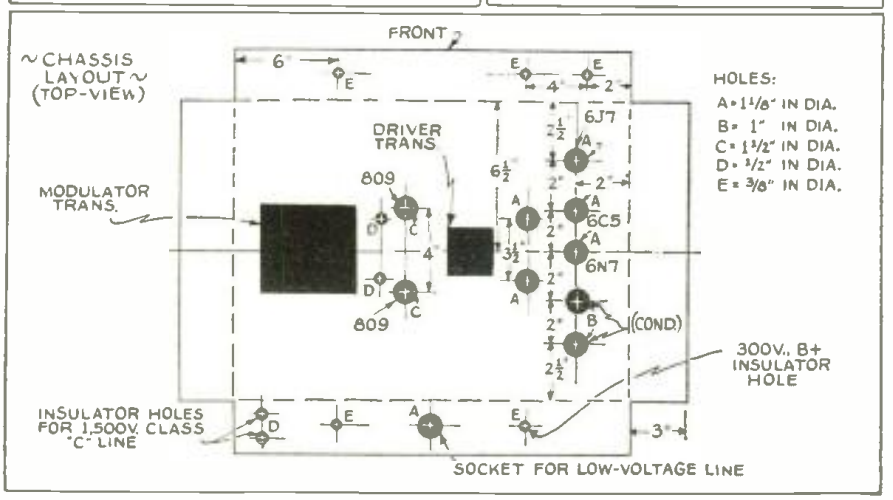


FIG. 1A CATHODE MODULATOR







The drawings above show the connections for the cathode modulator here described by Mr. Hooton. This apparatus was built by the author and tried out extensively "on the air," in connection with the W8KPX 5, 10, and 20 meter transmitter, illustrated and described in detail in the October issue of this magazine. This modulator will be found of interest to all Hams.

lamp but always check results with the grid meter for the final adjustment.

(2) Adjust the grid current to each HK-54 to a value of about 7 to 20 milliamperes *per tube*. This can be readily accomplished by loosening the coupling between the buffer plate tank circuit and the final amplifier grid tank circuit. It may also be necessary to change the value of the HK-54 grid leak resistor or the fixed bias.

(3) "Load" the antenna to a point slightly beyond that which gives the greatest antenna or R.F. feeder current. A satisfactory indicator for this adjustment will be the usual 6-volt pilot or automobile head-light bulb, clipped across a portion of the antenna or feeder line.

(4) Check the modulation quality with a phone monitor and some kind of carrier-shift or over-modulation indicator, in exactly the same manner as when using conventional plate modulation.

(5) Finally, with the transmitter in operation, carefully adjust the grid bias of the final amplifier to the point which will permit upward variation of the antenna current with modulation. Again the pilot or auto lamp is a very satisfactory indicator. A steady tone, such as that supplied by an audio oscillator, is best for making accurate adjustments.

It will be noticed that we have omitted any discussion of methods of adjustment using the cathode ray oscilloscope. While the oscilloscope is an excellent instrument in the hands of an expert, who understands the meaning of the various patterns obtained, it is advisable for the beginner or inexperienced phone ham to make the initial adjustments as outlined above. If you do possess an oscilloscope, the author suggests a thorough study of the chapters in the standard amateur manuals dealing with radiotelephone adjustment using this instrument. Although very little actual information on the adjustment of the cathode-modulated amplifier is presented, many of the patterns shown for different degrees of bias adjustment, etc., *are exactly those required for cathode modulation.*

The cathode impedance of a pair of HK-54's, operated with 1,500 volts on the plates, is about 600-800 ohms, depending upon the antenna load and the bias adjustment. Since a considerable mismatch between a cathode modulator and the R.F. amplifier can be tolerated without appreciable loss in efficiency, the taps on the output transformer may be permanently set to 700 ohms. The by-pass condensers across the filaments of the HK-54's to ground should be kept to the lowest capacity consistent with satisfactory R.F. by-passing, otherwise considerable audio power may be by-passed to ground and lost. The paper dielectric, 0.1 mf. condenser, attached to the sliding tap on the HK-54 grid-leak resistor, should be adjusted to the point where the least amount of grid modulation takes place. The use of an oscilloscope is desirable for an extremely accurate adjustment, but quite satisfactory results can be obtained by simply connecting the by-pass condenser from the junction of the 1,000 and 20,000 grid bias resistors to ground as shown in Fig. 2.

The author will be very much interested in hearing from those who build or con-

template building this transmitter. All letters will be answered if a three-cent stamp is enclosed for return postage. Address all correspondence to the author in care of RADIO & TELEVISION.

List of Parts

PAR METAL (Cabinet, Chassis and Panel)
1—Black crackle finished steel chassis, 13x17x3 in.
1—Pair small chassis supporting brackets
1—Black crackle finished steel panel, 8¾x19 in.
1—"De luxe" black crackle finished steel cabinet, overall height 66½ in., panel space 61¼ in.

STANCOR (Transformers)
1—Filament transformer, 2.5 volts, 5 amperes. Type P-6133
1—Filament transformer, 6.3 volts, 10 amperes. Type P-6308
1—Universal modulation transformer, "Polypedance" type A-3894
1—Universal driver transformer, "Polypedance" type A-4762

RCA (Tubes)
2—809 tubes
2—45 tubes
1—6N7 or 6SC7 tube
1—6C5 or 7A4 tube
1—6J7 or 6SJ7 tube

HAMMARLUND
2—Isolantite sockets, 4-prongs (for 809's)
1—Midget R.F. choke. Type CHX

AMPHENOL (Sockets)
3—Chassis-mounting sockets, "octal," 8-prong type
2—Chassis-mounting sockets, "octal," 4-prong type
1—Chassis-mounting socket, "octal," 5-prong type
1—Microphone connector, short-circuiting type

CORNELL-DUBILIER (Condensers for Filter and By-pass)
2—Can type electrolytic condensers, 8 mf., 450 volts. Type "KR" compact
1—Tubular electrolytic condenser, 25 mf., 25 volts. Type BR
1—Tubular electrolytic condenser, 10 mf., 50 volts. Type BR
1—Tubular electrolytic condenser, 5 mf., 25 volts. Type BR
4—Tubular paper condensers, 0.01 mf., 600 w.v. Type DT
2—Tubular paper condensers, 0.1 mf., 600 w.v. Type DT
1—Tubular paper condenser, 0.006 mf., 600 w.v. Type DT
2—Mica condensers, 0.002 mf., 5,000 volts

I.R.C. (Resistors)
1—Fixed resistor, 3 megohms, 1 watt
1—Fixed resistor, 2.5 megohms, 1 watt
2—Fixed resistors, 500,000 ohms, 1 watt
3—Fixed resistors, 50,000 ohms, 1 watt
4—Fixed resistors, 250,000 ohms, 1 watt
1—Fixed resistor, 2,000 ohms, 2 watts
1—Fixed resistor, 1,500 ohms, 10 watts (wire-wound)
1—Fixed resistor, 200 ohms, 50 watts (wire-wound)
1—Fixed resistor, 780 ohms, 10 watts (wire-wound)
1—Variable potentiometer (gain control), 250,000 ohms
4—Large feed-through insulators
2—Small feed-through insulators
1—Lot hookup wire, knobs, screws, etc.

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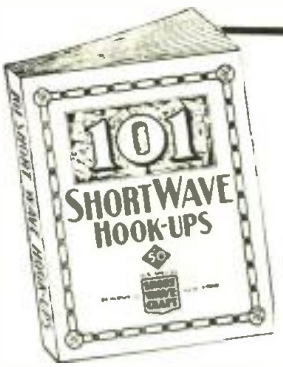

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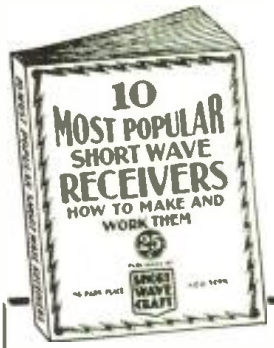

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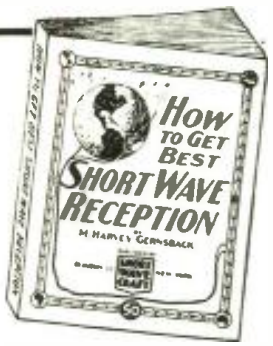

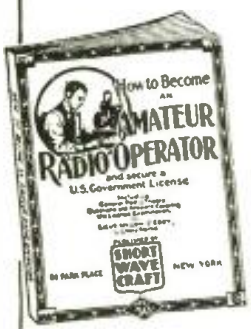

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APPENDIX II- Courtesy Federal Communications Commission

TABLE 1.—*Abbreviations to be used in radio communications—Q code Abbreviations to be used in all services*[1, 2]

Abbreviation	Question	Answer or statement
QRA	What is the name of your station?.....	The name of my station is . . .
QRB	At what approximate distance are you from my station?	The approximate distance between our stations is . . . nautical miles (*or* . . . kilometers).
QRC	By what private operating enterprise (*or* government administration) are the accounts for charges of your station settled?	The accounts for charges of my station are settled by the . . . private operating enterprise (*or* by the government administration of . . .).
QRD	Where are you going and where do you come from?	I am going to . . . and I come from . . .
QRG	Will you tell me what my exact frequency (wave length) is in kilocycles (*or* meters)?	Your exact frequency (wave length) is . . . kilocycles (*or* . . . meters).
QRH	Does my frequency (wave length) vary?	Your frequency (wave length) varies.
QRI	Is the tone of my transmission regular?	The tone of your transmission varies.
QRJ	Are you receiving me badly? Are my signals weak?	I cannot receive you. Your signals are too weak.
QRK	What is the legibility of my signals *(1 to 5)*?	The legibility of your signals is . . . *(1 to 5)*.
QRL	Are you busy?.....	I am busy (*or* I am busy with . . .). Please do not interfere.
QRM	Are you being interfered with?.....	I am being interfered with.
QRN	Are you troubled by static?.....	I am troubled by static.
QRO	Must I increase the power?.....	Increase the power.
QRP	Must I decrease the power?.....	Decrease the power.
QRQ	Must I transmit faster?.....	Transmit faster (. . . words per minute).
QRS	Must I transmit more slowly?	Transmit more slowly (. . . words per minute).
QRT	Must I stop transmission?	Stop transmission.
QRU	Have you anything for me?.. .	I have nothing for you.
QRV	Are you ready?..	I am ready.
QRW	Must I advise . . . that you are calling him on . . . kilocycles (*or* . . . meters)?	Please advise . . . that I am calling him on . . . kilocycles (*or* . . . meters).
QRX	Must I wait? When will you call me again?	Wait (*or* Wait until I have finished communicating with . . .). I shall call you again at . . . o'clock (*or* immediately).
QRY	Which is my turn?	Your turn is number . . . *(or according to any other indication)*.
QRZ	By whom am I being called?.....	You are being called by . . .
QSA	What is the strength of my signals *(1 to 5)*?	The strength of your signals is *(1 to 5)*.
QSB	Does the strength of my signals vary?....	The strength of your signals varies.
QSD	Is my keying correct; are my signals distinct?	Your keying is incorrect; your signals are bad.
QSG	Must I transmit . . . telegrams (*or* one telegram) at a time?	Transmit . . . telegrams (*or* one telegram) at a time.
QSJ	What is the charge to be collected per word to . . . including your internal telegraph charge?	The charge to be collected per word to . . . is . . . francs, including my internal telegraph charge.
QSK	Must I continue the transmission of all my traffic; I can hear you between my signals?	Continue the transmission of all your traffic; I shall interrupt you if necessary.
QSL	Can you acknowledge receipt?.....	I am acknowledging receipt.
QSM	Must I repeat the last telegram which I transmitted to you?	Repeat the last telegram which you transmitted to me.
QSO	Can you communicate with . . . directly (*or* through . . .)?	I can communicate with . . . directly (*or* through . . .).
QSP	Will you relay to . . . free of charge?....	I will relay to . . . free of charge.
QSR	Has the distress call received from . . . been attended to?	The distress call received from . . . has been attended to by . . .
QSU	Must I transmit (*or* answer) on . . . kilocycles (*or* meters) and or on waves of type A1, A2, A3, or B?	Transmit (*or* answer) on . . . kilocycles (*or* . . . meters) and or waves of type A1, A2, A3, or B.
QSV	Must I transmit a series of V's?.....	Transmit a series of V's.
QSW	Do you wish to transmit on . . . kilocycles (*or* . . . meters), and or on waves of type A1, A2, A3, or B?	I am going to transmit (*or* I shall transmit) on . . . kilocycles (*or* . . . meters), and/or on waves of type A1, A2, A3, or B.
QSX	Will you listen to . . . *(call signal)* on . . . kilocycles (*or* . . . meters)?	I am listening to . . . *(call signal)* on . . . kilocycles (*or* . . . meters).
QSY	Must I shift to transmission on . . . kilocycles (*or* . . . meters), without changing the type of wave? *or*	Shift to transmission on . . . kilocycles (*or* . . . meters) without changing the type of wave.
	Must I shift to transmission on another wave?	Shift to transmission on another wave.
QSZ	Must I transmit each word on group twice?	Transmit each word or group twice.
QTA	Must I cancel telegram to . . . as if it had not been transmitted?	Cancel telegram to . . . as if it had not been transmitted.
QTB	Do you agree with my word count?.....	I do not agree with your word count; I shall repeat the first letter of each word and the first figure of each number.
QTC	How many telegrams have you to transmit?	I have . . . telegrams for you (*or* for . . .).
QTE [3]	What is my true bearing in relation to you? *or*	Your true bearing in relation to me is . . . degrees *or*
	What is my true bearing in relation to . . . *(call signal)*? *or*	Your true bearing in relation to . . . *(call signal)* is . . . degrees at . . . *(time)* *or*
	What is the true bearing of . . . *(call signal)* in relation to . . . *(call signal)*?	The true bearing of . . . *(call signal)* in relation to . . . *(call signal)* is . . . degrees at . . . *(time)*.

[1] Abbreviations take the form of questions when they are followed by a question mark.
[2] The series of signals QA to QD and QF to QN are reserved for the special code of the aeronautical service.
[3] In certain aeronautical services, "true course" and "true bearing" are called "geographic course" and "geographic bearing."

(To be continued)

"Ham Ramblings"

Frank Courtney, W4FDX

● WE wonder how many fellows carefully read the very fine editorial by Mr. Hugo Gernsback in the August issue of RADIO & TELEVISION. Mr. Gernsback certainly hit the proverbial "nail on the head," for during this critical period in the affairs of our country, we Hams do not know when Uncle Sam will call on us to do our part. Those of us who have been working *phone*, and thereby allowing our C.W. to get somewhat rusty, should put "ye old mike" on the shelf for awhile and dust off that "bug," and bring our C.W. back to the point where we can copy at least 25 W.P.M. *without error!* We should all be ready, when, and if, the call to duty comes.

* * *

Well, it seems as though the much debated Ham vs. S.W.L. QSL controversy continues to hold the limelight. The S.W.L. continues to complain that only a small percentage of the Hams sent reports or S.W.L. cards, condescend to send a card, while most of the Hams counter with the fact that they do not care for reports from the S.W.L.'s, as they receive an abundance of reports from other Hams "worked." True, it is about all that most Hams can do to reply to the QSL cards received from actual QSO's. However, personally, we are of the opinion, that a fellow who wants one of our cards bad enough to write for it, certainly is entitled to the courtesy of an acknowledgment, if not a card. We are just completing three years on the air here, and to our knowledge we have never failed to send a card to any who requested it, and that shall continue to be our policy.

* * *

When your receiver is improperly operating, and you have no testing equipment on hand to locate the defective stage, have you tried the simple tube-pulling process? Simply pull out tubes one at a time, starting at the receiver input and working toward the speaker. The first stage that stops the trouble is, of course, the defective stage.

If you are dissatisfied with the present frequency of your crystal, you can change it several kilocycles by painting its faces with black India drawing ink. Use a cheap water color brush.

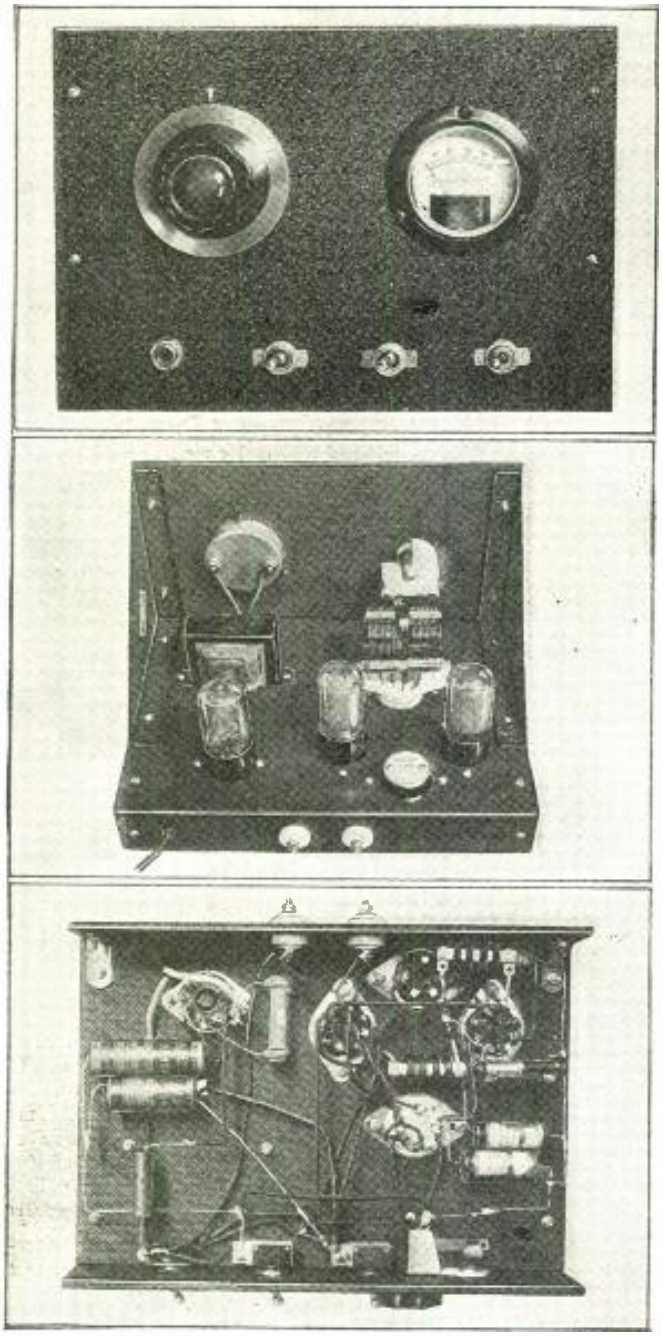
When our "bug" insisted on walking all over the table, and would not stay where we wanted it while in use, we solved the problem by touching the rubber feet with our soldering iron. The feet get sticky and the bug stays put!

We were recently called over to a neighbor's house to endeavor to find out why their new (self-installed) radio set refused to play. Upon questioning friend neighbor, we learned that he had tightened up several screws on the chassis that "had evidently become loose when the set was delivered." Result, an alignment job, as said screws happened to be *padders* and *trimmers!!*

An A.C.-D.C. Beginner's Transmitter

William D. Hayes, W6MNU

This simple transmitter for the fellow just entering the HAM game, is easily built and puts to work a trio of the new 35 volt tubes.



Front, rear and bottom views of the transmitter.

● LARGELY responsible for the recent increase in the number of receiving tube types has been the development and introduction of tubes employing a relatively high voltage heater designed for economical service in A.C.-D.C. circuits. These tubes require a heater current of only .15 ampere as compared with .3 ampere drawn by the older types. This means that in many cases line cord resistors and ballast tubes can be entirely eliminated.

For instance, the dropping resistor in the heater circuit of the transmitter described in this article dissipates only 1.7 watts, which is more than adequately handled by a small 10 watt resistor. The rig draws 17.5 watts from the line with the key up and 25 watts with the key down, whereas with the older type tubes the key up power would be 35 watts and the key down power 42 watts.

All this may be disheartening to those who depend on line cord resistors and ballast tubes for heating up the shack, but such a big improvement in efficiency is worth a mild case of cold feet. Besides, you can always buy an electric heater.

Circuit

A pair of 35L6GT's is used in a conventional push-pull crystal oscillator circuit. These tubes are designed to operate efficiently with 110 volts on the plate so a half wave rectifier, a 35Z4GT, is used in the power supply rather than a voltage-doubler. An advantage of the half-wave circuit over the voltage-doubling circuit is that it permits the set to be used on a D.C. line. The high capacity input filter condenser maintains the plate voltage of the 35L6GT's at about 100 volts under full load with seven watts input to the oscillator. Needless to say, the note is absolutely T9x.

A 0-100 D.C. milliammeter measures the plate current to the 35L6GT's, and with the oscillator loaded, this meter should read about 70 ma. A toggle switch is provided for shorting out the meter while keying. In the tank circuit is a small air-wound plug-in coil with an adjustable link (Bud OLS), and the coupling to the load can be conveniently adjusted by merely bending the link into or out of the coil proper. A receiving type midget variable is used as the tank condenser.

The design of the antenna tank circuit will, of course, depend entirely on the type of antenna available, and reference should be made to the various handbooks which cover the subject quite thoroughly.

Construction

The transmitter is constructed on Macolite, which is not only very inexpensive, but also extremely easy to work with. To convince yourself of this fact it is only necessary to try drilling a few holes in a steel panel and then to try the same thing on a piece of Macolite (or Masonite). Of course, steel has the advantage of providing shielding, but in this case no shielding is necessary.

The Macolite used both in the front panel and in the chassis is 3/16 inch thick; the panel measures 7" x 10", and the chassis is 7" x 10" x 1½". The panel is attractively finished in black crackle and is attached to the chassis by means of a pair of staunch and sturdy black crackled steel angle brackets. (That's a mouthful!) Incidentally, the brackets are Bud No. 1266.

Referring to the front panel, the tuning dial and meter are self-evident. Across the bottom, from left to right, are the keying jack, meter shorting switch, stand-by switch, and line switch. The R.F. output is fed through two small Alsimag insulators at the rear of the chassis.

Operation

As in tuning any crystal oscillator, the tank condenser should be tuned to resonance as indicated by minimum plate current, and then rotated about one degree in the minimum capacity direction. If this is not done, there will be a tendency to chirp, and the rig will not key properly.

