COLLINS SIGNAL

Published by

COLLINS RADIO COMPANY

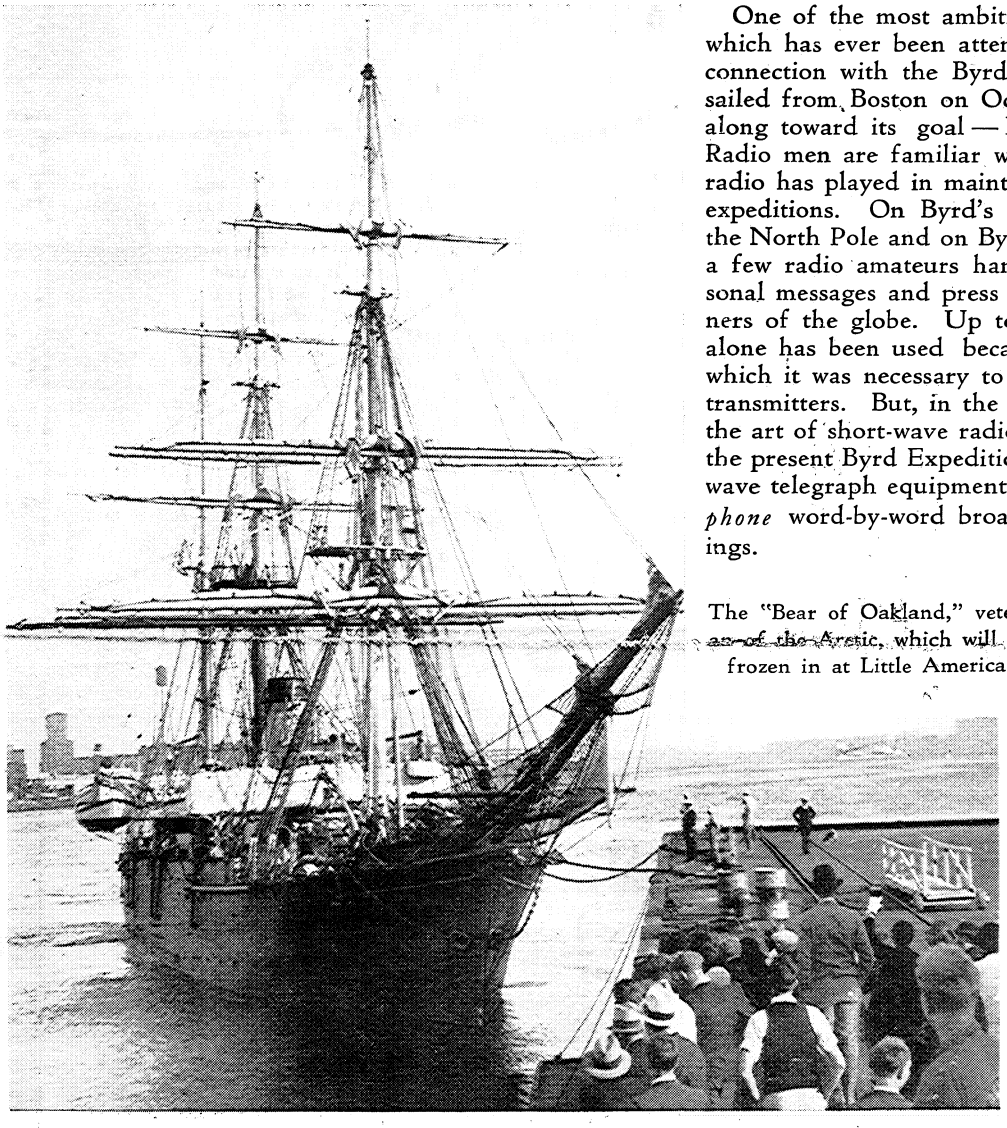
Designers and Manufacturers of
Transmitters, Transformers and Speech Equipment

CEDAR RAPIDS IOWA, U.S.A.

W. S. Johnson

JANUARY, 1934

The Byrd Antarctic Expedition II Sails With A Complete Collins Short Wave Broadcasting Station Aboard!