It cannot be over-emphasized that a reasonably good antenna system is essential for satisfactory results with a low-power transmitter. However, given a good antenna, the little outfit will provide the Ham beginner with many enjoyable QSO's. Perhaps by the time this article is published, the ban on *portable* operation will have been lifted, in which case I might suggest that the rig

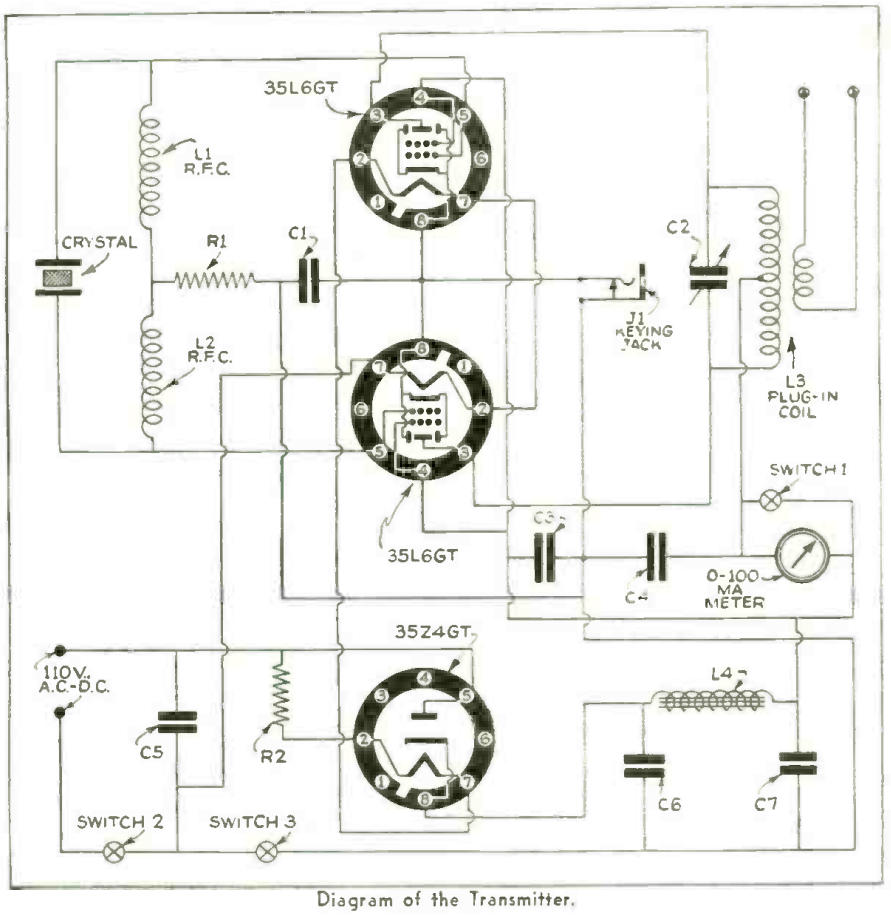


Diagram of the Transmitter.

is well suited for portable use. The elimination of a power transformer as well as the use of Macolite in construction puts it in the featherweight class.

While the rig can be used on any band for which a coil and crystal are available, *forty* and *eighty* meters are recommended. A glance at the list of parts and a little mental arithmetic will show that this little transmitter is very inexpensive to construct. For instance, a set of three tubes can be purchased for under $2.00 and, except for the crystal, that is the largest item.

In conclusion, here's a reminder: Do *not* ground the "B" negative.

Parts List

SPRAGUE
C_1, C_3, C_4, C_5, .01 mfd. 600 v. paper

HAMMARLUND
C_2, 100 mmfd. midget variable (SM-100)

AEROVOX
C_6, 24 mfd., 150 v. electro (Dandee)
C_7, 12 mfd., 150 v., electro (Dandee)

CONTINENTAL
R_1, 15,000 ohms, 1 watt (Carbon)

IRC
R_2, 75 ohms, 10 watts

MILLER
L_1, L_2, R.F. choke 2.5 mh.

BUD
L_3, Air-wound plug-in coil with adjustable link

STANCOR
L_4, 30 hy., 50 ma. (C-1003)

YAXLEY
J_1, Closed circuit keying jack

ARROW
S_1, S_2, S_3, S.P.S.T. toggle switch

BLILEY
X, Crystal for the band in use

READRITE
M_1, 0-100 milliammeter

RCA
Two 35L6GT's, one 35Z4GT

JOHNSON
Alsimag feed-through insulators

ICA
Dial

F.C.C. - Guide Questions FOR AMATEUR LICENSE

60. On what amateur bands is portable operation permitted only when prior notification has been given to the F.C.C. inspector in charge of the district in which such operation is contemplated?
61. On what amateur bands is adequately filtered direct-current plate power supply required for operation of an amateur transmitter?
62. On what amateur bands is adequately filtered d.c. plate power supply *not* required for operation of an amateur transmitter?
63. What is the maximum permissible plate power input to the final stage of an amateur transmitter and under what circumstances may it be used?
64. How would a short circuited turn of the coil affect the resonance frequency of a tuned circuit and why?
65. What is meant by the harmonic of a fundamental frequency?
66. What operating characteristics distinguish the electron-coupled type oscillator with regard to frequency stability?
67. What circuit conditions will minimize the harmonic components in the output circuit of a given radio-frequency amplifier stage?
68. Give the meanings of the following "Q" signals:

QRK QRM QRT QRX QSA QSY QSZ

(See previous issues for other "Guide" questions.)

"CQ"

Larry LeKashman, W2IOP

1—W9ZNU—better half of W9TIO. 2—Some month we'll devote a full page to W2GVZ. This is one wall of NNJ's SCM's station. Not much Pat hasn't got here, and wait 'till you see the rest. 3—Exclusive 20 meter operation has made W9ZXX well known throughout the U.S. 4—W9TIO—the man who pays the bills.

● I CAN'T honestly say that we're swamped with material yet. You boys and gals must have lots of worth-while information to pass around and surely we don't all agree on everything. Don't forget this column is open to impartial discussions of anything that might benefit *amateur radio*. I thought we had pretty well defined the aims of CQ in the opening column, but it would seem that unless it's a YL affair you can't stir the gang.

Speaking of YL's reminds us that we have a little preaching to do about QSL's. Unfortunately no one wrote in with good negative reasons on the QSL situation, although many of our brethren added an "amen" to the plea for the revival of QSL'ing. The amateur who won't QSL because of the expense is standing on pretty thin ice, since the ham who can afford to run a station and not the price of QSL cards, is few and far between. On the other hand many amateurs consider it too much of a bother. To them we can only say think back at the thrills and pleasure you got when you received your first cards. If you *never* QSL'd, then, brother, you just haven't been a ham and there's no use trying to speak this lingo to you. There is many a DX man who is now realizing what a mistake he made in not swapping cards when it could be done—don't you make the same mistake again.

By the way someone wrote in and asked us how we felt about the ARRL. It's a great thing in my opinion. League members elect the officials, so if there is any particular feature they object to it is their privilege to exercise the vote given them upon joining. In other words it's just like QSL cards. The boys find the energy to kick about different League activities. but not to do anything about them. Elect officials carefully; take an active part in ARRL affairs; and most important of all—keep in touch with your local SCM. The League is as good as its members—do your share and don't worry about the next bird.

W4FSE. Jim Harrison, of Asheville, N. C., isn't leaving anything to the other fellow. As editor of *The Arc*, W4FSE deserves a great deal of credit. Neat, interesting, and only fifty cents a year *The Arc* is now well into its second successful sea-

son. We don't dare lift too much of his material, so if you're interested in seeing a copy get in touch with W4FSE.

One thing has been bothering me for two years now—maybe one of our readers knows the answer. Why does the Manchester, N. H., R.C. emergency headquarters sport 10 and 20 meter rotary, with no low frequency antennas in sight? W2KOK is rebuilding for 10 meter phone with a pair of RK37's. W2KBH rebuilt his 10 mobile into a fixed station and is working the W1's on 2½ with his RK34-J feed antenna.

W2LFL, using a portable pedestrian transmitter consisting of a 1G4G and 1T5GT, running 1 watt input, has had many successful 2½ meter contacts. The complete station is housed in a camera case 5x6x4 inches with the B batteries in a separate pack around the waist. Best mobile DX has been about 6 miles. W4ECW has a similar outfit and when he walks down the main drag, according to *The Arc*, people follow him like a parade.

W2KDC is going to work for Westinghouse in Pittsburgh at the close of the NYWF. W2DSF is so busy developing his ping-pong game he never gets on the air any more. What are the SWL's doing with themselves now? It's a cinch the International Reply Coupon business is shot to pieces, along with most of Europe.

Long before the FCC banned foreign contacts many wiseacres knew it was due. The reason? Well, W5EGA can relate one story where a certain W6 was heard working a D. When asked to desist by another W6, the offender forgot his manners in no uncertain terms and all this on the air! After giving the well meaning interventionist a bawling out, he even had the nerve to write him an insulting letter. This belligerent and selfish attitude was all too evident long before the close-down and certainly didn't help our cause one bit. In fact, failure to heed the ARRL's neutrality code probably forced the FCC action in banning foreign contacts. Don't forget that, the next time the ARRL has a good suggestion to offer. By the way boys—how is your CW speed?

W9RFA is now married and more inactive, in ham radio particularly, than ever. We met the new XYL and fully understand the situation. Murray is excused—at least for the time being. W6QD is having all kinds of competition working W9's now. Tibet Workers of America have closed their club rooms for the duration of the war. W2KNA is on the air with a Hallicrafter 100 watt rig. W2MMV reports his best DX as Montana on 10 meter phone. W2HNS has temporarily forsaken his radio come-back in favor of more recording work. W1DOB, W3GXB, W3HTE, and K6AMF are four of the boys with PAA in New York. W2NAX has a 25-watt CC rig perking on 56MC. W2AVA has CQ 173 for a license plate.

So far this column reminds me of a second district clam bake. If this keeps up I'm going to be writing this column all alone; which will make me a virtual dictator; which will put me on equal footing with Europe's "Terrible 3" and who knows what that'll lead to. All because you folks won't cooperate. Don't say I didn't warn you!

"Honor" Plaque Awarded

To Merl T. Reynolds, W90KB

For Best HAM Station Photo

The station's main transmitter line-up is: a 6L6 as pentode or tritet crystal oscillator, or as buffer or doubler with a 59 ECO; HY-40Z buffer, and push-pull 852's running from 100 to 500 watts input. All circuits are metered, from light lines to antenna. Four 866's are used in two plate supplies and a 5Z3 in the bias supply.

The receiver is a five tube T.R.F. job using 58, 57, 56, 2A5, and 5Z3 tubes with 9 to 200 meter coverage. One switch controls both transmitter and receiver, giving "break-in" operation. From left to right on top of the desk are—a combination diode field-strength meter and volt-ohm-milliammeter; a wavemeter; an emergency transmitter.

Most contacts are made on 40 meters with some on 20 and 10 meters. The DX worked is 26 countries on 4 continents, all on 40.

Merl T. Reynolds, W90KB,
322 W. 12 St., Anderson, Ind.

●

Here is the new "Award of Honor" Plaque which measures 5" x 7" in size. It is handsomely executed in colors on metal, and is framed, ready to hang on the wall. The name of the winner will be suitably inscribed.

●

Note These Important Rules

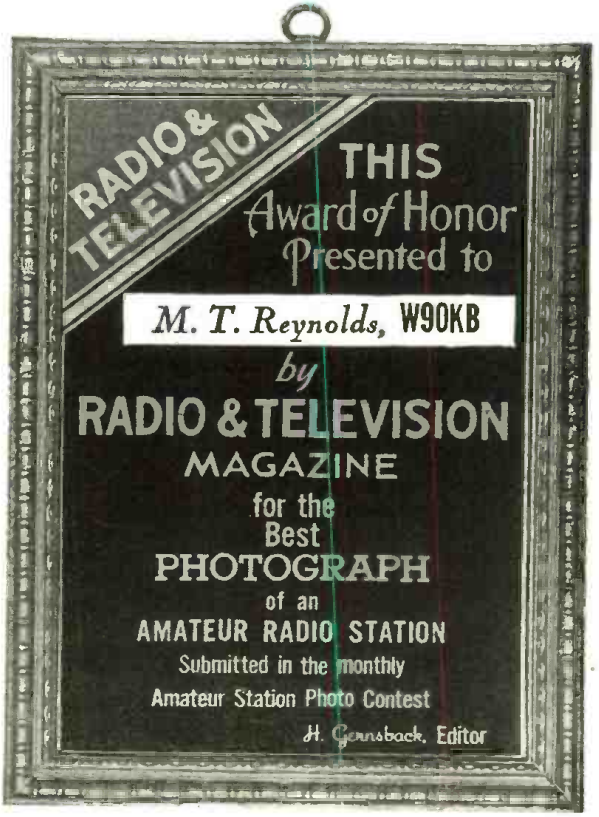
Attach a brief description not longer than 300 words, describing the general line-up of the apparatus employed, the size, type and number of tubes, the type of circuit used, name of commercial transmitter—if not home-made, watts rating of the station, whether for c.w. or phone or both, etc., also name of receiver.

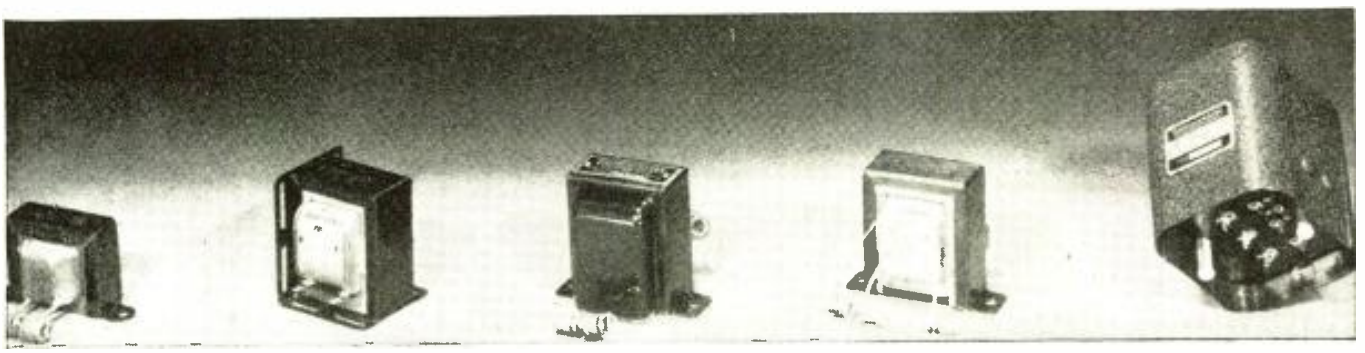
State briefly the number of continents worked, the total number of stations logged or contacted, and other features of general interest. Mention the type of aerial system and what type of break-in relay system, if any.

Important — Enclose a good photograph of yourself, if your likeness does not appear in the picture!

You do not have to be a reader of RADIO & TELEVISION in order to enter the contest.

Address all photos and station descriptions to Editor, Ham Station Photo Contest, c/o RADIO & TELEVISION, 20 Vesey Street, New York, N. Y.





Representative types of audio transformers.

A Review of Radio TRANSFORMER Applications

Leland S. Hicks*

● HOW easy it is to forget fundamental circuits and ideas. Reviews are always worth while and often bring ideas to mind at exactly the right moment. Here are a few standard circuits using transformers and chokes.

Fundamental Circuits

Figure 1: This simple circuit using triodes, 45's, 2A3's, 6A3's, etc., in the output stage will give unusually good frequency response. It is ideal for a radio tuner or phone pickup amplifier. T-1 may be any interstage audio with a ratio of about 3:1. The better the transformer the better the frequency response. T-2 will depend upon the output tubes used. Again a high quality transformer is necessary for the best response.

The circuit of Figure 2 is better where more power is required using 6V6's. This circuit will deliver 15 watts with very good response. T-1 must have a split secondary, as shown, to permit inverse feed-back to be used. See Figure 4 for an alternative inverse feed-back circuit.

Figure 3 shows a battery operated Class B amplifier using the new 1.4 volt tubes. The two triode sections marked 1G6G are really contained in a single glass envelope. The 1G6G is a zero bias tube; bias for the 1H4G is secured from the voltage drop across a resistor in the B-circuit. Its value is determined by the total Ip drain of the entire receiver, usually about 800 ohms.

*Thordarson Electric & Manufacturing Company.

Inverse Feed-back

Two methods of securing inverse feed-back are shown in Figures 4 and 5. Figure 4 shows the ordinary method of obtaining inverse feed-back with the resistor-condenser method. The amount of inverse feed-back is equal to $\frac{R_1}{R_1 + R_2}$, assuming that the reactance of condenser C_1 is negligible over the operating frequencies. However, this assumption is not necessarily true, especially at the lower frequencies. The circuit of Figure 5 is much more efficient from this standpoint. In Figure 5 the feed-back voltage is obtained from a *tertiary* winding on the output transformer. This method also provides a much better overload characteristic since the resistance in the grid circuit is negligible and it is quite possible to operate the tubes in the grid current region.

Power Supplies

At times a source of very pure D.C. is required. The brute force twin choke circuit shown in Figure 6, using an 80 or 5Z3 or equivalent rectifier is ideal. Choice of power transformer will depend upon the D.C. voltage required from the filter. Transformers are available to deliver from 250 volts D.C. at 40 ma. to practically any desired voltage, within the rating of such tubes. Choice of filter chokes will depend upon the current drain of the load. The actual inductance is not too important for most applications. Any choke catalogued as being capable of carrying a given current will have sufficient inductance for adequate filtering.

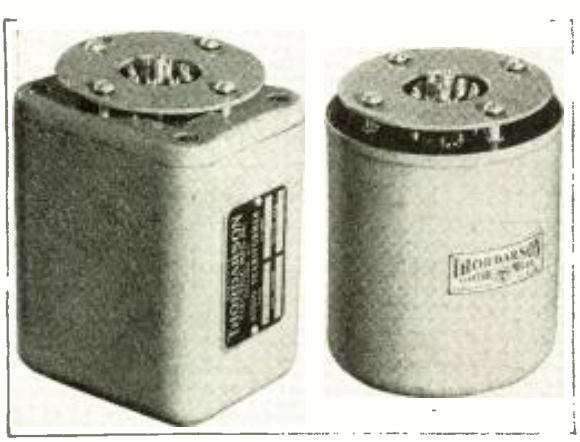
Universal Output Transformers

In choosing a Universal Output Transformer, be certain that the primary winding is designed to carry the plate current of the tubes you are using. The new beam power outputs draw from 50 ma. to 55 ma. plate current per tube. The older Universal outputs were designed to carry but 35 ma. to 40 ma.

Universal outputs with secondary leads, instead of lugs, are now available. These types are proving very popular as they permit the serviceman to cut off the unwanted leads and thus give the repair job a more finished appearance.

Copper Oxide Rectifiers

Model train builders often need a source of direct current that will be more convenient than a storage battery. This can be easily procured by using a simple transformer-copper oxide rectifier hookup as shown in Figure 7 or Figure 8. Figure 7 is a single-phase full-wave center-tapped circuit. Figure 8 is a single-phase full-wave bridge circuit. The former is most often



Two representative types of Broadcast quality audio transformers with mounting rings.

●

Various types of transformers are discussed by the author—what type to use for various circuit requirements—what to expect in a good filter choke—uses of auto-transformers — transformers for Vibrator power-supplies — what constitutes a good transformer—why effective shielding is necessary, etc.

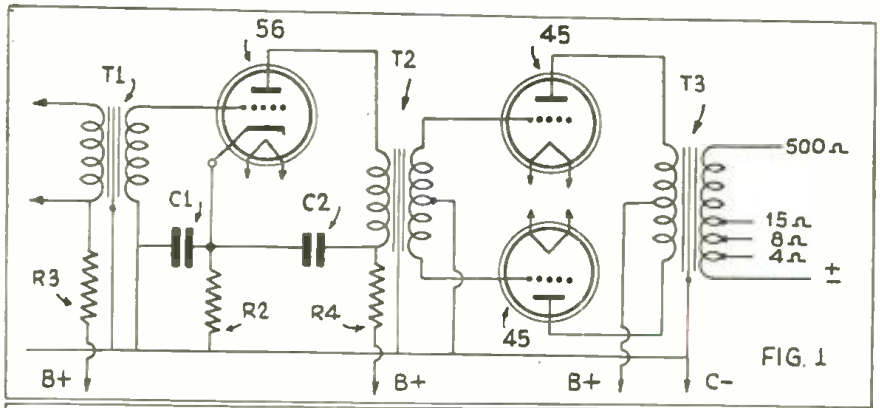


FIG. 1

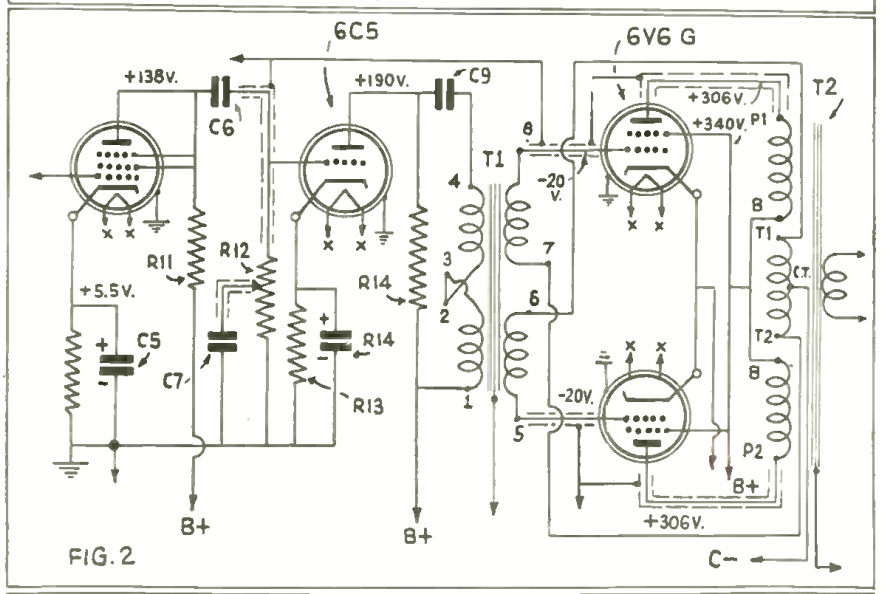


FIG. 2

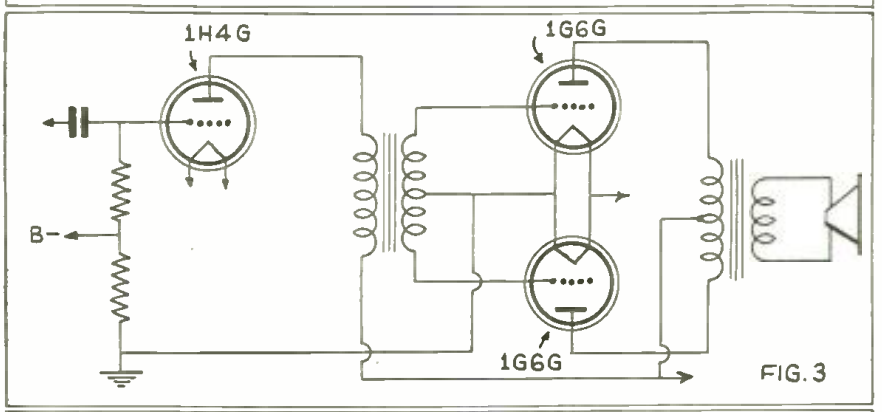


FIG. 3

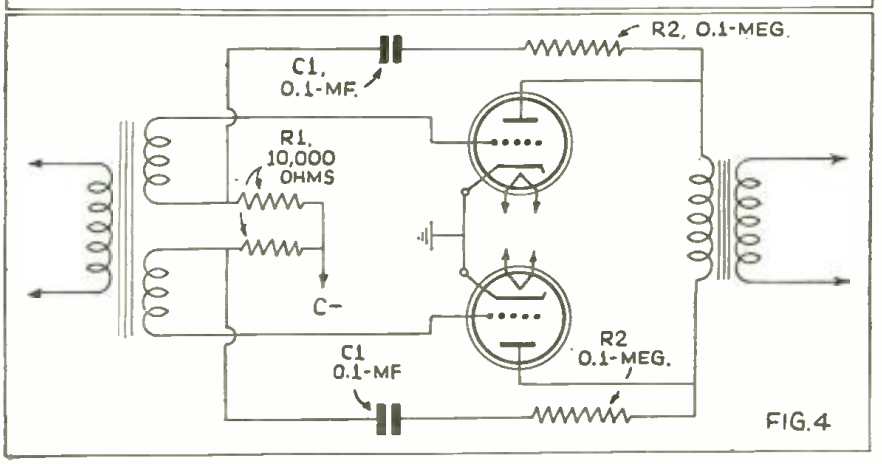


FIG. 4

Audio amplifier circuits—from simple to more complex types. Fig. 2—shows a 15-watt audio amplifier with inverse feed-back. (Fig. 4 optional feed-back circuit.) Fig. 3—A battery-operated class-B amplifier, using the new 1.4 volt tubes. Bias for the 1H4G is supplied by the voltage drop across the resistor in the B minus circuit.

used. The transformer must deliver approximately 13 volts A.C. to the rectifier to secure 6 volts D.C. from the output. Connecting two filament windings of a multiple secondary filament transformer in series will give this value, or near enough for ordinary use. Model trains do not have to have exactly 6 volts D.C. Rectifiers to deliver 1 or 2.5 amperes are easily available from most radio parts distributors and larger sizes can be ordered as specials from any of the several rectifier manufacturers. The larger sizes are stock types with the manufacturer but they are so seldom called for that it does not pay the distributor to stock them.

Auto-transformers

An important variation from the basic transformer having a separate primary and secondary is the auto-transformer. This device consists of a continuous winding upon a common iron core, with taps to provide needed step up or step down ratios. Since the primary and secondary is common in all the winding except the ratio portion, large current values (heavy loads) can be handled on a much smaller iron core, thus making a smaller and less expensive design possible. Auto-transformers are used especially to change the line voltage. Units are available to reduce 230 volts to 115 volts or vice versa. Others have taps to correct high or low line voltage. Still others will give varying secondary voltages from zero to 115 volts from the 115 volts line in 5-volt steps, through the use of available taps and appropriate switches. Figure 9 shows the fundamental idea of a typical auto-transformer.

In choosing an auto-transformer the VA or secondary load rating is as important as the ratio rating. It is common practice to catalogue such ratings in terms of VA instead of watts since the manufacturer cannot know the power factor of the load with which the transformer is to be used. It is well known that certain types of motors, arc welders, neon signs, luminous tube illumination, etc., do not have 100% power factor; some loads are as low as 50% P.F. A VA rating is correct in all cases. If the wattage is known, the V.A can be determined from the formula

$$\text{VA equals } \frac{\text{Watts}}{\text{Power Factor}}.$$

Vibrator Power-Supplies

Many amateurs are using battery-vibrator power supplies for mobile transmitter operation. The circuit of Figure 10 will deliver approximately 320 volts D.C. at 100 ma. from the filter. This power-supply uses a vibrator having accessible actuating coil terminals. With such a vibrator it is possible to avoid switching the high current which flows in the primary of the vibrator transformer, and consequently, the control of the vibrator may be done at a distance without the necessity of using connections of high current carrying capacity. Note that closing switch SW-1 lights the filament and SW-2 starts the vibrator. SW-2 can thus be used as a stand-by switch. It is important that SW-1 be closed and the filaments heated before SW-2 is closed, for the premature closing of SW-2 is almost certain to ruin the 6W5G rectifier.

Price Considerations

Parts distributors are often asked, "why spend $10.00 for an audio transformer performing the same function and having approximately the same ratio as one selling for $0.90"? A brief review of audio transformer characteristics will quickly answer this question.

Servicemen are primarily interested in replacement type audios having approximately the same physical and electrical characteristics as the one they are removing from the receiver. They are concerned more with stability, size and cost than anything else. Transformers designed for their use are furnished in strap mountings and are made as small, physically, as possible. The frequency response of such units is naturally poor as compared with those built for use by *broadcast* stations. Still the response is more than adequate for the use to which they are put, in use in midget and ordinary broadcast receivers.

The amateur, who often is trying for something better than usual, demands a better transformer. Amateur speech input equipment makes transformers with *hum-bucking* coil construction a necessity. A transformer with good frequency response is also demanded. Transformers such as the Thordarson CHT types are typical of those designed especially for advanced amateur use.

Broadcast stations naturally demand the best, regardless of price. The frequency response must be flat within ±1 db. from 30 to 15,000 cycles per second. The transformer must have *hum-bucking* coil construction and the best possible shielding. Special "triple shielding" sometimes is needed for specialized applications where the transformer must operate within a strong magnetic or hum field. This "triple shielding" will eliminate all trace of hum pickup by the transformer except in a very few "impossible" cases.

Broadcast type interstage transformers sell for as high as $18.50 list, and they are worth it. Amateur types sell for around $6.50 list and again they are worth it. Replacement types sell for as little as $1.50 list with the buyer getting just what he pays for. Quantity production plus the latest production methods keep transformer prices at an absolute minimum. The customer is certainly getting his money's worth today.

Parts List for Vibrator Power-Supply

T-1 Thordarson T-14R38 or equivalent
CH-1 Thordarson T-57C53 or equivalent
C-1, C-2 Double 8 mf. 450 volt electrolytic
C-3, C-4 .05 mf. oil impregnated condensers
C-5 .1 mf. 400 volt
R-1 200 ohm 1 watt
Vibrator—Electronics No. 427 or equivalent
Rectifier 6W5G

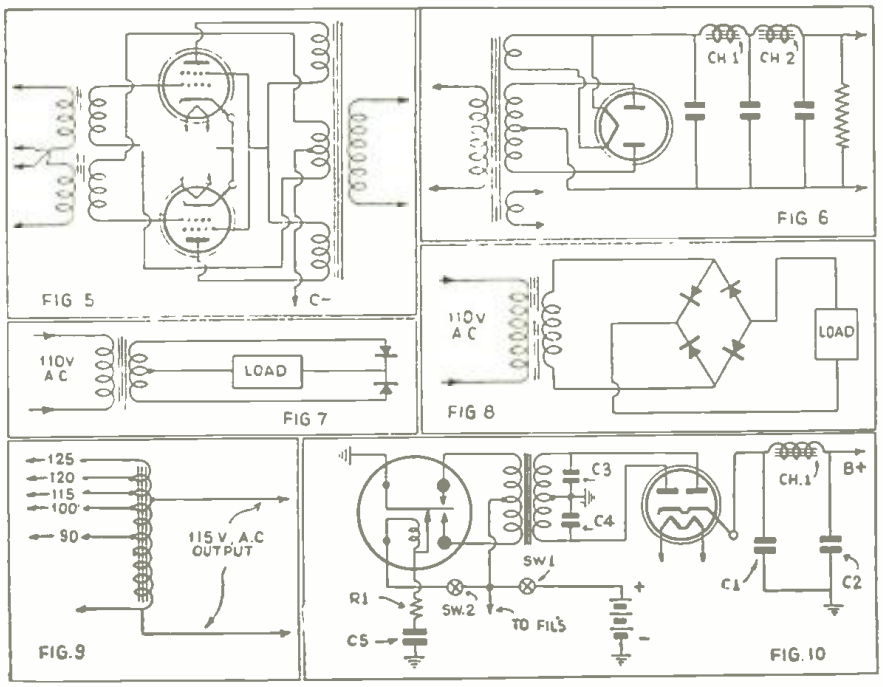
So many factors are involved in the design, construction and use of transformers that an entire library would be necessary to cover the subject completely.

We Will Pay

regular space rates for good construction articles giving novel and original ideas for building such simple radio apparatus as short wave converters, receiving sets, television and frequency modulation receivers, recording equipment, power supplies, simple set and tube testers, facsimile recorders, etc.

Address all contributions to Editor, RADIO & TELEVISION, 20 Vesey Street, New York, N. Y. Enclose stamped, self-addressed envelope if return of rejected material is desired.

Fig. 5—One form of inverse feed-back circuit. Fig. 6—Power-supply circuit. Figs. 7 and 8—Low-voltage D.C. supply from transformer and copper-oxide rectifiers. Fig. 9—Auto-transformer. Fig. 10—Transformers and filter choke in vibrator plate-supply.



The R. & T. Videophone

Ricardo Muniz, E.E.,* and Saul Morton Decker**

Part 2

● IN this month's article on the *"R&T" Videophone* we present the circuit diagrams of the complete unit. The parts lists are so drawn up that the constructor can build either a "two-way" *television telephone*, or a "one-way" *television telephone;* either of the units can also be used as a *modulator* for an amateur television transmitter.

It was found possible, after extensive experimentation, to reduce the number of stages of video amplification from the original five to three. These were found to have ample gain to take care of all practical conditions met. It will be noted that the number of tubes and the number of parts is very materially less than have been required on any similar unit as yet published. We feel that this is the *simplest and cheapest television camera* yet *described.*

The Video Amplifier: Probably the most critical part of the entire construction project is the *video amplifier.* Since the picture signal of the iconoscope tube is very minute a very high gain amplifier is required; moreover the "ike" works best into an exceedingly high impedance (in the order of 5 megohms) which introduces a number of additional problems. The video amplifiers must have a band-pass at constant gain and phase shift of from 30 cycles to 0.5 megacycle.

If you are interested in an experimental Videophone, by means of which you can *see over a wire,* be sure to read the first part of this article which appeared in last month's issue. A third article will give more pointers on the operation of the Videophone.

From the outset the problem of *shielding* was a foremost one. Interstage shielding was not found necessary. It was *necessary to shield all the signal carrying leads,* however. This is shown in the circuit diagram so that the constructor will not find it necessary to experiment on this point. Since the tubes used in the video amplifiers were all high impedance input and output there was a pronounced tendency to oscillation in the amplifier when first tested out, without the shielded wires. There was also a tendency to hum pickup by these leads. This hum showed up on the screen of the monitor and was very annoying.

The shielding problem was finally licked, however, in the videos, and the circuit as shown has the necessary gain and other characteristics without a trace of oscillation or hum pick-up.

It will be noted that 1852-6AC7 type tubes were chosen for the first two video stages. These tubes have an extremely high transconductance and consequently lend themselves to the construction of very high gain amplifiers. A type 6AG7 tube is used in the final stage because it is a beam-

*Engineer WNYE. Radio Instructor, B'klyn Technical H. S., Faculty adviser Television Club at B. T. H. S.
**President Television Club and student B. T. H. S.

Diagrams below show simple "wire circuit" Videophone, also details of shield for the iconoscope tube and power-supply circuit.

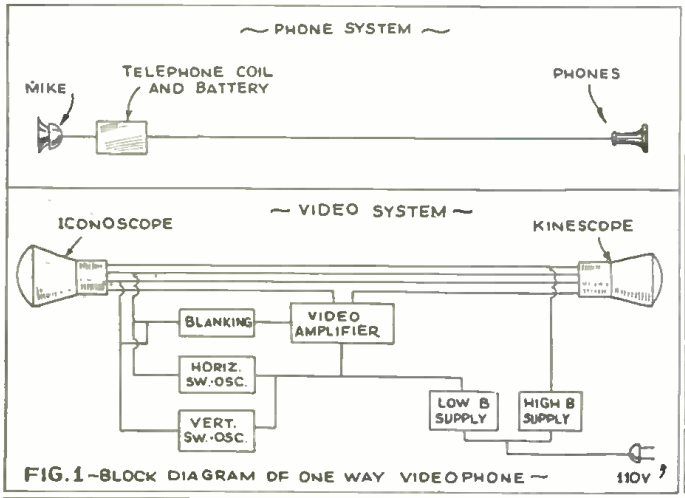


FIG. 1—BLOCK DIAGRAM OF ONE WAY VIDEOPHONE

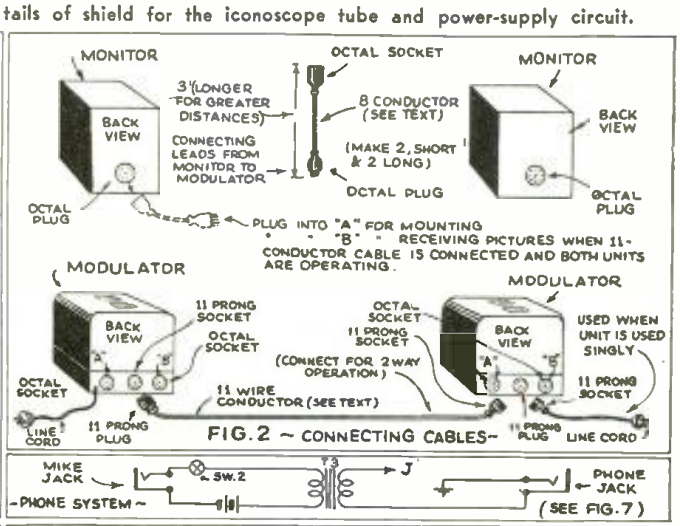


FIG. 2 ~ CONNECTING CABLES ~

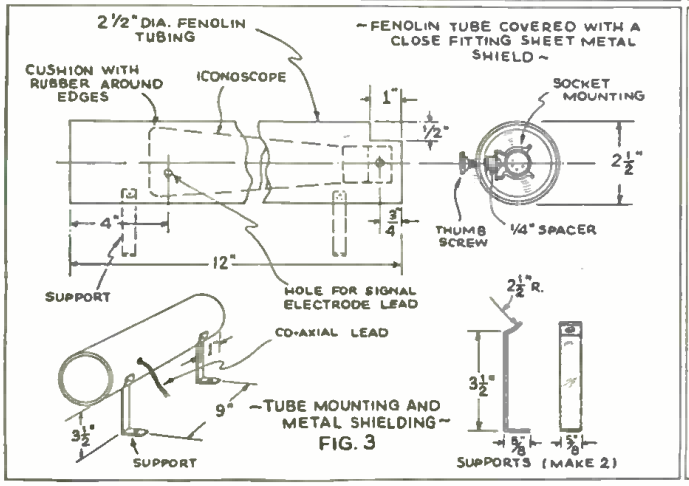


FIG. 3

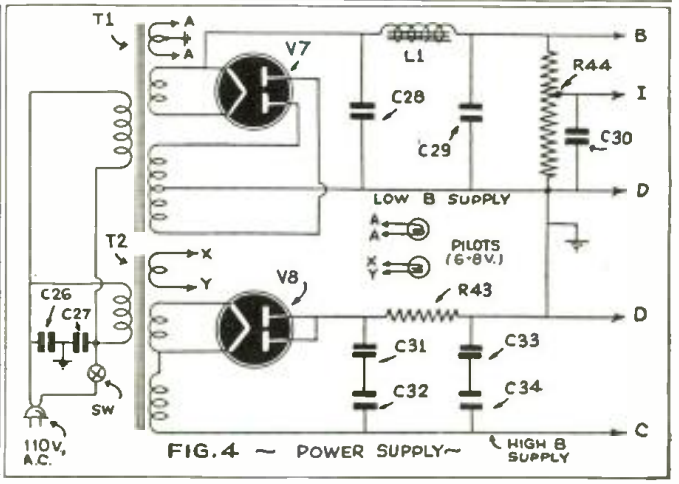


FIG. 4 ~ POWER SUPPLY ~

power amplifier of unusually high transconductance. The total voltage gain in the amplifier is extremely high and the power output several watts.

In the next issue of RADIO & TELEVISION we will publish the complete socket terminal voltage readings, as taken with a Triplett 1200 E 25,000 ohm per volt multimeter.

The Sweep Oscillators: The sweep oscillators are of the multivibrator type. A 6C8-G twin triode was used in each oscillator circuit. The constants specified in the circuits bring within the range of the sweep frequency controls the proper operating frequencies for the amateur television standard namely: 30 frames per second and 120 lines per picture. The actual operating frequencies are 30 per second for the vertical sweep and 3600 per second for the horizontal sweep. The output voltage of the sweeps as specified is just right to provide deflection of the beam to the edges of the proper sized picture on both the "ike" and the C-R viewing tube. The 902 type monitor C-R viewing tube was chosen because its deflection sensitivity matches the 1847 "ike," and thus the same saw-toothed waves can be applied to both for deflection purposes.

The linearity of the sawtooth waves generated by the multivibrators is quite good. That is to say the lines produced in the picture are fairly evenly spaced in a vertical direction, and the picture detail is not crammed at either edge of the picture in the horizontal direction.

The multivibrator type of sweep circuit was chosen because its voltage output is ample, with only one tube in each sweep. Blanking impulses are easily taken from this type of sweep as shown—employing a diode tube. When the unit is to be used as a television modulator, it is equally easy to get synchronizing impulses using a highly biased tube connected to each sweep. The highly biased tube allows only the peaks of the sawtoothed waves to cause plate current to flow. These amplified peaks are superimposed on the picture output signal from the ike and go to the video amplifiers. They go to the television transmitter, along with the picture signal and blanking impulses, and are used at the receiver to "trigger" the sweep oscillators there. This will be taken up in detail in a later article describing the use of the unit in conjunction with a Ham transmitter on the 2½ meter band.

The Power Supplies: Two power supplies are needed. A low voltage supply for the Videos and Sweeps; a high voltage supply for the beam voltage on the ike and monitor.

The power supply circuits for the unit used in the "two-way" Videophone are shown in Figure 4 (Fig. 4). Next month, a power supply unit for operating the second Videophone alone, will be published. The small filament transformer shown in the parts lists and marked "for 2nd Unit Only," is used when the voltage drop for the filaments is high, due to line losses. (Two must be ordered, one for video amplifiers, and a second for the IKE and monitor tubes.)

In the two-way Videophone the power supplies must supply two sets of Videos, one set of sweeps, two ikes, and two monitor tubes.

The voltages and filtering indicated were found ample for proper operation of unit.

Interconnection and Use: Multi-wire cables with plugs are supplied to admit of utmost flexibility of operation. In the "two-way" unit it is possible to plug in the

nearer monitor to the camera, and so make preliminary adjustments. It is then possible to plug in the distant monitor, with the assurance that a good picture is being sent out to it.

In these cables it was found necessary to use shielded leads for the sweep voltages. The sawtoothed waves which these constitute, are composed of a large number of harmonics (in order to obtain a sharp peak to the sawtooth). These harmonics tend to play hob with the picture signal in the tight cable. For optimum operation it is best, if transmitting the picture more than a few feet, to use a separate co-axial line for the video signal. Type No. 72-12 Amphenol flexible co-axial was found to give very fine results over distances of 100 feet. No doubt much greater distance is possible—but this was not tried. For short distances, however, a single cable was found O.K. The entire cable is encased in a shield to prevent stray pickup or radiation.

Small cables 3 feet long are provided to connect monitor to camera. A longer cable of the same type is provided for "one-way" Videophone operation. A large 11-conductor cable is used for connecting together the two sets of units for "two-way" Videophone operation. The use of Amphenol plugs and sockets with these cables made it very easy to change connections rapidly. The length of this latter cable is optional and may be quite short (8 or 10 feet) for "table top" demonstrations, or much longer for operation over longer distances. One of the fine points of the system is the flexibility provided by these cables and connectors.

Optical System: It was decided by the authors that since the picture resolution ability of the system is inherently limited, by the nature of the ike, to well below camera standards, it was foolish to make use of expensive lenses. Various lenses have been tried with varying success; many are yet to be tried. It was found that any lens having a 3" or so focal length and a large diameter gave satisfactory pictures. Even a double convex magnifier lens worked O.K. A lens of the type used in photographic enlargers is ideal. A projection lens from a 35 mm. movie machine is very fine too. In the next issue, specific recommendations as to a lens will be made. In the meantime it is recommended that the constructor use a cheap double-convex lens having 3" focus and large aperture.

The important thing to bear in mind concerning the optical system is that it must be *light-tight!* You are making a camera; stray light falling on the ike will cause "fogged" pictures just the same as in a camera using film. It is desirable to make the lens mount a tube which will slip into the ike support tubing. In this way no stray light can enter. The tubing keeps the light from hitting the ike except from in front. The lens mount restricts all light except that coming through the lens. A cap must be provided to keep light from the ike screen when the unit is not in use, as bright light focused on it by the lens can damage it.

The amount of light required for proper operation of the ike is about 3000 foot-candles. This may be obtained from sunlight or from two 200 watt bulbs, placed two feet from the subject. Fotoflood lamps may be used. If a lens having an aperture smaller than f/2.3 is used, the illumination must be proportionally increased.