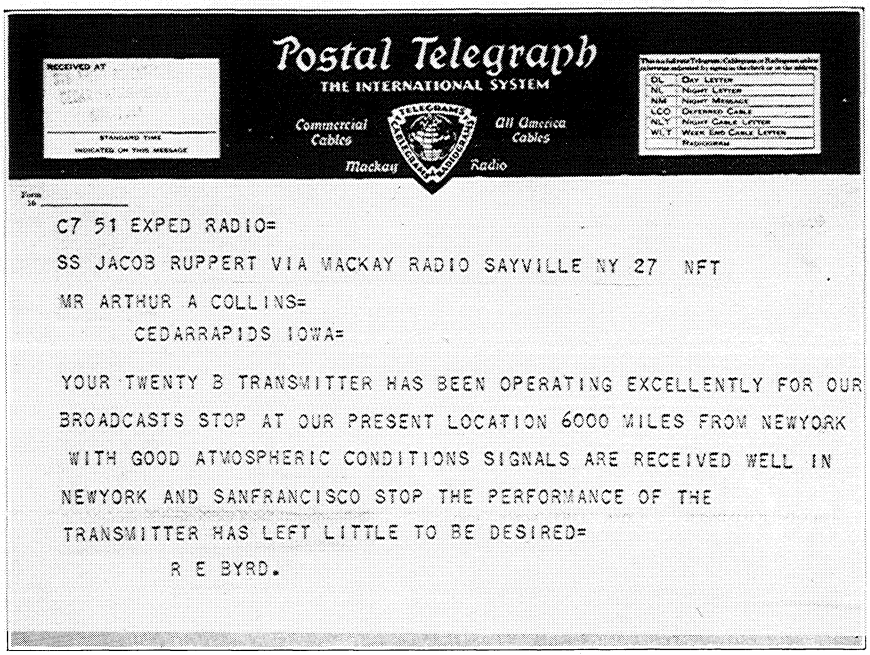
The "Bear of Oakland," veteran of the Arctic, which will be frozen in at Little America.

One of the most ambitious feats of radio communication which has ever been attempted is now being carried out in connection with the Byrd Antarctic Expedition II which sailed from Boston on October 11, 1933, and is now well along toward its goal — Little America in the Antarctic. Radio men are familiar with the important part short-wave radio has played in maintaining contact with previous polar expeditions. On Byrd's and McMillan's previous trips to the North Pole and on Byrd's last journey to the South Pole a few radio amateurs handled thousands of words of personal messages and press releases direct from these far corners of the globe. Up to now, short-wave radio telegraph alone has been used because of the tremendous distance which it was necessary to cover with relatively low-powered transmitters. But, in the last few years the advancement in the art of short-wave radio telephony has been so great that the present Byrd Expedition decided not only to carry short-wave telegraph equipment but also to transmit by *radio telephone* word-by-word broadcasts of their thrilling undertakings.

Rear Admiral Byrd shown on the Bridge of the Flagship, "Jacob Ruppert," as the Expedition sailed.

A careful survey of the technical problems involved was made by Dr. T. S. McCaleb of Harvard University, Director of Communications of the Expedition and Mr. E. K. Cohan, Technical Director of the Columbia Broadcasting System, and so great was their faith in the plan that the Columbia Broadcasting System actually sold the proposed broadcasts to a prominent United States advertiser, so that the broadcasts from Little America will not only be heard by amateurs and short-wave listeners but by the vast radio broadcast audience as well, over a nation-wide C.B.S. network.

At first glance one does not realize the tremendous technical difficulties which have to be overcome in order to carry out a feat of this kind. Amateurs are accustomed to talking between continents with relatively low power and occasionally with voice, but a commercial service is an entirely different problem.



Postal Telegraph
THE INTERNATIONAL SYSTEM
Commercial Cables · All America Cables · Mackay Radio

C7 51 EXPED RADIO=
SS JACOB RUPPERT VIA MACKAY RADIO SAYVILLE NY 27 NFT
MR ARTHUR A COLLINS=
CEDARRAPIDS IOWA=
YOUR TWENTY B TRANSMITTER HAS BEEN OPERATING EXCELLENTLY FOR OUR BROADCASTS STOP AT OUR PRESENT LOCATION 6000 MILES FROM NEWYORK WITH GOOD ATMOSPHERIC CONDITIONS SIGNALS ARE RECEIVED WELL IN NEWYORK AND SANFRANCISCO STOP THE PERFORMANCE OF THE TRANSMITTER HAS LEFT LITTLE TO BE DESIRED=
R E BYRD.

First of all, is the limitation imposed by the source of power available. Consideration of cost, fuel consumption and weight very definitely limit the size of the transmitter which could be used. The commercial transoceanic radio telephone circuits use transmitters of 40 or 50 kw. output in order to maintain consistent communication. The Expedition found that the job would have to be done with a 1 kw. transmitter.

Another problem was the erection of a suitable antenna aboard the ship. The commercial circuits use directive antennas covering acres of ground in order to concentrate as much of the radiated power as possible on the receiving station. On the other hand, the not-too-efficient ship's antenna on the "Jacob Ruppert" has to be used until the Expedition reaches Little America.

Most important of all are the varying transmission conditions which affect short waves. Magnetic storms occasionally interrupt commercial circuits for days at a time. No special dispensation of Providence could be counted upon to insure perfect transmis sion conditions whenever the hour arrived for a scheduled broadcast from the Byrd Expedition.

But, with these things firmly in mind the engineers of the Byrd Expedition and the Columbia Broadcast System went ahead with their plans and at the time this account is printed two broadcasts have already been made. The first, on November 11, was transmitted from a position near Easter Island, off the coast of Chili. The "Jacob Ruppert" was in a heavy sea and the speakers and performers had difficulty in keeping the proper spacing from the microphone because of the heavy rolling of the ship. The program was picked up in New York and placed on the network at the appointed hour. The CBS engineers at New York and the operators aboard the ship had been carrying out daily tests for the previous two weeks and the broadcast had been rehearsed several times with excellent reception. But, of course, everyone was nervous and excited because the thing had never been done before and no one knew just how satisfactory the reception would be. It so happened that conditions were miserable on that evening, but, nevertheless the program came through understandably although somewhat distorted by fading and back-ground noise. Astonished broadcast listeners got a real thrill out of hearing the Flagship's whistle, an introduction of the various members of the Expedition, the barking of the 150 huskies aboard the ship and an announcement by Rear Admiral Richard E. Byrd, himself.