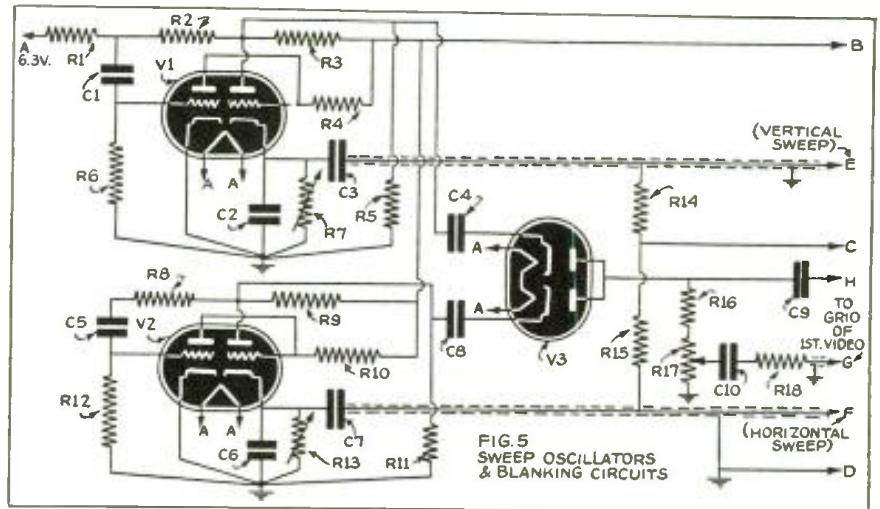


FIG. 5
SWEEP OSCILLATORS & BLANKING CIRCUITS

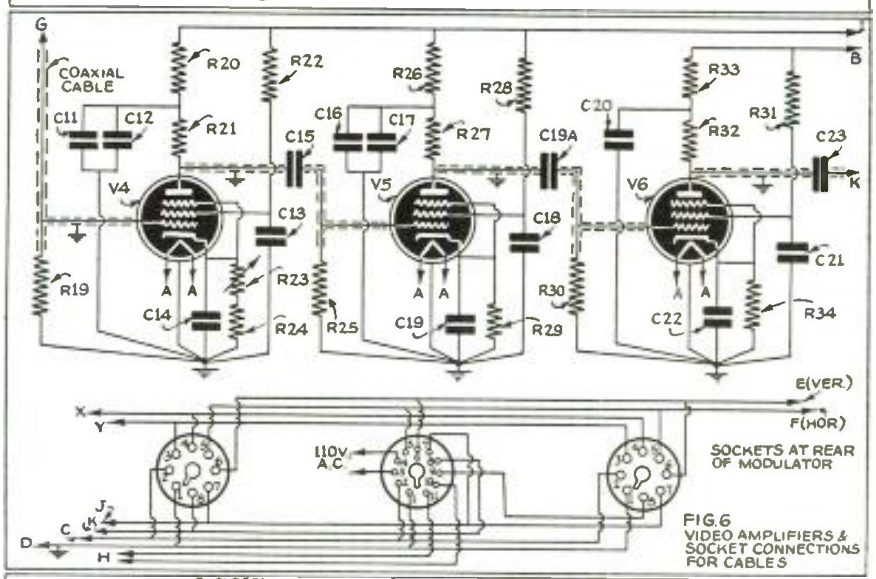


FIG. 6
VIDEO AMPLIFIERS & SOCKET CONNECTIONS FOR CABLES

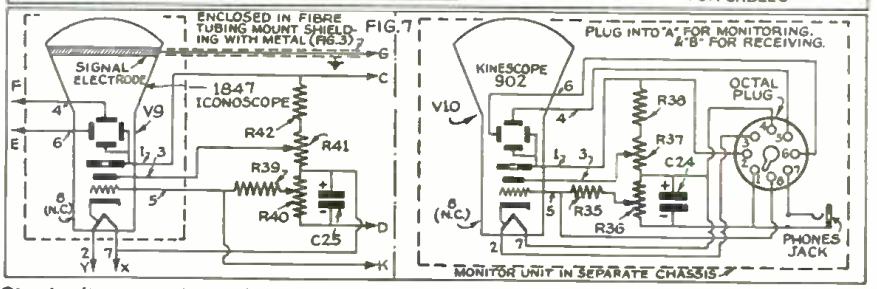


FIG. 7

Circuit diagrams above show how to connect up various resistors and condensers for the sweep oscillator and blanking circuits. Fig. 6 (center) shows video amplifier connections. Fig. 7—Connections to the kinescope tube.

Operating and Adjusting: Hints on adjusting and operating the units will be published next month. In the meantime the constructor will not find any great difficulty in getting the units assembled and running.

The R. & T. Videophone Parts List

RCA (Tubes)
1—1847 Iconoscope # —V9
1—902 Cathode Ray Tube # —V10
1—6AG7—V6 #

NATIONAL UNION (Tubes)
1—5U4 G—V7
1—80—V8
2—6C8 G—V1, V2
1—6H6—V3
2—1852—V4, V5 #

CORNELL-DUBILIER (Condensers)
C1—.002 mf., type 1W, Cat. No. 5D2
C2—.1 mf., type DT, Cat. No. 6P1
C3—.5 mf., type DT, Cat. No. 6P5
C4—.01 mf., type DT, Cat. No. 4S1
C5—.002 mf., type 1W, Cat. No. 5D2
C6—.002 mf., type 1W, Cat. No. 5D2
C7—.5 mf., type DT, Cat. No. 6P5
C8—.01 mf., type DT, Cat. No. 4S1
C9—.5 mf., type DT, Cat. No. 6P5
C10—.25 mf., type DT, Cat. No. 4P25
C11—4 mf., type BR, Cat. No. 435 #
C12—.002 mf., type 1W, Cat. No. 5D2 #
C13—4 mf., type BR, Cat. No. 435 #
C14—50 mf., type BR, Cat. No. 502 #
C15—.1 mf., type DT, Cat. No. 6P1 #
C16—4 mf., type BR, Cat. No. 435 #
C17—.002 mf., type 1W, Cat. No. 5D2 #
C18—4 mf., type BR, Cat. No. 435 #
C19—50 mf., type BR, Cat. No. 502 #
C19a—.1 mf., type DT, Cat. No. 6P1 #
C20—8 mf., type BR, Cat. No. 845 #
C21—8 mf., type BR Cat. No. 835 #
C22—50 mf., type BR, Cat. No. 502 #
C23—.1 mf., type DT, Cat. No. 6P1 #
C24—8 mf., type BR, Cat. No. 845
C25—8 mf., type BR Cat. No. 845
C26—.1 mf., type DT, Cat. No. 4P1
C27—.1 mf., type DT, Cat. No. 4P1
C28—8 mf., type KR, Cat. No. 5888-A
C29—8 mf., type KR, Cat. No. 5888-A
C30—8 mf., type KR, Cat. No. 5888-A

C31—4 mf., type KR, Cat. No. 504
C32—4 mf., type KR, Cat. No. 504
C33—16 mf., type KR, Cat. No. 516A
C34—16 mf., type KR., Cat. No. 516A

INTERNATIONAL RESISTANCE CO.
(All resistors are type BT-1 unless otherwise specified)

R1—1 megohm
R2—4000 ohms
R3—2000 ohms
R4—100,000 ohms
R5—1 megohm
R6—1 megohm
R7—150 M # ohm (150,000 ohm) pot. Type VC 8376
R8—4000 ohms
R9—2000 ohms
R10—100,000 ohms
R11—1 megohm
R12—1 megohm
R13—50 M ohm (50,000 ohm) pot. Type VC 8375
R14—1 megohm
R15—1 megohm
R16—200,000 ohms
R17—10 M ohm (10,000 ohm) pot. Type 11-116
R18—1 megohm
R19—5 megohms #
R20—4000 ohms #
R21—10,000 ohms #
R22—100,000 ohms #
R23—5000 ohm pot. # Type 11-114
R24—160 ohms #
R25—250,000 ohms #
R26—10,000 ohms #
R27—10,000 ohms #
R28—250,000 ohms # (M=thousand)
R29—1500 ohms #
R30—250,000 ohms #
R31—50,000 ohms # Type BT-2 (2—25 M (25,000 ohms) in series)
R32—2000 ohms # Type BT-2
R33—5000 ohms # Type AB
R34—300 ohms #
R35—50,000 ohms #
R36—100 M ohm (100,000 ohm) pot. # Type 11-128
R37—250 M ohm (250,000 ohm) pot. # Type D-11-130
R38—200,000 ohms #
R39—50,000 ohms #
R40—100 M ohm (100,000 ohm) pot. # Type 11-128
R41—250 M ohm (250,000 ohm) pot. # Type D-11-130
R42—200,000 ohms #
R43—50,000 ohms #
R44—20,000 ohms # Type ES

AMERICAN PHENOLIC CORP.
(Co-Ax. Cable, Sockets, etc.)

100 feet co-axial cable No. 72-12
1—4-prong tube socket No. SS4
4—No. SS8 sockets
3—No. SS8 sockets #
2—No. PF8 connectors #
2—No. PM8 connectors #
1—No. ACP8 plug #
2—No. RS8 sockets #
1—No. RS11 socket
1—No. PM11 plug
1—No. PF11 socket #
7—No. RPH rubber handles #
1—No. ACP11 (only for 2nd unit)
1—No. 61-M4 #
2—No. 913 C.R. assembly #
1—No. LD-1 die for punching socket holes, with keyway
1—No. 51-1 retainer ring hand tool for setting sockets

PAR METAL PRODUCTS CORPORATION

1—Cat. No. F-717 foundation chassis (7x17x3") #
1—Cat. No. BP-4515 bottom plate for above #

INSULINE CORPORATION OF AMERICA

1—No. 3801 metal cabinet (monitor chassis) #
1 foot No. 140 2¼" fenoline tubing #
2—No. 1233 toggle switches
2—No. 1551 grid caps
2—No. 1720 tube shield for 6C8 Gs
8—No. 1127 bakelite bar knobs (only 5 more for 2nd)
Spaghetti tubing—Nos. 182, 186 and 201
5—No. 2437 terminal tie points
1 Can No. 2801 crystalline paint for touch-up work

AMERICAN MICROPHONE CO., INC.

1—AT2 carbon microphone

AMERICAN RADIO HARDWARE CO., INC.

2—No. 128 phone plugs #
3—No. 89 phone jacks #
2—No. 39 panel indicator brackets
Miscellaneous hardware, grommets, brackets, etc.

THORDARSON ELECTRIC MFG. CO.

T1—Type No. T-17R30 power transformer
T2—Type No. T-13R12 high voltage power trans.
T3—Type No. T-72A59 mike transformer #
Type No. T-61F85 filament trans. (for 2nd unit only)
L1—Type No. T-17C00-B filter choke

MISCELLANEOUS

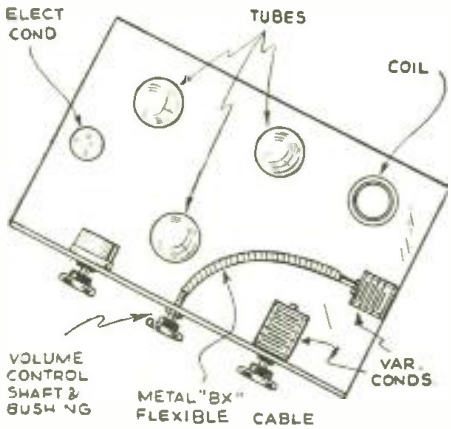
Solid conductor tinned push-back wire (various colors)
Rosin core radio solder
No. 14 tinned bus wire
Line cord
Tape (rubber and friction)
Small flashlight cells for mike battery
Shielded conductor
Shielding braid
Battery cable
Pilot lights
Sheet metal

[The parts marked # are to be ordered twice if 2-way communication is desired. That is, one complete camera, one camera with videos, ike and fil. transformer only, and two identical monitors.—*Ed.*]

The Cover Kink
First Prize Winner

Flexible Condenser Drive

I recently needed an additional condenser mounted on the front panel of my set, but there was no space for it; therefore I resorted to the stunt here illustrated. I mounted the variable condenser on the chassis and arranged to turn it with a flexible shaft. For this purpose I used a piece of ⅜" BX cable and soldered one end of it to the shaft of the variable condenser. The other end of the cable I soldered to an old variable resistor knob and this was mounted on the panel.—*Homer L. Davidson.*

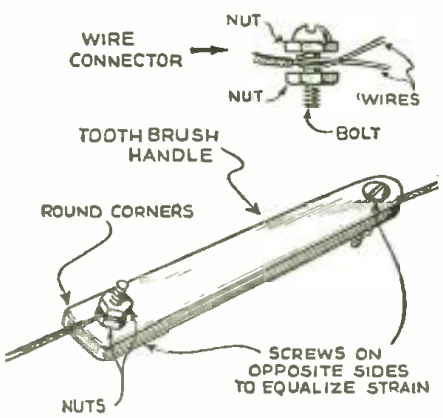


A piece of flexible cable or shaft, used in the manner shown above, often proves useful to the radio set-builder as the control knob may be mounted at right-angles to a condenser or other apparatus.

Two Useful Kinks

When a low-resistance temporary connection is desired, thread two nuts on a screw; any size will do, twist the two or more wires desired for the connection between the two nuts, and tighten.

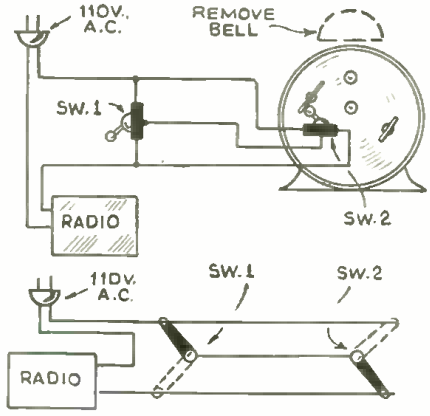
An excellent four-inch insulator can be made by sawing off the plastic handle of a discarded toothbrush at the base, inserting a nut and bolt through the hole at one end and drilling a small hole in the other end for the same purpose. The wires are attached by threading another nut on the screw at each end, fastening the wire to this.—*Franklin Williams.*



The illustrations above show how to make a temporary connection between two or more wires, by using a stove bolt and a couple of nuts. The second picture shows an improvised insulator made from a piece of old toothbrush handle.

Automatic Timer

As I have the common habit of falling asleep with my radio still playing, I devised the outfit described at very little expense.



The automatic alarm clock circuit shown here will provide a very pleasant and sure-fire alarm.

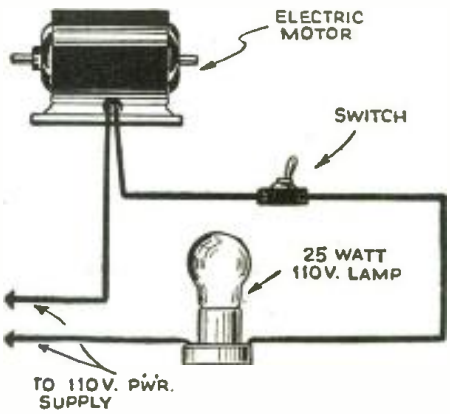
After buying two single-pole, double-throw toggle switches, I rummaged an old alarm clock from the attic. After removing the bell, I soldered one of the switches to the back, in such a position that when the alarm went off, the winding key snapped the switch to its opposite position.

The second switch, which I mounted on my radio cabinet, when wired up as shown in the accompanying diagram, determines whether the clock mechanism opens or closes the circuit.

This automatic timer, when completed, may be used to turn on or off, radio sets, electric signs, motors, etc. But you'll have to get back into the habit of winding the clock!—*R. L. Hawks.*

Reducing Motor Speed

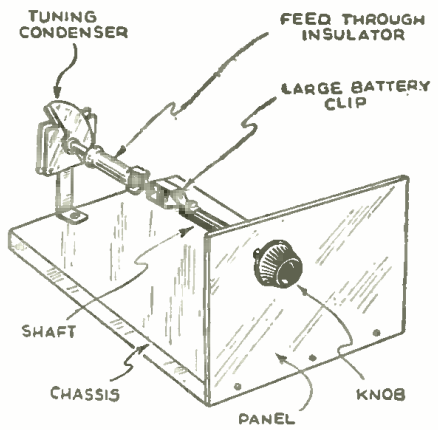
I recently found that my electric phonograph motor ran at too high a speed. Here is the way I leveled the speed to 78 revs. per minute. I connected a 25 watt, 110 volt lamp in series with the motor, as the diagram shows. The size of the lamp may vary, depending on the line voltage and the design of the motor.—*Ensign Courter.*



A 110 volt lamp connected in series with a motor will lower its speed; the larger the lamp the faster the motor will run.

U. H. F. Coupling

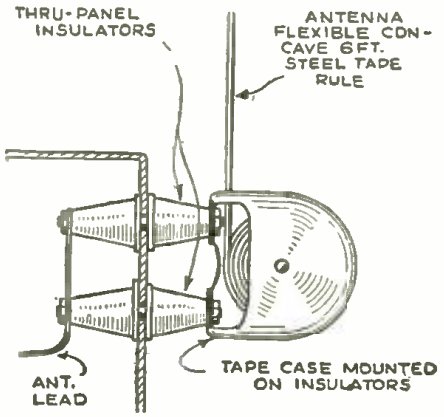
Take a porcelain feed-through insulator and connect one end of it to the tuning condenser by forcing it on with the use of small wooden chips. Clamp a large battery clamp on the other end of the insulator and solder a small piece of shaft to the clip. Put the shaft through the panel, mount a knob, and you have a good coupling unit. —*Alfred Letcher.*



A good coupling for ultra-high frequency circuits is shown above. It is made from a section of insulator and a large battery clip.

Steel Rule Antenna

A six-foot steel rule, of the concave type, makes an excellent antenna for portable radio sets. It is especially convenient for transmitters, since the radiating portion can be adjusted quickly to the exact length desired. Two midget-size feed-through insulators make an excellent support.—*Robert Young.*



The familiar steel pocket rule of the concave type can be used as a variable length antenna as here shown.

RADIO KINKS published on these pages will win their senders 8 months' subscription to RADIO & TELEVISION. The *best* kink published each month will win a *2 years'* subscription. Read these kinks; they will be of real use to you, besides indicating what is wanted. Send a typewritten or ink description with sketch of *your* favorite to the Kink Editor

THIS BEAUTIFUL DESK for only $1.00 EXTRA

WITH ANY REMINGTON PORTABLE TYPEWRITER

A beautiful desk in a neutral blue-green which will fit into the decorations of any home—trimmed in black and silver—and made of sturdy fibre board—is now available for only one dollar ($1.00 extra) to purchasers of a Remington Noiseless Portable Typewriter. The desk is so light that it can be moved anywhere without trouble—it is so strong that it will hold six hundred (600) pounds. With this combination of desk and Noiseless Deluxe Portable Typewriter, you will have a miniature office at home. Learn the complete details of this offer. Mail the coupon today.

The

COMBINATION

FOR AS LITTLE AS 10c A DAY

How easy it is to pay for this combination of desk and Remington Deluxe Noiseless Portable Typewriter! Just imagine, a small good will deposit with terms as low as 10c a day to get this combination at once! You will never miss 10c a day. Yet this small sum can actually make you immediately the possessor of this amazing office at home combination. You assume no obligations by sending the coupon.

MONEY BACK GUARANTEE

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To help you even further, you get free with this special offer a 32-page booklet, prepared by experts, to teach you quickly how to typewrite by the touch method. When you buy a Noiseless you get this free Remington Rand gift that increases the pleasure of using your Remington Noiseless Deluxe Portable. Remember, the touch typing book is sent free while this offer holds.

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ALL ESSENTIAL FEATURES of large standard office machines appear in the Noiseless Portable—standard 4-row keyboard; back spacer; margin stops and margin release; double shift key and shift lock; two color ribbon and automatic ribbon reverse; variable line spacer; paper fingers; makes as many as seven carbons; takes paper 9.5″ wide; writes lines 8.2″ wide. There are also extra features like the card writing attachment, black key cards and white letters, touch regulator, rubber cushioned feet. These make typing on a Remington Deluxe Noiseless Portable a distinct pleasure. Thousands of families now using the Remington Deluxe Noiseless Portable know from experience how wonderful it is!

MAIL COUPON NOW!

Remington Rand Inc., Dept. 300-12
465 Washington St., Buffalo, N. Y.

Tell me, without obligation, how to get a Free Trial of a new Remington Deluxe Noiseless Portable, including Carrying Case and Free 32-page Typing Instruction Booklet on terms as low as 10c a day. Send Catalogue.

Name.....

Address.....

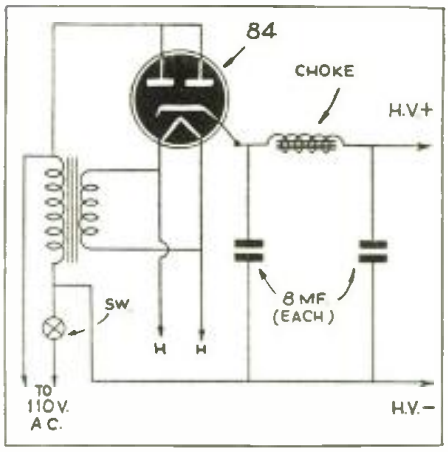
City.....State.....

Diagrams of Interest

This is a new department. If you have a new Hook-Up, send it along; a pencil diagram will do. Be sure to include a brief description.

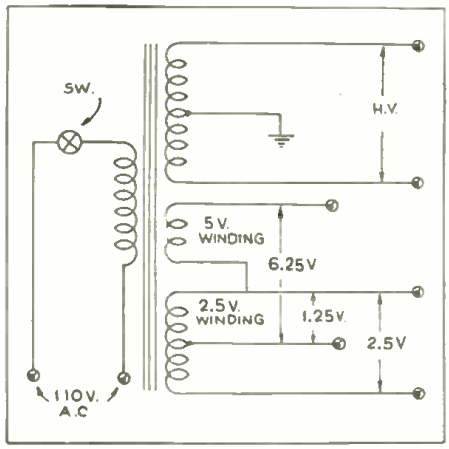
All diagrams and descriptions accepted and published will be paid for at regular space rates. Diagrams may be for receivers, adapters, amplifiers, etc. Send them to Hook-Up Editor, RADIO & TELEVISION, 20 Vesey St., New York City.

COVER FEATURE

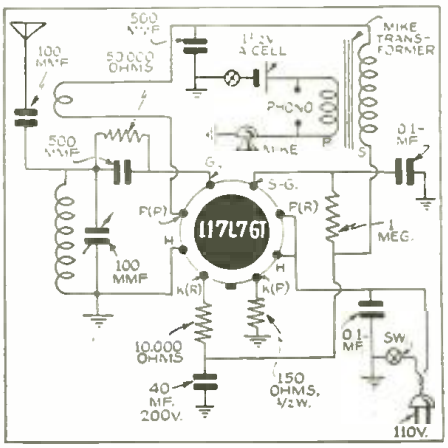


This power-suppy circuit, contributed by Bernard Cross, is intended for a one- or two-tube receiver. Transformer is a bell-ringing type, with output of 6 to 8 vts. Connect to ground through condenser only.

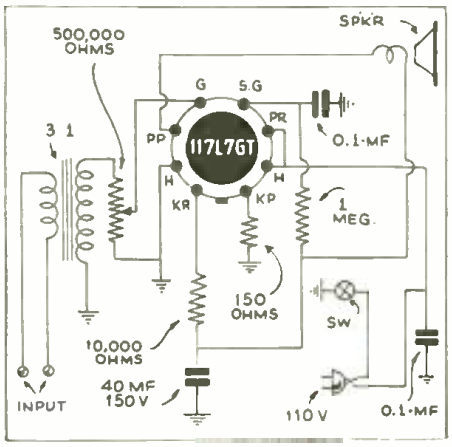
HOW TO OBTAIN 6.25 VOLTS



Circuit above sent to us by Jacob P. Frankel, shows how to connect the 5 volt and 2.5 volt windings of a transformer, so as to obtain 6.25 volts. Be sure the two windings are connected in phase.

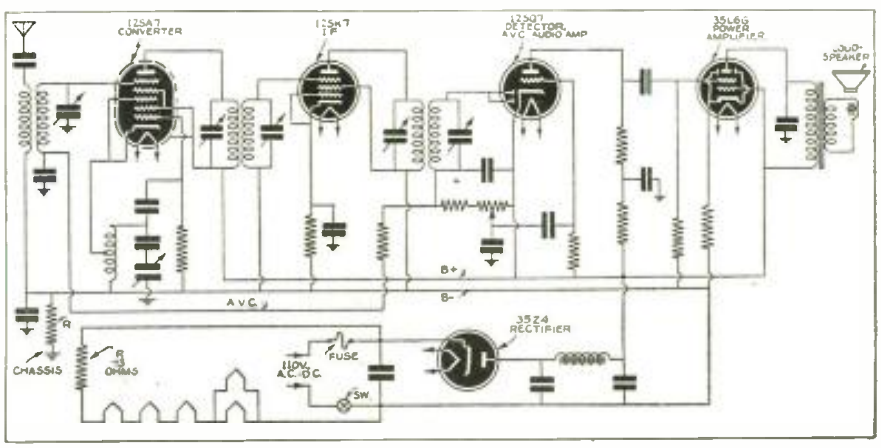


Electrified parlor transmitter (after original battery circuit by H. McEntee) uses 117L7GT tube. Coil may be a midget BC oscillator coil. Will talk through BC receiver without direct connection.—R. Jones.



1-tube electric amplifier. This circuit also contributed by Robert Jones, shows how to rig up a handy 1-tube amplifier which will operate from 110 volts A.C. or D.C. Half of the tube operates as rectifier.

WHAT'S WRONG WITH THIS DIAGRAM?



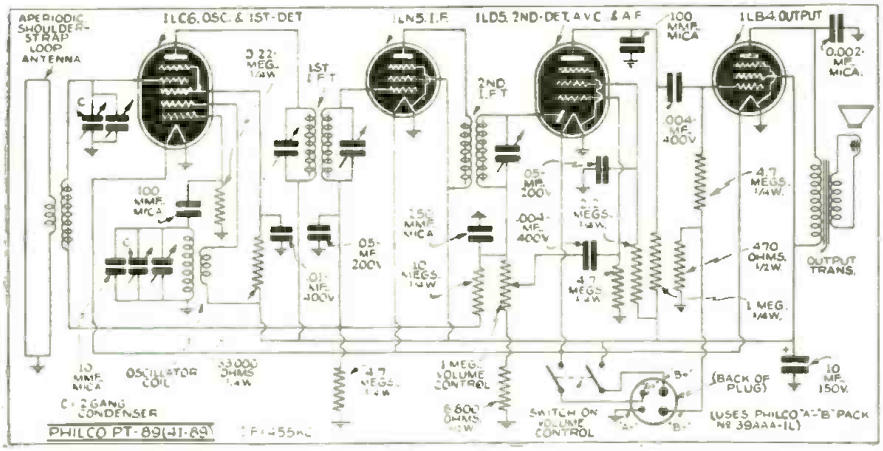
Be honest with yourself and study the diagram above for at least 3 minutes before turning to the answers on page 501.

to the Radio Experimenter

CIRCUIT OF NEW PHILCO PORTABLE RECEIVER

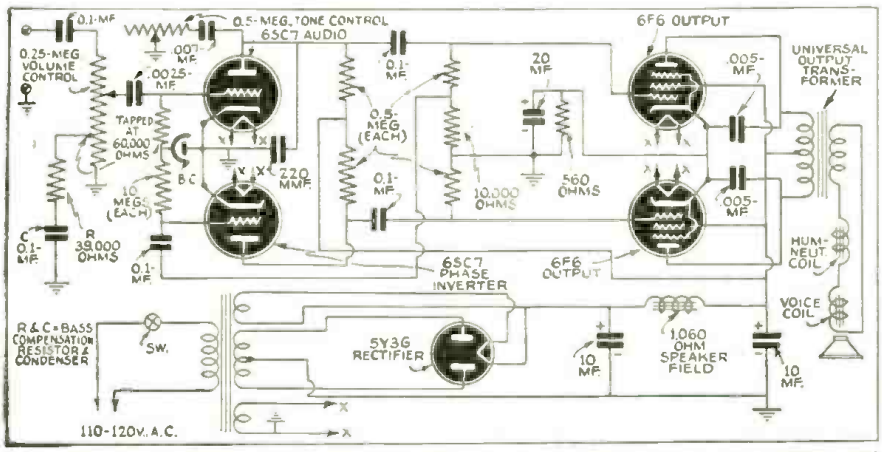
● THE new Philco portable receiver, which can be strapped over the shoulder like a camera, is shown herewith. This receiver is very interesting and especially its circuit, which is given below. The set itself measures less than 5" high, 10" wide, and 4" deep. The aerial is self-shielding and it is braided and woven within the carrying strap. The circuit employs four of the newest type, low drain battery tubes, and a self-contained battery block.

A new type lightweight permanent-magnet loudspeaker makes possible a clear tone, and the sound issues through slots in the side of the case. The radio experimenter will find this circuit very interesting, and since some of the latest type battery tubes may be employed, many valuable experiments may be carried out with it.



Wiring diagram of the new Philco 4-tube portable receiver; the aerial is in the form of an aperiodic loop, built into the shoulder strap supplied with the set.

HIGH QUALITY AUDIO AMPLIFIER



This amplifier circuit, contributed by Stanley Dowgiala, shows how to build up a powerful amplifier which can be used in connection with a radio set, or a phono pickup, etc. This circuit includes a phase inverter, a tone control and a bass compensator circuit. By using a universal output transformer, practically any loudspeaker may be matched to the amplifier.

NOTICE TO CIRCUIT HOUNDS!!

● Come on fellows, send us along some of your interesting 1- 2- and 3-tube hookups, whether they are *Parlor-Transmitters*, *Receivers* or what not—just so long as they are good "working" circuits which you have tried out. The diagrams should be drawn in ink but do not have to be finished drawings as we redraw all circuits for publication purposes. Be sure to include a brief description, giving the good points about the circuit and what it does—100 to 150 words is usually sufficient, including your name, address, and in the event that it is not published please include a 3c stamp for return.—Editor

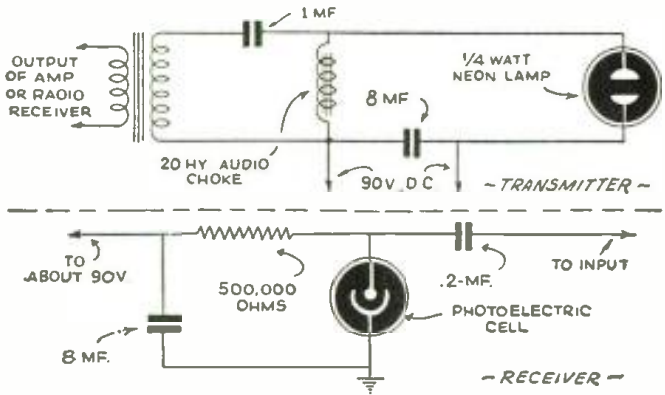
Edited by Herman Yellin, W2AJL

Talking Over a Light Beam

I would like to experiment with transmission of voice over a light beam. Can you furnish me with a hook-up?—J. Madonna, Kearny, N. J.

A. The diagrams show the equipment necessary to accomplish this. The two amplifiers that will be needed have not been shown, since they can be of any type. The transmitter will need a low-power amplifier of about 3 to 5 watts and this modulates the one-quarter watt neon bulb. Most radio receivers should have sufficient output to be used for this purpose. A reflector mounted back of the neon bulb and a double lens can be used to focus the light beam.

The receiver uses a photo-electric cell connected to a high-gain amplifier. If you can get hold of one of the old selenium cells, the amplifier will not have to be of the high gain type. Use a lens in front of the cell to focus the light rays on it.

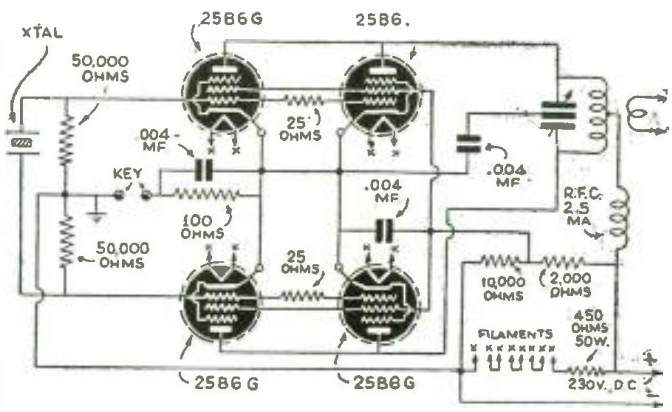


The diagrams above show simple transmitter and receiver hookups for the transmission of speech over a light beam. The Neon lamp will follow the rapid voice current fluctuations. (No. 1239.)

Self-Excited C.W. Transmitter

Please print diagram of a self-excited CW transmitter that could be operated from a 230 volt D.C. line.—L. Lawson, Louisville, Ky.

A. The use of the 25B6G tubes is ideal for your purpose. Four of them connected in push-pull parallel as an oscillator will deliver about 30 watts of R.F. Having 25 volt filaments, they can all be connected in series with a 450 ohm, 50 watt resistor across the line. Use a split stator tuning condenser having 140 mmf. per section. Standard coils can be used.



Hookup for a self-excited CW transmitter for operation on a 230 volt D.C. line. (No. 1240.)

160 Meter Phone

Will you please furnish me with a diagram of the simplest 160 meter phone transmitter that will pass F.C.C. requirements.

A. The diagram contains full information on a "rig" successfully used by W8NCM. The Pierce crystal oscillator requires no tuned circuits. The use of a mica blocking condenser removes the customary plate voltage from the crystal. The amplifier plate circuit

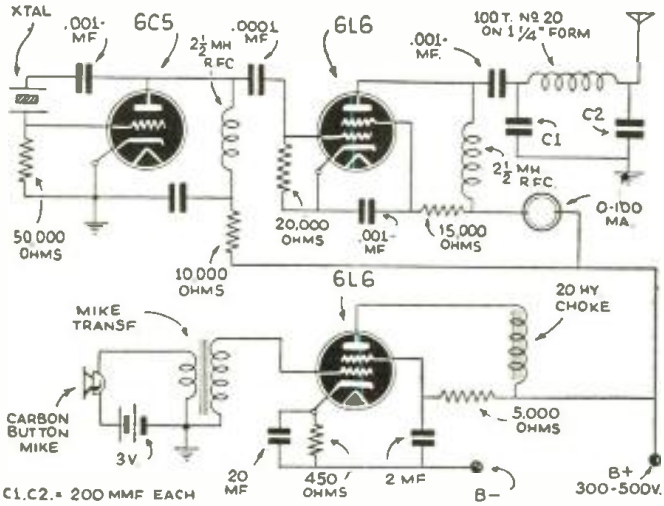


Diagram for 160 meter phone transmitter used successfully by W8NCM. The Pierce crystal oscillator is used. (No. 1241.)

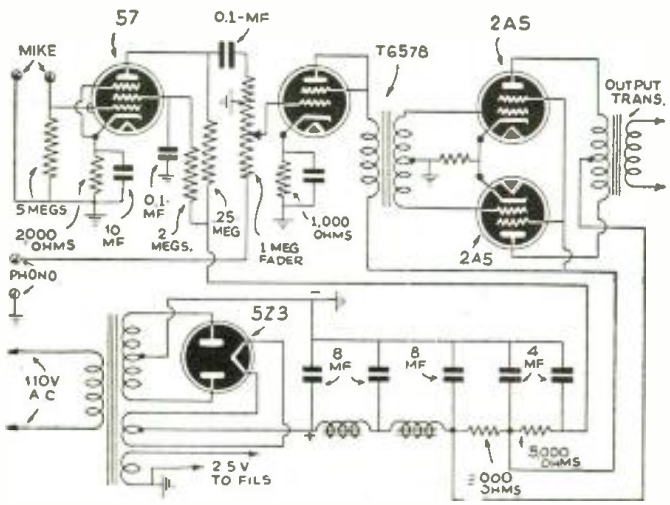
is also untuned and requires no neutralization. The antenna tuning network will permit of operation on 160 and 80 meters. Almost any wire can be used for an antenna, but it is best to have it somewhere near a half wavelength long. Condenser C-1 is for a plate current dip, while C-2 will determine the plate current at the dip caused by C-1. The transmitter should be operated straight through—that is, the "final" on the crystal frequency. The 6L6 modulator furnishes more than enough audio power.

This transmitter can be used on CW by disconnecting the plate voltage to the modulator and keying in 6L6 amplifier cathode.

20-Watt Amplifier

Will you please print me a diagram of a fifteen- or twenty-watt amplifier for a dynamic mike and phono pick-up, resistor-coupled, using a 2A5 driving two 2A5 tubes in the "final" to a dynamic speaker? The power supply here is 110 volts, 60 cycles A.C.

A. Here is the diagram you request.



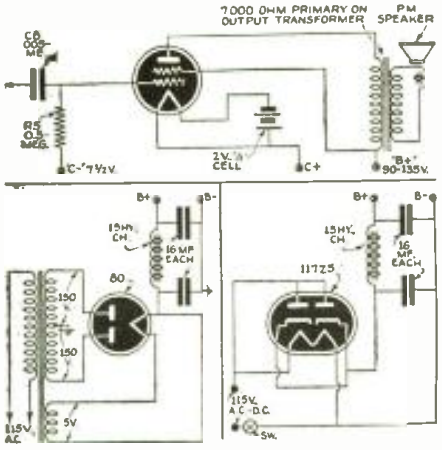
Circuit for 20-watt audio amplifier; it may be used in connection with a microphone or with phonograph pickup as the diagram shows. A well-filtered power-supply is included and it operates from 110 volt, 60 cycle A.C. circuit. (No. 1242.)

Queries to be answered by mail (not on this page) should be accompanied by fee of 25c (stamps, coin or money order). Where schematic diagram is necessary, our fee is 50c up to 5 tubes; for 5 to 8 tubes fee is 75c; over 8 tubes, fee is $1.00. *No picture diagrams can be supplied.*

Radio Piano

? *I would like to construct a radio piano (refer to your Feb. 1938 issue). First—is the total tonal range restricted to 16 notes? Or can this be extended to include sufficient keys to cover all or a goodly portion of the range covered by a mechanical piano? Would you advise using a 3-1 transformer between the 1A6 driver and 33 power tube? Is it necessary to use a "C" battery with the 33 tube in the circuit? If so, where should it be connected? Could a power-pack be used in connection with this circuit, instead of "B" batteries?*

A. With reference to your questions on the electronic piano described in the February, 1938, issue, the principal point to understand is that the two tubes used ("30" and "1A6") comprise two R.F. oscillators, whose frequencies are close together, so that their *difference* frequency comprises an *audio* (audible) frequency note. The range of the instrument is therefore unlimited and as many keys as desired can



be used with the notes running to as high a frequency as needed. However, only one note at a time can be played—if two keys are struck at the same time, a single note, lower in frequency than either of the two, will result. Regular commercial electronic pianos contain separate oscillators for each note, and if you wish to be able to sound two notes at a time, it will be necessary to use duplicate oscillators similar to the one shown in the article and all fed into the amplifier. An audio transformer is unnecessary to couple the oscillator to the "33" power tube. Merely connect the grid of the tube, the terminal marked "to G of 33" on the diagram in the February issue.

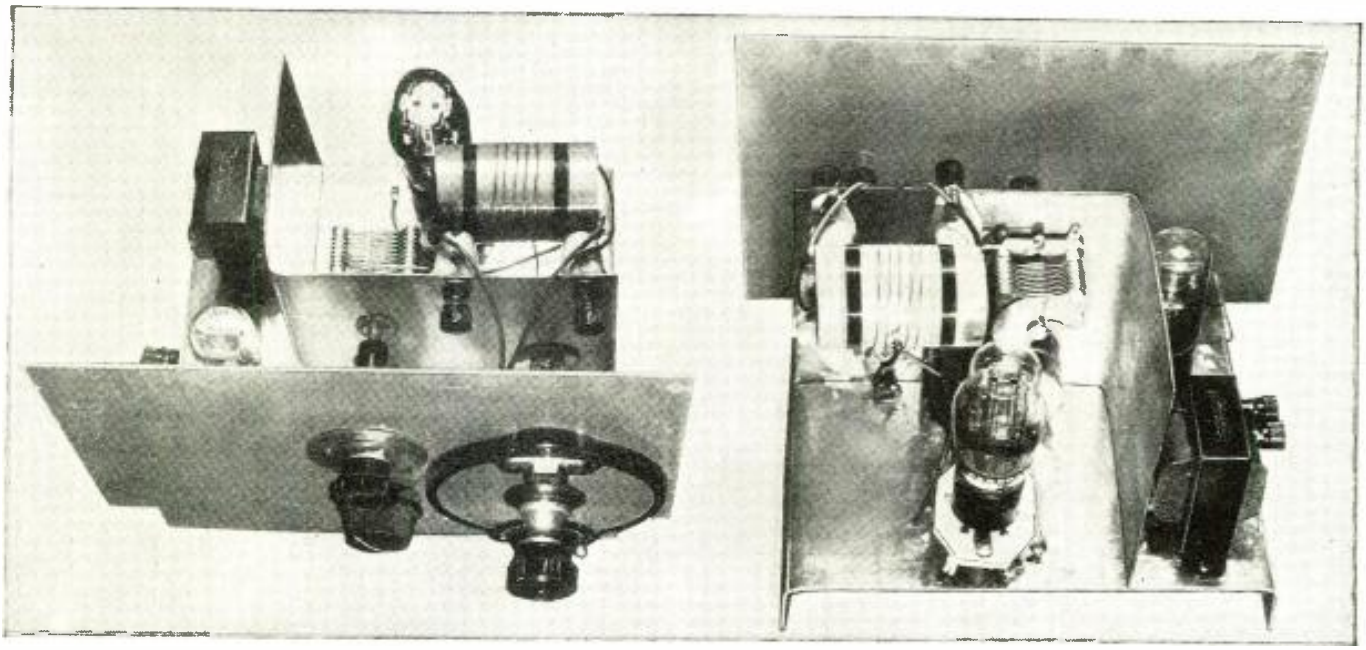
A power-pack could be used with this equipment, and one is shown in the diagram.

Incidentally, the small tuning condensers used for the individual notes can be 30 mmf. mica trimmers.

Code Practice

? *I was interested in the method shown in the Kinks section of the June issue on using the constant signal from WWV for code practice. I placed a key in series with the headset of my receiver, but the signals are unsteady.—H. Newton, Brooklyn, N. Y.*

A. This system of securing a signal for code practice is suitable only when the signal does not fade. However, WWV can be heard in most locations with a very good signal, although there may be certain hours of some days when the signal fades.



Front and rear views of the "push-pull" regenerative receiver.

A 2-Tube Push-Pull Regenerative Receiver

Robert Bayne

The author states—"This set has shown remarkable ability to receive *foreign* stations and receives many of them on a loudspeaker! Since it employs only two tubes, I believe this rather remarkable and trust it will be of interest to your readers."

● THIS set was designed primarily for the beginner and incorporates simplicity with extreme selectivity. During the period in which it was tested it received not only a host of American stations but many European stations as well. Some of the European stations were worked using a loud speaker, which furnished comfortable room volume.

The detector circuit is somewhat unusual as it uses a center-tapped tuning coil with outer ends connected to the grids of a dual type '19 tube. Two tickler coils are placed each side of the grid coil so as to provide regeneration. Two variable resistors of 50.000 ohms resistance each are connected across the tickler coils to control regeneration. For ease of operation these are ganged to a single shaft.

The audio amplifier is of standard design, employing impedance coupling from the detector to the grid of the 1C5-G output tube. Sufficient volume is obtained with this arrangement to operate a speaker on signals of strong or moderate strength. Weaker signals may be heard quite easily on earphones.

In constructing the receiver it will be necessary to shield the detector from the audio tube and the coupling choke. Otherwise feed-back may result between the two stages, due to the strong regenerative action present in the detector. Extension shafts are used for all controls to eliminate hand-capacity effects. Small condensers and resistors are mounted underneath the chassis.

Naturally all leads should be as *short* as possible for best results. This is especially true of the plate leads and the wiring connecting the variable condensers across the tuning inductance.

The coils used in this receiver are home-made and were wound on a bakelite tube two and one-half inches long, by one and one-half inches in diameter. Plug-in coils were not used on my receiver, but may be easily contrived in the following manner.

On each coil mount a row of nine small sized banana plugs, which are connected respectively to the leads from the tickler coils, the grid winding, the center tap, and the antenna coil. On the shield panel directly above the vernier tuning condenser, mount a strip of bakelite containing a corresponding row of jacks connected into the proper parts of the detector circuit. Thus the receiver may be made to cover a wide band of frequencies.

Coil Data

All coils wound on bakelite forms, one and five-eighths inches in diameter.

All grid windings are spaced to occupy length of one inch.

The grid windings are wound with No. 20 tinned copper hook-up wire.

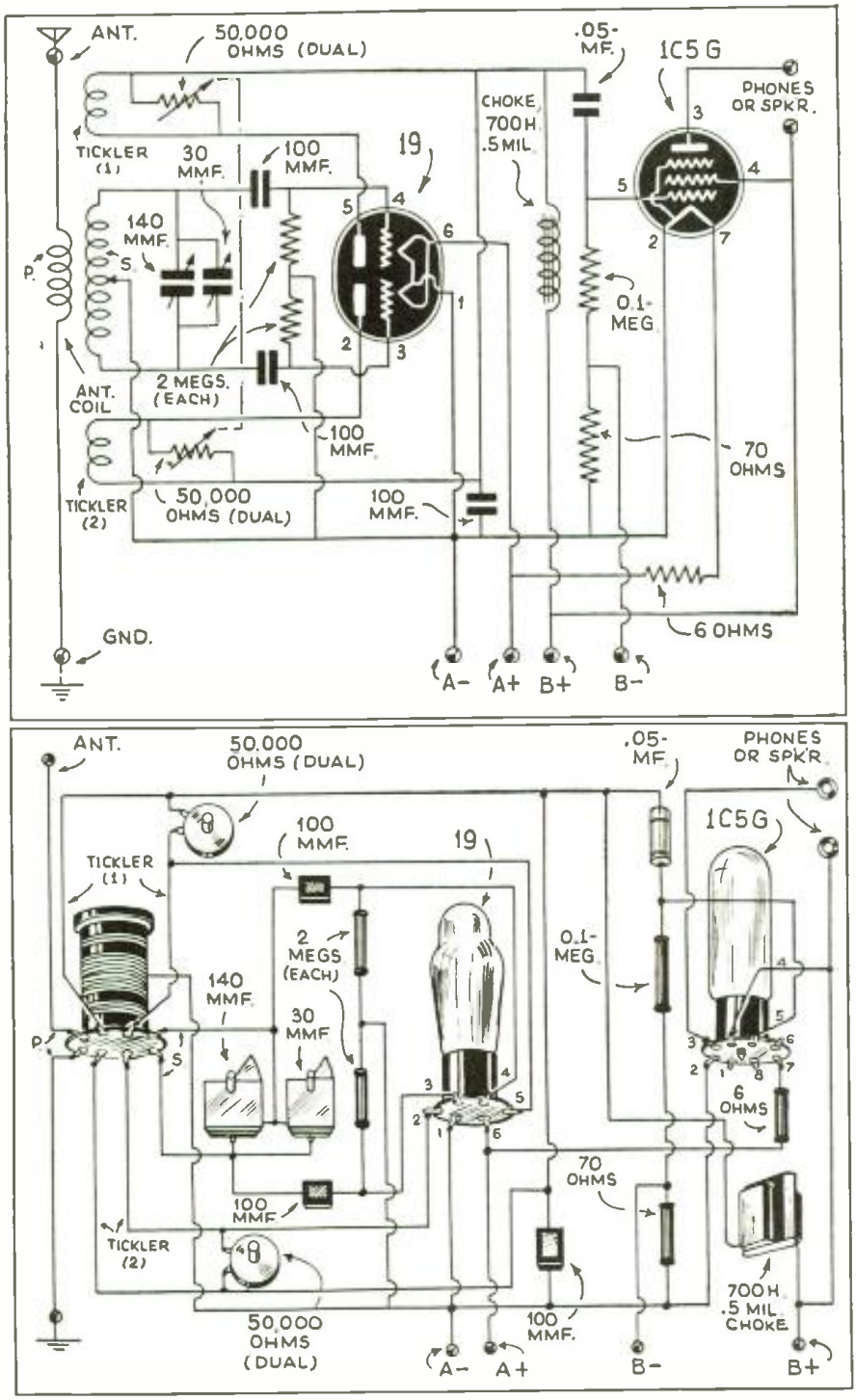
The tickler coils are wound with No. 26 enameled magnet wire.

10 to 20 meter coil
Grid coil—6 turns
Tickler coil—11 turns
20 to 40 meter coil
Grid coil—8 turns
Tickler coil—14 turns
40 to 80 meter coil
Grid coil—18 turns
Tickler coil—16 turns

After the coils are wound they should be coated with coil dope to preserve their electrical characteristics. All grid coils are center-tapped.

Parts List

One variable condenser .00014 mf.
One variable condenser .000015 mf.
Three fixed condensers .0001 mf.
One fixed condenser .05 mf.
One variable resistor (dual) 50.000 ohms
Two resistors 2 meg. each
One resistor 100.000 ohms
One resistor 70 ohms
One resistor 6 ohms
One 700 henry plate coupling choke
One six-prong tube socket for above panel mounting
One octal tube socket
One type '19 tube and one type 1C5-G tube
Two eight by ten aluminum panels
Hook-up wire, binding posts, etc.
One foot of bakelite tubing one and five-eighths inches in diameter
Coils of No. 20 wire and No. 26 magnet wire



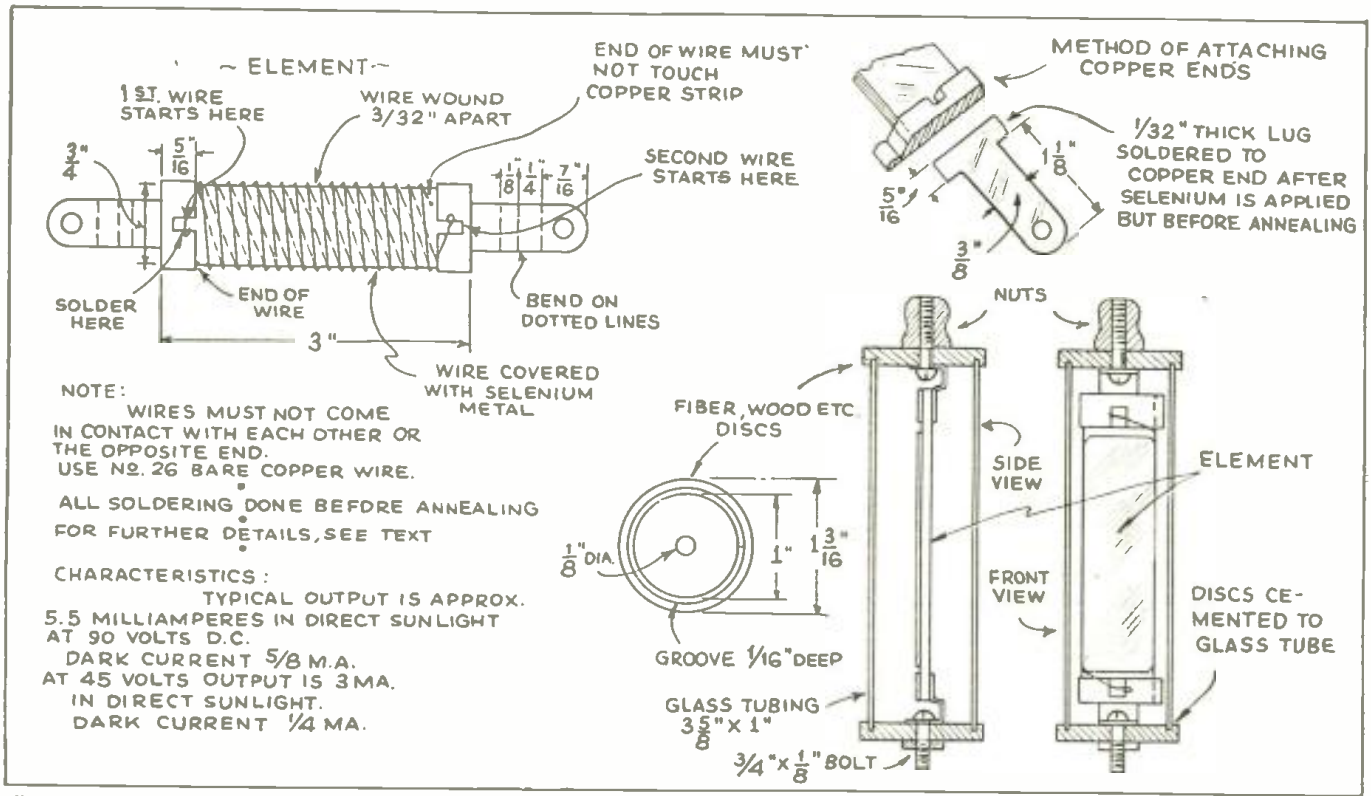
It's a cinch to build this fine 2-tube receiver by following the simple schematic and picture diagrams presented herewith.

ANSWERS FOR THE PUZZLE DIAGRAM APPEARING ON PAGE 496

1. In the first tube, a 12SA7, the signal is fed to the suppressor grid instead of the control grid; also the control grid is grounded, which is wrong.
2. The 12SK7 I.F. tube signal is fed to the suppressor grid instead of the control grid; the control grid is grounded, which is also wrong.
3. The connections to the rectifier tube are reversed.
4. The grid of the 12SQ7 should go to B– instead of B+.
5. All the tube filaments should be connected in series; the series-parallel connection on two of the tube filaments is wrong in this case.
6. The plate of the 12SK7 goes to B– instead of B+.
7. The grid connections to the 35L6 tube are reversed.
8. The lower end of the grid coil of the 12SK7 I.F. tube should go to the AVC lead and not to B–.

How to Make Your Own Photo-Electric Cell (Selenium Type)*

Martin D. Koehler



The drawing herewith shows how to construct a selenium-type photo-electric cell. When light falls on the cell its electrical resistance is lowered, permitting more current to flow and thus operate a sensitive relay or other device.

● THE Photo-Electric Cell is a very important tool of science today. In general there are three types of cells:

1. The Emissive Cell, which consists of two electrodes, one of which is sensitive to light, enclosed in a glass tube, either evacuated or containing a minute quantity of an inert gas. When light strikes the sensitive electrode electrons are freed in proportion to the intensity of the light. These electrons are drawn, by a positive potential, to the other electrode, thus producing a small current.

2. The Photo-Voltaic Cell is of the self-generating type.

3. The Photo-Conductive Cell is a device in which the resistance of a material is lowered when illuminated. There are many materials that show this effect, Rocksalt, Molybdenite, Lead halides, Selenium, etc., Selenium being the most active and most generally used in this type of cell. It is the conductive cell that we are concerned with here.

Construction Detail: First cut a piece of window glass, 3 in. long by 3/4 in. wide, this is to act as the base for the electrodes. Next cut 2 strips of copper sheet (about 1/100 in. thick, or less) 5/16 in. wide and 2 1/2 in. long. These are fastened to the ends of the glass plates (see print) by folding the strips over the end of the plates and rolling and squeezing the two ends together with a pair of long nosed pliers. Now take a sharp razor blade and make two cuts about 1/8 in. apart in the copper and bend up the piece between the cuts. This piece acts as a hold and connection for the electrode wire. Do this on both ends of the plate (see print). Next comes one of the most important operations, forming the electrodes. Take a length of No. 26 copper magnet wire (bare) and form a small hook on one end. This is hooked on the projecting piece of copper on one of the plate ends. Now wind the wire on the glass between the two copper ends, leaving a space 3/16 in. between windings. When the wire is wound to approx. 1/8 in. from the opposite end, clip off the remaining wire and hook the end on the edge of the glass plate. Do not allow this end to touch the opposite copper strip. This is most important. Now repeat the same procedure, starting with the other copper strip, and wind the second wire between the windings of the first wire. At no point must the wires touch each other or the opposite copper ends. You now have a gridwork of two separate wires which act as the electrodes of the cell.

The next step is to apply the light-sensitive material, which is selenium. This metal comes in either stick or powder form. In this case, the powder must be used. Place 1/2 or 1/4 oz. of this powder in an old pepper shaker. Now spread the powder very uniformly over the grid wires. Put on enough to cover the wires well. It is best to leave the small space between the wire ends and copper ends open. Do not put on too much or the sensitivity will be decreased. Place the cell on a copper or other metal plate and heat in a gas flame (kitchen range will do) till the powder melts. Now take a stiff piece of paper or light cardboard 3/4 in. by 4 in. and spread the molten selenium evenly over the wires. **Don't inhale the fumes!**

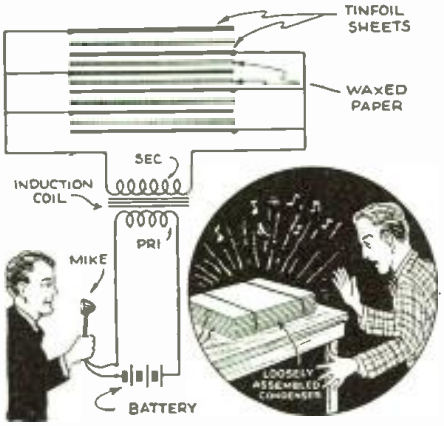
After the selenium is smoothly spread, remove plate and allow to cool (in cold air if possible). If any holes appear in the selenium, add a little more powder and remelt.

Annealing: This is the most important step of all. After the cell has cooled off, place in oven and anneal it for 4 hours at a temperature between 183 and 187 degrees CENTIGRADE. This is very important so employ an accurate thermometer and check the reading occasionally. (Do not allow oven door to remain open too long.) You may have to experiment some with the annealing time and temperature as selenium from different sources differs in its characteristics. The time and temperature is usually about the same as specified here. After it has annealed for the required time, remove the cell from the oven and allow to cool. When it is sufficiently cool, apply two coats of lacquer. This is to prevent excessive moisture and oxygen from harming the cell, which is very important. Use only a lacquer which has a high Dielectric Constant (insulating qualities). The lacquer used to coat radio-frequency coils is ideal and can be obtained from almost any radio supply house.

TALKING CONDENSERS!

Cover Feature

● THE secret of the *talking condenser* lies in the fact that the alternate sheets of tin-foil and wax paper used in making up the condenser are not tightly clamped, but are held loosely with a couple of rubber bands or even allowed to lie in a loose pile. The condenser itself may be made up of 12 to 15 sheets of waxed paper, measuring about 5" by 7" and between every 2 sheets of paper, tin-foil or other thin metal leaves measuring ½" smaller all around than the paper are interspersed. Every other tin-foil leaf is connected to a common terminal as the diagram shows. The induction coil used

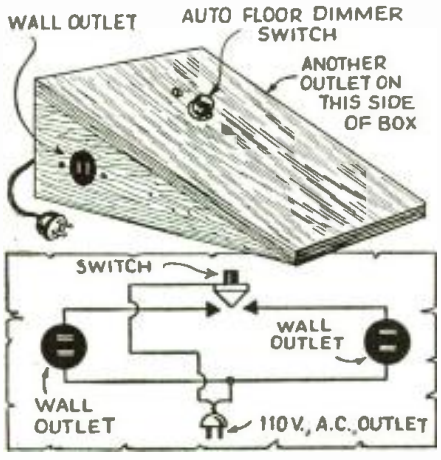


to excite the condenser may be a telephone type coil, an old shocking coil or a small spark coil; even an ignition coil may be used in a pinch. An ordinary microphone is connected in series with a battery of a few dry cells and the primary winding of the induction coil. The condenser really forms an electrostatic loud-speaker, and as the fluctuating electric charges caused by speaking into the microphone reach the condenser leaves, they vibrate in unison with the voice.

2-Way Foot Switch

● THE foot switch described here is easy to make, has a variety of uses, and gives good service for years. I use it for printing, enlarging, and when I paint on canvas from colored transparencies.

The whole thing is wired in a box with a slanting top. A hole is cut on the top for the switch and one on either side for the the outlets. The plug is fastened to one end of the cord and the other end goes into the box.—*Zoltan T. Bogar.*



See our new offer of FREE PARTS with your subscription on Page 511.

Digest of Recent Radio Patents

ULTRA-HIGH FREQUENCY OSCILLATOR

● THIS patent, No. 2,216,170, was recently issued to Roscoe H. George, and relates particularly to oscillators for developing ultra-high frequency currents. One of the objects of this invention is to provide an oscillator which will be stable in operation and which will also supply a fixed fundamental frequency as determined by the physical dimensions of the oscillator alone. A marked advantage of the present invention lies in the provision of means whereby the oscillator may be cooled through the circulation of a cooling medium such as water. Where necessary the cooling medium may be readily applied both to the exterior and interior of the oscillator tube proper. The cooling water may be passed through the central tube, as shown in Fig. 1. The two metal tubes and the end members are hermetically sealed and thus provide an evacuated chamber between the tubes, in which the filament, grid and other tube members are mounted. Many other items of interest are included in the patent.

Fig. 1

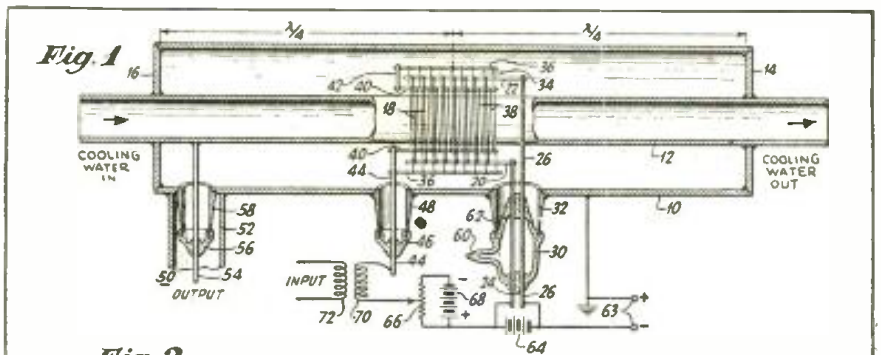
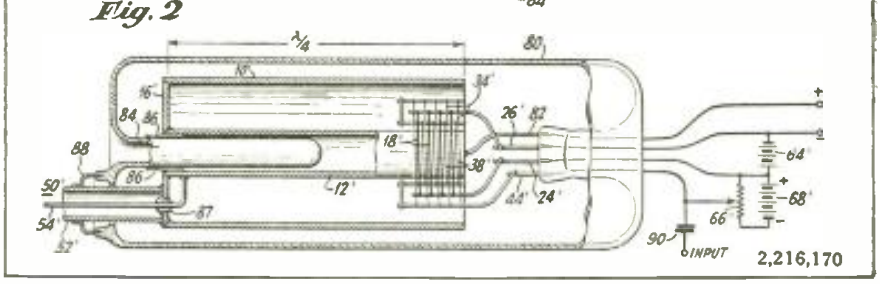


Fig. 2

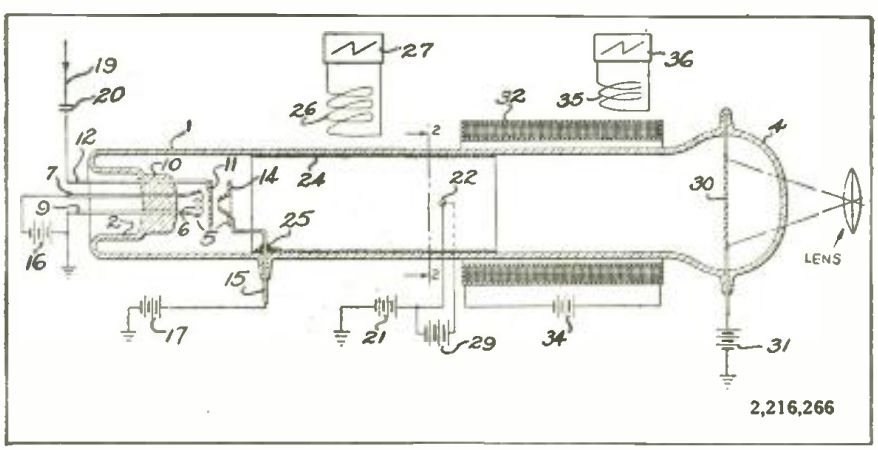


2,216,170

2-STAGE OSCILLOGRAPH

(Front Cover Feature)

● THIS patent, No. 2,216,266, recently issued to Philo T. Farnsworth, covers means of developing an amplified cathode-ray beam within the oscillograph tube; also to provide a method of increasing the beam power; further to yield a more brilliant visual image from a primary beam, etc. Still another object is to provide an oscillograph wherein an electron beam is utilized to produce an incandescent line image. A long evacuated tube terminates at one end by a re-entrant stem and at the opposite end by an enlarged rounded head. The electron gun directs a signal modulated beam of electrons along the axis of the tube, the electrons being accelerated by a positive potential produced by a D.C. source connected to an intermediate electron-emitting electrode. The impact of the electron beam upon electrode 22 heats it to a degree of incandescence, varying along its length in accord with the variable light intensity of the picture element in corresponding position.

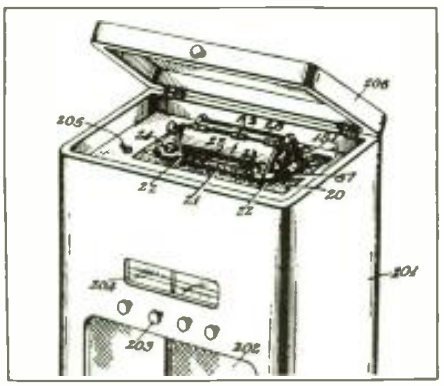


2,216,266

FACSIMILE PATENT

● THE U. S. patent office recently issued to W. G. H. Finch, of Finch Telecommunications, four more patents on his facsimile system.

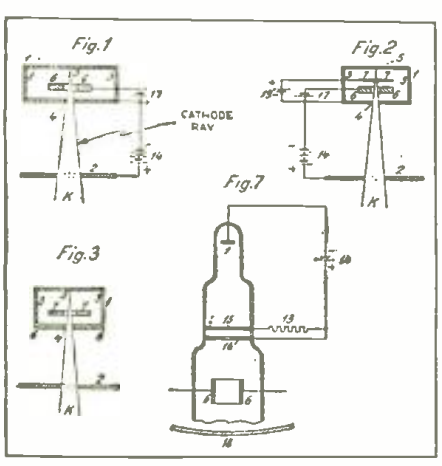
Two of these patents, Numbers 2,212,971 and 2,212,968, cover additional frequencies on his important and well-known automatic



synchronization system. The third patent, No. 2,212,970 covers a multi-stylus or triple pen recorder, while the remaining patent, No. 2,212,969, covers Mr. Finch's system of limiting the surges and recording signal level, thus insuring uniform high-fidelity facsimile reproductions on *dry* electro-sensitive facsimile paper, such as used with all Finch facsimile recorders.

COLD CATHODE TUBE

● THIS interesting patent was issued to Walter Rogowski and bears the No. 2,210,127. One of the objects of this patent is to provide means for varying the intensity of the electronic ray in a tube having a cold cathode, without altering the shape of the spot. One method of carrying out the invention consists in making the cathode hollow, so as to form a Faraday cage, and to dispose control electrodes in this cage, which are of a symmetrical rotation type. These electrodes must have sufficiently large openings for the ions or the electrons to pass through. (See Figs. 1-3.) In Fig. 1, K denotes the cathode ray; two continuous voltage sources are designated at 14 and 17; this arrangement may constitute a cold cathode ray oscillograph. A control electrode is indicated at 6, and either electrostatic or magnetic control fields may be used. Low voltages may be employed to effect control of the cathode ray in this system.



RADIO AIRCRAFT DETECTOR

● A RADIO system for detecting the presence of aircraft comprising a reproducer apparatus of the television type, adapted to produce a television "scan" or "raster" in any manner well known to the television art. Also means of supplying the apparatus with periodic signals, to enable it to produce the said "raster"; a very short wave radio transmitter; means for modulating the waves transmitted from said transmitter, with a series of periodic signals occurring at a frequency correlated with the scanning line frequency in the "raster"; and finally—a plurality of very short wave radio receivers distributed over the area in which detection is to be effected. A transmission line system connects these receivers with the point where the television reproducer apparatus is located. With no airplane present to reflect the short waves, a vertical black line will appear on the screen of the C-R tube. If a plane appears and causes the wave to be reflected, the line on the raster will change in appearance, as explained in the patent. (No. 2,207,267)

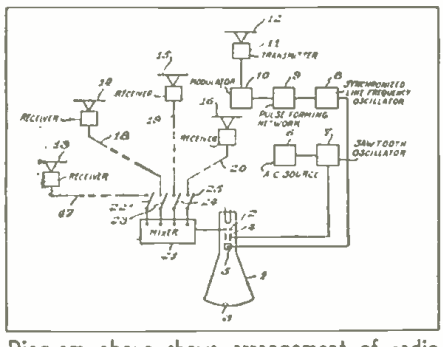


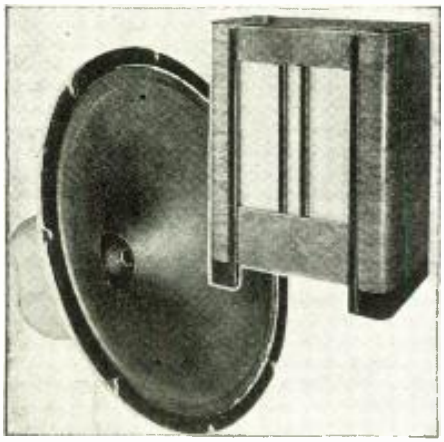
Diagram above shows arrangement of radio aircraft detector. At left—cold cathode tube.

New Type Speaker Available Separately

● A NEW 15¼-inch High Fidelity loudspeaker mechanism, available either separately or with wall housing or console cabinet, has been announced by the Commercial Sound Division of the RCA Manufacturing Company. It is designed for use wherever tops in tone quality and fidelity are required, such as in music rooms, audition studios, school auditoriums, dance halls, night clubs, etc.

Also announced was a new type of baffle designed for mounting four 7-inch "accordion edge" High Fidelity RCA loudspeakers in both the new cabinets.

The 15¼-inch permanent magnet loudspeaker handles 15 watts of power, excellent for reproducing phonograph recordings or other sound under conditions of high noise level. The voice coil (impedance 8 ohms) is completely dust proof. It is designated as model MI-6237.



The console designed for the new mechanism is a walnut cabinet unit built to give correct acoustic response. An acoustic phase inverter circuit is built into the cabinet, to extend low frequency response. Model MI-6222, the cabinet stands 32" high, 24" wide and 14" deep.

The wall housing for the new speaker is of heavy veneer, finished in umber grey or, for installations where it is desirable to paint it to match its surroundings, in a neutral color. It measures 28" high, 19" wide and 13" deep, and is designed to give proper acoustic response. It is designated as Model MI-6223.

The new baffle (MI-6224) is cut to mount four RCA 7-inch "accordion edge" loudspeakers (MI-6234) in either the console cabinet or the wall housing mentioned above. Four matching transformers are supplied with and mounted on the baffle.

New FM-AM Radio Receiver

● A NEWLY-ENGINEERED radio receiver which will make available programs broadcast by **frequency modulation** as well as standard American broadcasts and domestic and foreign short-wave transmission, has been announced by the General Electric radio and television department. The new receiver, designated model JFM-165, is the first combination model to be built by them since the recent formal allocation of commercial frequency-modulation transmission channels by the Federal Communications Commission.

One of the most interesting features of the new receiver to those who have been enjoying the limited FM programs of the past year are the triple beamascopes (built-in antennas). Each antenna has been designed for a special purpose, and in the majority of cases the need for an outside antenna or ground connection has been eliminated. The standard **broadcast** beamascope is designed for the reception of programs on the standard broadcast band. The new **short-wave** beamascope, added to

several models in the 1940 line, makes possible the reception of foreign and domestic short-wave programs with a much higher degree of sensitivity than was formerly experienced except by means of a special outside antenna. The "FM" beamascope is a built-in dipole antenna, which eliminates in most circumstances the more complex outside dipole which has been standard for most FM receivers during the past year. In certain areas, and depending to some extent upon the power of the FM station being picked up by the listener, it will still be necessary to rely on an outside antenna of this type. With the growing popularity of frequency modulation because of its static-free characteristics and high-fidelity transmission, it is probable that transmitters of relatively higher power will be placed in service, thus easing the antenna requirements of the set owner.

Actually two receivers in one, the new AM-FM set has two super-powered chassis. The AM system has a rated power consumption of approximately 80 watts, and the FM one of approximately 145 watts. Operating cost of the former is about 1/3 cents an hour, that of the latter about 2/3 cents an hour at national average KWH rates. Each chassis has its own full complement of tubes. There are 12 tuning keys provided in all, on two tuning panels.

The FM, television audio, or phonograph key, on the front panel, automatically permits the listener to enjoy FM reception, television sound broadcasts when used in conjunction with a television picture receiver, or a wired type of record player.

The receiver stands 39½ inches high, 31½ inches wide, and 15 inches deep.

New All-Purpose Controls Simplify Replacements

● THE new Type D All-Purpose Volume Controls recently announced by the International Resistance Company pave the way for important savings in time and effort on the part of servicemen. Not only may these controls be used universally to replace either midget-size or larger, old-style units, but they are easy to install, thanks to the convenience of the new Tap-in Shafts. Moreover, a small stock of the most popular numbers will equip the serviceman for by far the greater percentage of all control replacements. For instance, 18 controls together with 6 switches and 5 special, extra Tap-in Shafts handle from 60% to 75% of all control replacements as shown by actual records.

Jr. Type Marine Radiophone

● TO more precisely meet the communications requirements of small boats, and of larger boats with moderate off-shore cruising range, Hallicrafters announce the Model HT-11 compact marine radiophone, which combines modest initial cost, with the lowest ship's battery drain consistent with reasonable working range.

The HT-11 includes a transmitter and receiver, all housed in one sturdy, corrosion-proofed metal cabinet only 14½" x 8⅝" x 9¼". The standard power supply is a separate unit connected to the other by cable. This power supply operates from either 6-volt or 12-volt battery sources, or a special 110-volt, 60-cycle supply is available which may be driven from a 110-volt a.c. source or from a 32-volt or 110-volt d.c. converter.

The transmitter section provides 12 watts into the antenna and a choice of three gang-switched and crystal-controlled operating frequencies. These three channels are adjusted and pre-tuned during installation and thereafter need no further attention.

The receiver covers the "broadcast" and "marine" radiophone bands and consists of a 6SK7 r.f. stage, 6K8 mixer, 6SK7 i.f. amplifier, 6SQ7 detector-a.v.c.-audio, 6K6G output stage and two 6X5G rectifiers. The output is heard through a built-in speaker for "stand-by" service, or through the handset during actual communication. The handset is equipped with a push-button "send-receive" switch for instantaneous changeover during communication.

New Constant-Pressure Contact Band for Adjustable Resistors

● AN entirely new type of band for adjustable tubular power resistors developed by International Resistance Company eliminates annoying problems frequently met with in using units of this type.

The design and construction of the new adjustable band are such as to assure positive pressure at all times, without danger of wire breakage or damage without oxidation or corrosion at point of contact. The band cannot be adjusted too tightly and is designed and tempered for temperatures above those met in resistor operation.

The band is of cold-rolled steel, heavily cadmium plated. Contact is made through an opening in the band by a corrosion-proof silver button spot-welded to a stainless steel spring spot-welded to the outer surface of the band. Thus, no matter how much the band itself is tightened, the pressure of the button on the windings remains safe, constant and positive. No matter how often the band may be readjusted for tapping off different resistance values, there is no danger of damaging the resistance windings.

4 New RCA Tubes

● RCA recently introduced four new tubes—three new *transmitting* tubes and a *receiving* tube, as follows:

RCA-833-A—R.F. Power Amplifier, Modulator
RCA-1627—R.F. Power Amplifier, Modulator
RCA-8003—Oscillator, Power Amplifier, Modulator
RCA-12A6—Beam Power Amplifier

The 833-A is a transmitting triode similar to RCA-833, but it has an improved construction and can be operated at higher output with forced-air cooling. The 833-A has a maximum plate dissipation rating of 450 watts (ICAS). It can be operated in class C telegraph service with a maximum input of 2000 watts (ICAS) at frequencies as high as 20 megacycles. The 833-A is directly interchangeable with the type 833 in circuits designed for the latter.

The 1627 is a transmitting triode the same as RCA-810, except that it is designed with a filament rated at 5 volts, 9 amperes. Other data are the same as for RCA-810.

The 8003 is a transmitting triode having a maximum plate dissipation of 100 watts. In self-rectifying oscillator circuits such as those used in therapeutic applications, two 8003's are capable of delivering a useful power output (at 75% circuit efficiency) of 375 watts. The 8003 is rated for operation at frequencies as high as 30 megacycles but it may be used with reduced plate voltage and input at higher frequencies up to 50 megacycles.

The 12A6 is a beam power amplifier of the metal type with a 12.6-volt, 0.15-ampere heater for use in A.C./D.C. receivers. With 250 volts on plate and screen, the 12A6 can handle a power output of 2.5 watts with 10% distortion.

8003 Oscillator, Power Amplifier, Modulator

RCA-8003 is a transmitting triode suitable for use as a power amplifier, modulator, and oscillator. In class C telegraph service, it has a typical power output of 250 watts. In self-rectifying oscillator circuits such as those used in therapeutic applications, two 8003's are capable of delivering a useful power output (at 75% circuit efficiency) of 375 watts. The 8003 is rated for operation at frequencies as high as 30 megacycles but it may be used with reduced plate voltage and input at higher frequencies up to 50 megacycles.

The 8003 has a construction which provides high insulation resistance between its electrodes. This

feature enables the tube to withstand high peak voltages.

Characteristics and Ratings

Filament Voltage (A.C. or D.C.)	10.0 Volts
Filament Current	3.25 Amperes
Amplification Factor	12
Direct Interelectrode Capacitances:	
Grid-Plate	11.7 μμf
Grid-Filament	5.8 μμf
Plate-Filament	3.4 μμf
Bulb	T-20
Cap	Medium Metal
Base	Jumbo 4-Large Pin

Maximum CCS Ratings with Typical Operating Conditions

As R.F. Power Amplifier Class B Telephony
Carrier conditions per tube for use with a max. modulation factor of 1.0

D.C. Plate Voltage	1350 max.	Volts
D.C. Plate Current	150 max.	Ma.
Plate Input	150 max.	Watts
Plate Dissipation	100 max.	Watts
Typical Operation:		
D.C. Plate Voltage	1350	Volts
D.C. Grid Voltage‡	−110	Volts
Peak R.F. Grid Voltage	135	Volts
D.C. Plate Current	110	Ma.
D.C. Grid Current (Approx.)	1.5	Ma.
Driving Power (Approx.)***	8	Watts
Power Output (Approx.)	50	Watts

As Plate-Modulated R.F. Power Amplifier—Class C Telephony
Carrier conditions per tube for use with a max. modulation factor of 1.0

D.C. Plate Voltage	1100 max.	Volts
D.C. Grid Voltage	−400 max.	Volts
D.C. Plate Current	200 max.	Ma.
D.C. Grid Current	50 max.	Ma.
Plate Input	220 max.	Watts
Plate Dissipation	67 max.	Watts
Typical Operation:		
D.C. Plate Voltage	1100	Volts
D.C. Grid Voltage	−260	Volts
From a grid resistor of	6500	Ohms
Peak R.F. Grid Voltage	430	Volts
D.C. Plate Current	200	Ma.
D.C. Grid Current (Approx)**	40	Ma.
Driving Power (Approx.)**	15	Watts
Power Output (Approx.)	167	Watts

As R.F. Power Amplifier and Oscillator—Class C Telegraphy
Key-down conditions per tube without modulation‡‡

D.C. Plate Voltage	1350 max.	Volts
D.C. Grid Voltage	−400 max.	Volts
D.C. Plate Current	250 max.	Ma.
D.C. Grid Current	50 max.	Ma.
Plate Input	330 max.	Watts
Plate Dissipation	100 max.	Watts
Typical Operation:		
D.C. Plate Voltage	1350	Volts
D.C. Grid Voltage		
From a fixed supply of	−180	Volts
From a grid resistor of	5000	Ohms
From a cathode resistor of	630	Ohms
Peak R.F. Grid Voltage	350	Volts
D.C. Plate Current	245	Ma.
D.C. Grid Current (Approx.)**	35	Ma.
Driving Power (Approx.)**	11	Watts
Power Output (Approx.)	250	Watts

As Self-Rectifying Oscillator

A.C. Plate Voltage (RMS)	1500 max.	Volts
D.C. Grid Voltage	−400 max.	Volts
Peak R.F. Grid Voltage	550 max.	Volts
D.C. Plate Current	200 max.	Ma.
D.C. Grid Current	30 max.	Ma.
Plate Input	330 max.	Watts
Plate Dissipation	100 max.	Watts
Typical Operation in push-pull circuit at 25 Mc.:		
Unless otherwise specified, values are for 2 tubes		
A.C. Plate Voltage (RMS)	1500	Volts
Grid Resistor	5000	Ohms
D.C. Plate Current	400	Ma.
D.C. Grid Current (Approx.)	40	Ma.
Power Output (Approx.)	500	Watts
Circuit Power Output (75% circuit efficiency)	375	Watts

*Averaged over any audio-frequency cycle of sine-wave form.

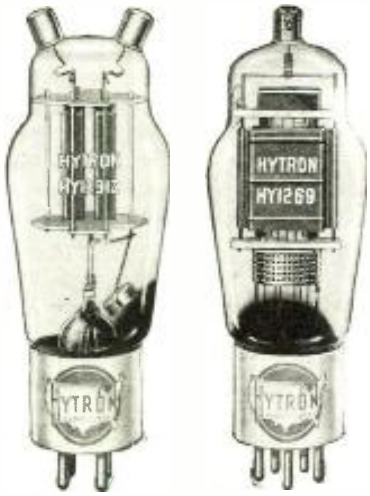
‡Grid voltages are given with respect to the mid-point of filament operated on A.C. If D.C. is used, each stated value of grid voltage should be decreased by one-half the filament voltage and the circuit returns made to the negative end of the filament.

†At crest of audio-frequency cycle with modulation factor of 1.0.

**Subject to wide variations depending on the impedance of the load circuit. High-impedance load circuits require more grid current and driving power to obtain the desired output. Low-impedance circuits need less grid current and driving power, but plate-circuit efficiency is sacrificed. The driving stage should have a tank circuit of good regulation and should be capable of delivering considerably more than the required driving power.

‡‡Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

Two New Tubes



● THESE 12 volt series tubes have been designed for mobile type operations and aircraft and marine services. They incorporate the same outstanding features which have made the Hytron HY69 and HY31Z's popular.

The HY1269 will deliver up to 50 watts RF output, while the HY1231Z will deliver up to 51 watts undistorted power output. Both of these tubes have instant-heating type filaments, which eliminate power drain during "stand-by."

Type HY1231Z

General Characteristics

Filament voltage (A.C or D.C.)	11.4 to 13.2 volts
Filament current	1.25 amperes
Mutual conductance (per section)	1800 umhos
Average amplification factor	45
Bulb	ST16
Maximum overall length	5¾ inches
Maximum seated height	5 1/16 inches
Maximum diameter	2 1/16 inches
Net weight	2½ ounces
Plate leads	metal top caps
Base	4-pin ceramic

Inter-Electrode Capacitances
(per section)

Grid to plate	5.0 mmf.
Grid to filament	5.0 mmf.
Plate to filament	1.9 mmf.

Class B Modulator, R.F. Amplifier, Oscillator, Frequency Multiplier

The Hytron HY1231Z is a twin triode transmitting tube of the high-mu type for use as a zero-bias Class "B" modulator, radio-frequency amplifier, oscillator, and audio-frequency amplifier. The HY1231Z has an instant heating thoriated-tungsten filament and has been designed specifically for mobile operation as a companion tube and modulator for the HY1269.

Maximum CCS# Ratings and Typical Operating Conditions
Class "B" Audio Amplifier-Modulator
(Values for one section)

D.C. plate voltage	500 max. volts
Maximum signal D.C. plate current*	75 max. ma.
Maximum signal plate input*	37.5 max. watts
D.C. grid current	15 max. ma.
Plate dissipation*	15 max. watts

Typical Continuous-Service Operation for Both Sections

D.C. plate voltage	300	400	400	500 volts
D.C. grid voltage	0	0	0	0 volts
Peak AF grid to grid voltage	104	140	98	131 volts
Zero sig. D.C. plate current	20	26	26	36 ma.
Max. sig. D.C. plate current	100	150	100	150 ma.
Max. sig. grid current	20	28	16	30 ma.
Load resistance per tube	1250	1250	1750	1750 ohms
Plate to plate effective load	5000	5000	7000	7000 ohms
Max. sig. grid driving power	1.4	2.0	1.2	1.8 watts
Max. sig. power output	18	40	24	51 watts

* Averaged over any audio-frequency of sine-wave form.
\# Continuous service.

operating plate power supply the application of the plate potential must lag the application of the filament power by approximately 1 second.

General Characteristics

Filament Voltage (A.C. or D.C.)	11.4 to 13.2 volts
Filament Current	1.125 amp.
Mutual Conductance	3000 umhos
Average Amp. Factor	140
Bulb	ST16
Max. Overall Length	5¾"
Max. Diameter	2 1/16"
Net Weight	2½ oz.
Cap	small metal
Base	Med. 5-pin ceramic

Maximum Ratings and Typical Operating Conditions
As push-pull amplifier—Class AB₂ (fixed bias)

D.C. Plate Voltage	600 max. volts
D.C. Screen Voltage (Grid #2)	300 max. volts
Max. Signal D.C. Plate Current*	120 max. ma.
Max. Signal Plate Input*	72 max. watts
Max. Signal D.C. Screen Current	15 max. ma.
Screen Input*	5.0 max. watts
Plate Dissipation*	40 max. watts

Typical Operation for Two Tubes Class AB₂

Plate Voltage	500	400	500	600	600 volts
Screen Voltage	250	250	300	300	300 volts
DC grid Voltage	−25	−25	−25	−35	−35 volts
Peak AF grid to grid voltage	106	145	120	145	183 volts
Zero signal DC plate current	60	60	65	65	65 ma.
Max. signal DC plate current	150	170	200	200	240 ma.
Max. signal DC screen current	23	14	23	18	29 ma.
Max. signal DC grid current	4.0	5.0	5.0	5.0	6.0 ma.
Load resistance per tube	1000	1000	1250	1250	1175 ohms
Effective plate to plate load	4000	4000	5000	5000	4500 ohms
Max. sig. driving power*	0.25	0.4	0.3	0.4	0.7 watts
Max. signal power output**	30	40	65	78	97 watts

Type HY1269

R.F. Amplifier, Oscillator, Class AB₂ Audio Amplifier Frequency Doubler

Hytron HY1269 is a filament-type transmitting tube of Beam-Tetrode design incorporating efficient inter-electrode shielding and high insulation factor. The HY1269 affords extremely high power sensitivity as an audio-amplifier and very high plate efficiency as an R.F. oscillator, amplifier or frequency doubler. Surprisingly high output is obtainable from a single HY1269 as a crystal oscillator due to the high amplification factor and the small transfer of energy from plate to grid. Because of its well suited characteristics, the HY1269 operates as a Class "C" doubler at high efficiency with relatively high power output. The internal structure of the HY1269 permits operation at maximum ratings at frequencies up to 60 megacycles. The maximum plate dissipation of the HY1269 is 40 watts.

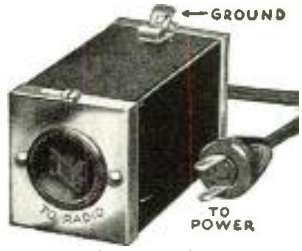
The instant heating filament (thoriated tungsten) has been designed so that the tube filament may be controlled by the same switch or relay as the plate-supply motor generator, thereby eliminating the need for burning the filament during standby, consequently reducing battery drain. The usual push-to-talk circuit applying plate voltage during transmission should be employed.

When the HY1269 is used with an instant-

New Line Filter

● HERE is a new Line Filter, which is claimed to eliminate all line noises. It may be used to prevent crackling and sizzling in your radio set, caused by household appliances, motors and high-frequency disturbance pickup from power lines. It requires no adjustment or attention.

The device combines both inductive and capacitive filtering, with duo-lateral wound choke and impregnated paper dielectric condensers. Comes complete in chromium and black KemArt metal case, with approved rubber cord and unbreakable plug. Made by the J. W. Miller Co.



Line Filter

New Radio Catalogs

Radio Dictionary

● A VALUABLE dictionary of radio terms, edited by L. O. Gorder, Professor of Radio Engineering at Chicago Technical College, has been issued by the Allied Radio Corp. of Chicago. The subjects are arranged in alphabetical order and wherever necessary suitable illustrations of the apparatus described are included. A valuable chart for the student shows all of the radio symbols used in wiring diagrams. This 36 page dictionary, measuring 6x9 inches, printed on good quality paper with stiff paper covers, will be found very useful.

New Allied Catalog

● THE 1941 catalog of the Allied Radio Corp. of Chicago contains 208 pages and has a very beautiful cover in colors, showing Elmer Davis reading the day's news in the CBS studio. Every imaginable type of radio set as well as parts of all kinds for service men, are elaborately illustrated and described. A new line of miniature radio receivers is included, with two new miniature portable sets of the personal type, resembling a camera in style. Ham apparatus including all the standard receivers, antennas, etc., are listed and illustrated, as well as public address amplifiers and allied equipment of every size—from a few watts up to 75 watts. Servicemen's test equipment is illustrated and described in elaborate profusion; a great assortment of tubes are likewise included. A number of new "portables," including three-way types, are listed and shown; also console-type receivers with provision for making your own records.

Stromberg-Carlson F-M Booklet

● A VERY interesting booklet describing the features of frequency modulation broadcasting has been brought out by the Stromberg-Carlson Co. and the various features of their line of F-M receivers are illustrated and described therein. The special features of their labyrinth and carpinchoe speakers are illustrated and described.

"Sun" Sound Systems

● A NEW 1941 catalog has just been brought out by the Sun Radio Co., of New York City, illustrating and describing their new line of Public Address systems. All sizes of amplifiers and speakers are described and illustrated, from those giving 6 watts—all the way up to elaborate 50-watt systems, intended for school and stadium requirements. An interesting assortment of pickups and loudspeakers as well as phono motors are described and illustrated.

Birnbach Radio Co. Catalog

● THE Birnbach Co. have recently issued their new catalog No. 41 on radio wires and cables, hardware, antennas, and ceramics. This catalog will appeal to every radio set-builder, Ham, and service man. A very complete line of radio wire, cables and hardware is illustrated and described, including doublet antennas for television and frequency-modulation reception. A couple of valuable graphs are given, from which the lengths of the elements of ultra-high frequency antennas may be deduced, without any tedious mathematical calculations. Every imaginable type of radio knob, plug, jack and test cord is shown in the new catalog, plus all types of insulating tubing, wire and cable.

The Daven Company

● THIS elaborate catalog describes every imaginable type of variable resistor, attenuator, and measuring device for use in commercial or advanced amateur radio stations. A valuable chart and table is included, showing the different types of attenuators. A graphic curve is given for each type of variable resistance network illustrated, so that the designer can tell just which type of attenuator to select. Among the other pieces of apparatus covered in this catalog are—fixed attenuators, decade resistor units, output meters, volume level indicators, decade voltage divider, logarithmic resistors, transmission measuring set, and program line equalizers.

Allen B. Du Mont Laboratories

● A BEAUTIFUL new catalog containing 68 pages illustrates the complete line of Du Mont cathode-ray instruments, including oscillographs of all types and television image tubes. Other apparatus illustrated and described are synchronizing-signal generators, television cameras, television signal generators, variable frequency stimulator, electronic switch, cathode-ray modulator monitor, etc. An interesting table on all sizes of cathode-ray tubes from 3-inch up to 20-inch diameter is included, giving the anode voltage, etc.

New "Pack" Catalog

● PACK catalog No. 109-C is now offered by the Standard Transformer Corporation, Chicago, in addition to their Service Guide, Hamanual and Complete Catalog. This valuable book contains information on many stock packs manufactured by Stancor. A wide assortment of filtered and non-filtered "packs" are shown, together with technical data and operating graphs on each.

In this catalog will be found "packs" for use in portable battery radios, to convert them for use on 115 volt A.C., 115 volt D.C. and 6 volt D.C. There are model railway packs, units designed to operate pin games, packs for auto radio demonstration work, time clocks, etc. Other packs to be used in electro-plating, to operate telephones, for the operation of solenoids, etc. In fact, many uses will be suggested by the wealth of information contained in the book itself.

New R.C.P. Catalog

● RADIO City Products Co., Inc., announce a Supplementary Catalog (No. 123) covering a number of new pieces of test equipment which have been added to their line for the 1940-41 season, since the issuance of their Master Catalog. Included in these new items are several Tube-Testers, all featuring the new "Rolindex" tube chart; Multi-meters featuring high-speed testing; general test units; combination Tube and Set testers, etc.

Copies are obtainable without charge by addressing the manufacturer, or from the Service Dept., RADIO & TELEVISION, 20 Vesey St., New York, N. Y.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933.

Of RADIO & TELEVISION, published monthly at Springfield, Mass., for October 1, 1940.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared H. Gernsback, who, having been duly sworn according to law, deposes and says that he is the editor of Radio & Television, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912 and as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Popular Book Corp., 20 Vesey St., New York, N. Y.; Editor, H. Gernsback, 20 Vesey St., New York, N. Y.; Managing Editor, H. Winfield Secor, 20 Vesey St., New York, N. Y.; Business Managers, none.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Popular Book Corp., 20 Vesey St., New York, N. Y.; D. Gernsback, 20 Vesey St., New York, N. Y.

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

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

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

H. GERNSBACK, Publisher.

Sworn to and subscribed before me this 2nd day of Oct., 1940.

MAURICE COYNE, Notary Public.
Notary Public, N. Y. Co. No. 104
(My commission expires March 30, 1942.)

BOOK REVIEW

(Continued from page 465)

RADIO OPERATORS' LICENSE GUIDE by Wayne Miller; 155 pages, stiff cloth covers, illustrated, published by Wayne Miller, Chicago, Illinois.

This extremely important and timely radio guide contains over 1250 answers to radio questions which are likely to be asked in operators' license examinations. The book is right up-to-date and contains diagrams where necessary, together with short concise answers to the general type of questions encountered by those applying for radio operators' license, following those given in the new Federal Communications Commission study guide. The author is a radio communications engineer of many years' experience and the answers given to the various questions have been very carefully prepared, so that they may be clearly understood by the student. The value of such a book will be at once realized by every radio student who has attempted to find answers to many problems by reference to half a dozen or more text-books. Here one does not have to read his head off and try to digest several chapters on theory, before he can formulate an answer to a fairly simple question. Besides the many circuits illustrated and described, other vital radio subjects covered in concise "question and answer" form are: Basic Radio Laws, Radio Theory and Practice, Radiotelephony—both elementary and advanced, Radio Telegraphy, F.C.C. Rules and Regulations governing radio operators, Abbreviations used by operators, etc.

FREE CATALOGS and INFORMATION

By carefully reading the advertising columns, you will find many offers to furnish literature containing valuable technical information that will help you in your work. Use this list freely.

Firm	Business	Offer	No.	Cost	Adv. Page
ABC Radio Laboratories	Set Mfr.	Information		Free	477
Acme S. W. Radio Co.	Kit Mfr.	Circular		Free	477
Allied Engineering Institute	Kit Mfr.	Circulars		Free	469
Allied Radio Corp.	Mail Order	1941 Fall Radio Catalog		Free	463
		New Radio Dictionary		10c	
American Radio Institute	Radio School	Booklet		Free	477
Arrow Radio, Inc.	Mail Order	Information		Free	497
Audel, Theo., & Co.	Book Publisher	Information		Free	491
Ayers, Automatic Code Machines	Code Machines	Information		Free	491
Bliley Electric Co.	Parts Mfr.	Circular	D-2	Free	474
		Engineering Bulletin	E-6	10c	
		Bulletin	E-7	Free	
		Circular	A-7	Free	
Bridge, Harry P.	Stamps	Information		Free	499
Browning Laboratories	Kit & Parts Mfr.	Information		Free	484
Bud Radio, Inc.	Parts Mfr.	Catalog		Free	471
Burstein-Applebee Co.	Mail Order	1941 Catalog	57	Free	479
Candler System Co.	Code Course	Book of Facts		Free	474
Cannon, C. F., Co.	Parts Mfr.	Folder	T-18	Free	475
Chartered Institute of American Inventors	Inventors' Organization	Booklet		Free	504
Cowell, R.A.	Publisher's Rep.	Information		Free	479
Crowell, Thomas Y., Co.	Book Publisher	Information		Free	475
Dodge's Institute	Radio School	Catalog		Free	491
Eagle Radio Co.	Kit Mfr.	Information		Free	486
Goldentone Radio Co.	Set Mfr.	1941 Bargain Catalog		Free	493
Gold Shield Products	Mail Order	Catalog		Free	491, 493, 496, 499
Hallicrafters, Inc.	Set Mfr.	Literature		Free	B. C.
Hammarlund Mfg. Co.	Set & Parts Mfr.	Catalog		Free	485
Harrison Radio Co.	Mail Order	Information—List		Free	477
Harvey Radio Company	Mail Order	Information		Free	475
Henry Radio Shop	Mail Order	Information	120	Free	474
Hickok Elec. Instrument Co.	Test Instruments	Catalog		Free	484
Howard Radio Co.	Set Mfr.	Information		Free	451
Hytronic Laboratories	Tube Mfr.	Information		Free	463
Instructograph Company	Code Machine	Information		Free	483
Jensen Radio Mfg. Co.	Parts Mfr.	Information	82	Free	467
Lafayette Radio Corp.	Mail Order	196-Page Catalog	83	Free	465
		Gift Catalog		Free	
Lancaster, Allwine & Rommel	Patent Attorneys	Booklet		Free	505
Mass. Radio School	Radio School	60-Page Catalog		Free	491
Midget Radio Co.	Set Mfr.	Information		Free	499
Midwest Radio Corp.	Set Mfr.	Catalog		Free	493
Millen, J., Mfg. Co., Inc.	Parts Mfr.	Catalog		Free	486
Miller, J. W., Co.	Kit & Parts Mfr.	Information		Free	471
National Company, Inc.	Set & Parts Mfr.	Folder		Free	I.F.C.
National Radio Institute	Radio School	64-Page Book		Free	449
National Schools	Radio School	Catalog		Free	491
Nelson Co.	Used Courses	72-Page Catalog		Free	488
Radio Corp. of America	Radio & Television	Literature		Free	459
Radiocrafters	Parts Mfr.	Information		Free	486
Radio & Technical Publ. Co.	Radio Textbooks	Circulars on each book		Free	488
RCA Institutes, Inc.	Radio School	Catalog		Free	491
RCA Manufacturing Co., Inc.	Set & Parts Mfr.	Folder		Free	I.B.C.
Remington Rand	Typewriter Mfr.	Catalog		Free	495
Sprayberry Acad. of Radio	Radio School	52-Page Book		Free	491
Sun Radio Co.	Mail Order	Information		Free	483
Supreme Publications	Publishers	Information		Free	479, 497
Teleplex Co.	Code Machines	Booklet	S-12	Free	477
Triplett Electrical Inst. Co.	Parts Mfr.	Catalog		Free	483
Vibroplex Co.	Code Machine	Illus. Catalog		Free	475

What Do YOU Think?

ANENT THOSE QSL CARDS!

Editor,

For the past two years I have had a SWL listening post. In this column I have read the arguments which have arisen over QSL cards. You SWL's can send in the call letters of all amateurs you have sent reports to that were correct, and who have not returned their QSL card. If you're a ham you can send in your call letters, explaining you do not send out QSL cards. Send the call letters to me and when I get enough calls, I will send out a *black list* to the persons sending in letters. If you want a black list and haven't any letters, send in a self-addressed stamped envelope or post-card. You can also send me your QSL card and I'll QSL 100%.

Bob Miller,
9215 Birwood,
Detroit, Michigan.

England Hails Us

Editor,

I am unfortunately unable to renew my subscription to your very splendid magazine.

This is of course a greater loss to me than it is to you for I found your magazine very helpful indeed. As a matter of fact I have constructed quite a few short wave receivers from circuits printed in "R.&T." I have been a regular reader for the past four years, although I have been on your mailing list only for the last two years. I suppose that I shall have to revert to getting my "R.&T." from my American Newsagency.

73 and long life to the best Radio magazine on the market.

Yours faithfully,
Leslie G. Doolchie,
23, Wormholt Road,
London, W. 12,
England.

"Full of Information"

Editor,

I am a regular reader of your wonderful magazine Radio & Television, and it is full of information for radio men. Anything that I can do to help "R.&T." I feel as though I should do, for it helps everyone interested in radio from beginning to end. So please keep up the fine work in *television*, and 73 to R.&T.

Richard Dickerson,
R. 3, Laurel, Dela.

Prefers "All-Radio" Mag.

Editor,

During the past three years that I have been reading Radio & Television, I have never written you condemning or praising your magazine.

Radio & Television has always been a "F.B." *Ham* publication. I have derived a great deal of technical information from your departments and articles. Thanks to you I am soon to take the test for my amateur license.

Liam O'Keeffe,
103 West 74th St.,
New York City.

(Continued on page 512)

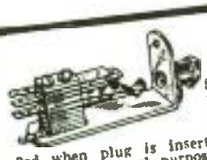
FREE TO YOU!

RADIO PARTS AND ACCESSORIES

HERE is some real BIG NEWS for you! Through a fortunate arrangement which we have been able to make, we can now offer you FREE premiums of such extraordinary value that they overshadow anything we have ever offered in the past with subscriptions to RADIO & TELEVISION Magazine.

NEVER BEFORE, in the 11 years' history of the magazine, have we offered such worthwhile premiums. All of these radio parts and accessories can be used to good advantage by the "ham" or constructor in his daily experiments.

TELEPHONE JACK



Substantial long frame phone jack. 2-circuit filament control type, closes when plug is inserted. Can be used for variety of control purposes in radio and telephone work. 2⅜" long, 1" high. Ship. weight 4 oz.

Premium No. 1 (3 Pts.) Val. 35c.

PUNCHED CHASSIS

Heavy plated steel chassis with holes punched for 11 tubes, power transformer, speaker plug and tuning dial. Great for large experimental sets, transmitters, etc. Reinforced construction. 13"x7⅞"x2½". Ship weight 3 lbs.

Premium No. 2 (5 Pts.) Val. 25c.

TWO GANG POTENTIOMETER

Well-made Yaxley 2 gang wire wound potentiometer. 2 units are insulated from each other. One is 5000, the other 15,000 ohms. Used as dual action volume control (antenna and bias in broadcast receivers). Also useful in experimental circuits. Ship. weight 1 lb.

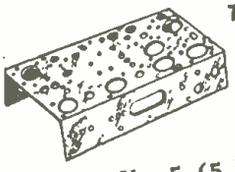
Premium No. 3 (5 Pts.) Val. 25c.

ALLOY CHASSIS

Medium weight alloy metal chassis punched for power transformer and 8 tubes as well as numerous mounting holes. Easily drilled metal. Open ends. Well made 10⅜"x6⅜"x2½". Ship. weight 2 lbs.

Premium No. 4 (5 Pts.) Val. 25c.

7 TUBE CHASSIS



Alloy metal chassis punched for 7 tubes, condensers, etc. Ideal for building small sets or simple apparatus. Metal is easy to drill. Size 10½"x5⅜"x2". Shp. wgt. 2 lbs.

Premium No. 5 (5 Pts.) Val. 25c.

CONNECTING CABLE & TERMINAL

Unusually well made Philco 8 foot, 5 wire cable with spade terminals at one end and terminal block with 8 positions at other end. Wires color coded. Well insulated. May be used for remote control or battery connections, etc. Terminal block 3"x3"x¾". Ship. weight 1 lb.

Premium No. 6 (6 Pts.) Val. 35c.

LOUDSPEAKER UNIT

Kellogg magnetic loudspeaker unit for use with horn speaker. Has adjustable diaphragm. May be used as pillow speaker or attached to acoustic phonograph. Also useful as sensitive microphone for voice reproduction. Threaded (⅞" diam.) throat. Size 2½" diam., 1⅝" deep. Shp. wgt., 2 lbs.

Premium No. 7 (10 Pts.) Val. 75c.

These parts are given to you IN ADDITION to the cut-rate subscription prices we list below:

7 mos. for $1 (saving you 75c over the single-copy price)
16 mos. for $2 (saving you $2 over the single-copy price)
24 mos. for $3 (saving you $3 over the single-copy price)

And, of course, the longer your subscription runs, the more merchandise you obtain FREE. As we expect a tremendous response to this offer, we would suggest that you send your remittance without delay, as our supply of parts is limited and we won't be able to duplicate this offer again.

IF YOU ARE A RADIO EXPERIMENTER, AMATEUR OR SERVICEMAN, TAKE ADVANTAGE OF THIS MARVELOUS OPPORTUNITY NOW!

A SHORT while ago we were informed that one of the largest surplus houses in the East was ready to sacrifice a huge quantity of radio parts and accessories which cost the original manufacturers thousands of dollars.

We entered into an agreement with this house whereby we suggested to them to allow us to offer these parts to our readers in connection with subscription offers.

The surplus house enthusiastically endorsed our plan. We—the publishers—pay the surplus house cash for each of these parts, and you—the reaper of this fortunate arrangement—will get these valuable radio parts and accessories ABSOLUTELY FREE.

This is positively the first time that we have been enabled to make such an unprecedented offer which in many ways sounds too good to be true. Nevertheless, we vouch for it in every way and we know you will not be disappointed.

This special arrangement enables us to offer you this valuable merchandise FREE with your subscription to RADIO & TELEVISION magazine, at a price which is already a tremendous saving over the newsstand cost.

This is how the plan works:— Next to the premium number of each item, we show its point value.

For each 7 months' subscription ($1.00) you receive 15 points' worth of merchandise free.
For each 16 months' subscription ($2.00) you receive 30 points' worth of merchandise free.
For each 24 months' subscription ($3.00) you receive 45 points' worth of merchandise free.

For instance, if you send us a seven months' subscription at $1.00, you are entitled to 15 points' worth of free merchandise. You may order one No. 4 (5 points) and one No. 7 (10 points). Or if you wish, one each of numbers 2, 3 and 4 (each 5 points), or any other combination which totals 15 points.

Similarly, if you send us a 16 months' subscription ($2.00) you may order any combination of merchandise which totals 30 points. On a 24 months' subscription ($3.00), any combination totalling 45 points.

Due to the high cost of the merchandise, we cannot ship the articles prepaid, therefore we show the weight of each piece, packed. If you wish your free parts sent by parcel post, please add to your remittance a sufficient amount to cover postage. Or, if you would rather have us send the parcel express charges collect, we will be glad to do so.

Please remember that we do not sell these articles. You cannot buy them from us at any price.

In order to make sure that you receive your parts promptly, ORDER TODAY. Fill out the coupon, clip and mail to us together with the proper remittance.

ALL RADIO PARTS ARE NEW AND UNUSED
Many are in their Original Packing

●

IMPORTANT TO PRESENT SUBSCRIBERS

If you are already a subscriber or have recently subscribed to the magazine, this offer still holds good for you, too. We merely will lengthen your subscription for either 7 months, 16 months or 24 months, as the case may be. There is a place on the coupon which provides for this.

RADIO & TELEVISION, 20 Vesey Street, New York, N. Y. RT-1240

Please enter my subscription to RADIO & TELEVISION for

- ☐ 7 months—$1.00. Plus 15 points' worth of FREE radio parts.
- ☐ 16 months—$2.00. Plus 30 points' worth of FREE radio parts.
- ☐ 24 months—$3.00. Plus 45 points' worth of FREE radio parts.

Canadian and foreign countries add 32 cents for $1.00 subscription; 72 cents for $2.00 subscription; $1.08 for $3.00 subscription.

- ☐ I enclose my remittance for $....., which includes parcel post charges on the FREE parts I am ordering.
- ☐ Please send the merchandise to me express charges collect.
- ☐ I am a subscriber now. Lengthen my subscription for ..... months:

I am circling the numbers of the parts I wish to have you send me Free.
Nos. 1 2 3 4 5 6 7

Name ..... Address .....

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

(Send remittance in form of check or money order. If you send cash or unused U. S. postage stamps, be sure to register your letter.)

DON'T MISS THIS OPPORTUNITY! WE ASSURE YOU THAT YOU WON'T BE DISAPPOINTED. ORDER TODAY! SIMPLY FILL OUT THE COUPON. PROMPT SHIPMENT ASSURED!

RADIO & TELEVISION
20 VESEY STREET
NEW YORK, N. Y.

A "CLEARING HOUSE" FOR SWL's

Editor,

For the past eight years I have been an enthusiastic reader of R. & T. I have built several sets from your diagram and they work astoundingly well. I have veris from the 48 states, most of the U. S. possessions and 87 countries!

In the July issue of "R. & T.," one of your readers stated that what is needed to settle the SWL's QSL problem is a "clearing house," which will inform them which radio broadcasting, amateur radio stations, as well as SWL's will not veri. I believe it to be the most sensible idea given yet.

Several of my friends, most of them SWL's, and myself, have formed a small organization for the benefit of all SWL's all over the world. The name of this organization is the "*International Radio Listeners' Guild.*" At present the organization has the support of 43 members. We have elected only a president, who is none other than *yours truly*. I would like to have everyone join this organization, because the more members we have the greater will be the amount of privileges granted to us. Everyone wishing to enroll may do so by sending 10 cents in coin to me. This is a non-profit organization, the 10 cents is to cover the cost of printing and mailing of membership cards. When applying for enrollment be sure to give full name and address, and most important of all, the international prefix. On the card will appear the name and address of the "Guild," the member's international prefix, name and address.

The organization operates in the following manner: Every member must QSL 100% to his best ability, and members knowing of a SWL, ham or short wave broadcasting station who will *not* verify will send in the station's call letters (and address if possible) to the organization's headquarters. Then every month we mail out to every member a list of stations and SWL's who will not mail out veris.

I hope that through the cooperation of your fine magazine we can publish a monthly list of all SWL's, hams and short wave broadcasting stations who will *not* answer. I believe that this way we can clear up this whole situation.

My shack has four panel racks. At the bottom of the first two, I have two 15" P.M. speakers. Above the first I have a Hammarlund Super-Pro; above this an antenna coupling unit. Above the second an RME 70, above this the DB20 and the antenna coupling unit. The third rack contains the Hallicrafters Marine, a home-made 2½ and 5 meter super, and above it another antenna coupling unit. The third rack houses a 1 kw. rig on 6 bands, which will be ready to go on the air as soon as I receive my ticket. As for the antenna, I have 2 horizontally polarized barrage broadside antennas, one a 3-section, the other a 4-section. With these two antennas and the aid of a very complicated antenna coupling unit, I manage to get very good reception and very little outside interference. Anybody is welcome to the diagram of either the antennas or coupling unit or both. Just drop me a line.

THEODORE ZAMMIT.
122-53 Nellie Street,
Jamaica, L. I.

Index to Advertisers

(While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.)

A New Thrill in Radio Reception

AR-77

COMMUNICATIONS AND ALL-PURPOSE RECEIVER WITH MI-8314 EXTENDED-RANGE, HIGH-FIDELITY LOUDSPEAKER

- ☆ Unmatched Stability
- ☆ Highest Signal-to-Noise Ratio
- ☆ Finer, Noise-Free Reception
- ☆ Higher Fidelity Reproduction
- ☆ Foreign Reception at its Best

Here is a receiver that looks different and *is* different – just the thing for the short wave listener, amateur or radio fan who wants a radio capable of bringing in those hard-to-get signals or giving superlative short wave or broadcast reception. It is the finest, most sensitive and most stable receiver of its type RCA has ever made – bar none!

The band-spread dial of the AR-77 makes the tuning of foreign stations remarkably easy. Once you've tuned a broadcast it "stays put." "Drift" is reduced to a minimum. As for noise, the manually-operated Noise Limiter of the AR-77 is a feature that has brought high praise from all sides. In actual test, peak noise voltages hundreds of times higher than the signal have been pulled down to signal level, so that the signal could be clearly heard and understood.

Frequency coverage is from 540 to 31,000 KC in *six* ranges, with calibrated band-spread for the 10, 20, 40 and 80 meter bands.

As illustrated here, the AR-77 is shown with the RCA MI-8314 Extended Range Loudspeaker. The unusually wide frequency range, the tremendous power handling capabilities and outstanding performance of this Loudspeaker combine with the AR-77 to produce reception that is amazing for clarity and faithfulness to the original broadcast.

Hear this remarkable outfit perform at your nearest RCA Amateur Equipment Distributor's store. You be the judge! Descriptive folder free.

AR-77 Receiver, $139.50 *net, f.o.b. factory. 8" Speaker in matched cabinet (not shown above)* $8.00 *net, extra.*

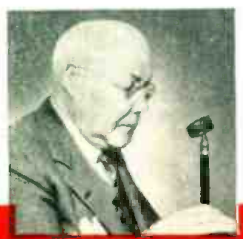
AR-77 Receiver and MI-8314 Extended Range Loudspeaker $159.50 *net, f.o.b. factory.*

Read these Comments from Radio Men Who Know

● Reliable reception under all conditions is a "must" for operators of the well-known Amateur stations. What these prominent operators say of the AR-77 tells its own story of outstanding dependability.

"It beats receivers costing twice as much!" says Thomas A. Consalvi (above), owner of world-famous W3EOZ at Bryn Mawr, Pa. "In many features, the AR-77 is superior to any other I ever tried at any price. In every way, it matches the performance of my old receiver costing more than twice as much."

● "The AR-77 is even finer than your announcement led me to expect," states Dr. Burton T. Simpson, W8CPC of Buffalo, an old-time amateur and still one of the best known voices on the air. "The Noise Limiter is particularly valuable because of its manual adjustment which can easily be regulated to meet local conditions in separating signal from noise. I am more than pleased with the outfit and believe it is the last word in receivers."



RCA

for Performance Plus

RCA MANUFACTURING COMPANY, INC., Amateur Division, CAMDEN, N. J. • A Service of the Radio Corporation of America

a new hallicrafters

WITH 1941 IMPROVED FEATURES

The SKYRIDER MARINE

(MODEL S-22R)

THIS communications model is truly an all purpose receiver: Covers Weather and Time Signals (NAA). Beacons and Aircraft Weather. Commercial wave lengths—Ship-to-Shore, Ship-to-Ship, (calling and working on the same band.) The Broadcast band. The Amateur Bands (160 to 20 meters inclusive.) Police. High Frequency Ship-to-Shore, Aircraft, Press and Government channels. Plus the International Short Wave channels. 4 Bands. Frequency range from 16.5 to 2730 meters (18 mc. to 110 kc.). 110 volt AC/DC operation.

Easy logging is provided by mechanical bandspread with separate dial. The directly calibrated main tuning dial eliminates the use of confusing charts and tables. The improved image rejection at the higher frequencies is achieved through the use of a 1600 kc. IF amplifier. Tuning permanency is assured through permeability tuned IF transformers. The 1941 Skyrider Marine (Model S-22R) will give the maximum in utility and dependability.

IMPROVED FEATURES—Two stages of IF—Greater sensitivity and selectivity. Permeability tuned IF transformers assure permanency of tuning.

Specially treated variable mica condensers will maintain adjustment under all atmospheric changes.

Directly calibrated main tuning dial.

Permeability-tuned beat oscillator with control to change BFO setting.

All steel parts and chassis heavily copper plated and nickeled.

Highly efficient mechanical bandspread with separate dial provides easy logging.

Frequency range 16.5 to 2730 meters (18 mc. to 110 kc.). Band 1—110-410 kc. . . . Band 2—400-1500 kc. . . . Band 3—1.7-5.9 mc. . . . Band 4—5.3-18 mc. 8 Tubes. cabinet dimensions 18½" x 9¼" x 8½".

The Skyrider Marine (Model S-22R) complete with tubes and speaker, $64.50 net.

the hallicrafters inc.

CHICAGO, U. S. A.

USED BY 33 GOVERNMENTS • SOLD IN 89 COUNTRIES