After calling at Easter Island the Expedition sailed for New Zealand, and on November 25 at 9:00 p.m. CST. the second program was put in at the scheduled time from a point in the South Pacific, over 6,000 miles from New York City where it was received. Conditions were a little more favorable this time, and a greater degree of intelligibility was obtained. The practicality of the thing has now definitely been proved and the technical staff has settled down to a routine of transmitting the weekly broadcasts back to an eager public. Sometimes the reception will be better than others, but the programs will always pack a thrill.

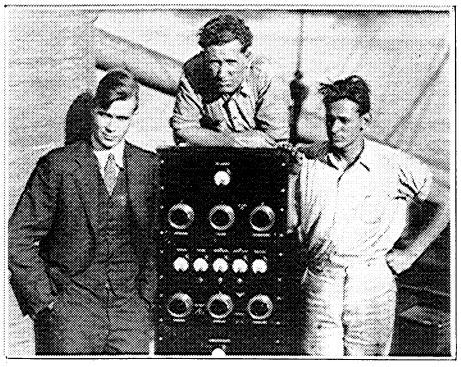
The Collins Radio Company feels very proud of the fact that its equipment was selected as being the best suited for this tremendous communication undertaking where highest possible performance and absolute reliability of the apparatus are of vital importance. A standard Collins type 20B Transmitter, operating at 1,000 watts output, is the basic unit used aboard the "Jacob Ruppert" for these broadcasts. In addition two Collins 150B transmitters are being used for communication between the different camps of the Expedition. The builders of the equipment also feel that the technical staff of the Expedition, the Columbia Broadcasting System and RCA Communications (who will handle the relay circuits from Buenos Aires) are to be highly complimented on the skill and facility with which they are performing this exacting task.

When the base is set up at Little America, these transmitters will be connected to a Bruce-type directional antenna trained on Buenos Aires and New York. The greater radiation efficiency of the directional antenna will increase the effective power of the 20B to several kilowatts. In addition to handling all of the important traffic between the Expedition and civilization the 20B will send back the weekly broadcasts for retransmission over the C. B. S. network during the entire period of the Expedition's stay in Little America. Amateurs will hear KJTY, the call of the "Ruppert," and KFZ, which is the call to be used in Little America, on the following frequencies:

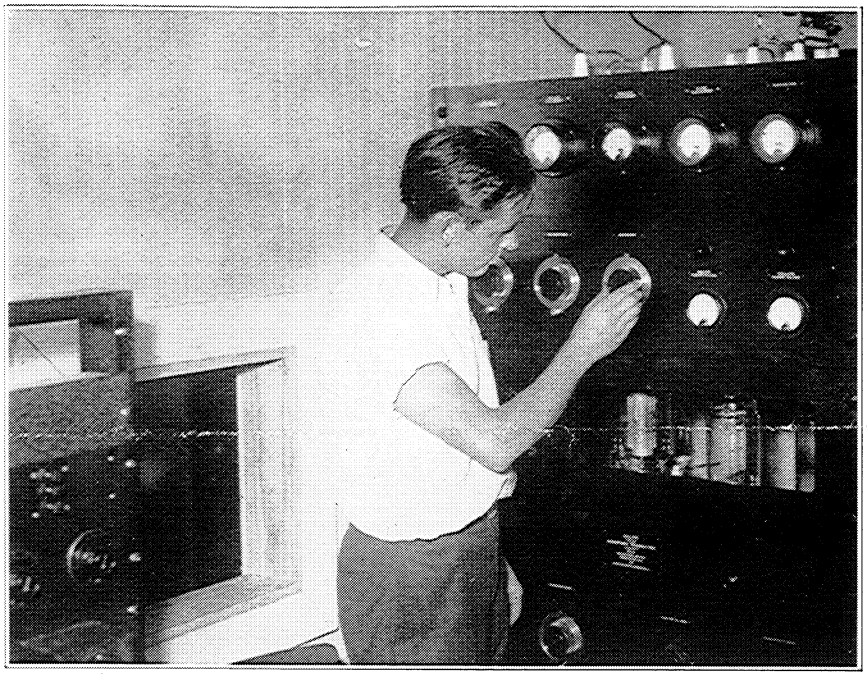
3105 kcs.
4140 "
5520 "
6210 "
8280 "
11040 "
12420 "
16560 "
22080 "

Conventional Federal code transmitters are also installed aboard the "Bear of Oakland" and the "Jacob Ruppert." They are used for communication with other vessels and shore stations and also to contact amateurs when time permits. The bulk of the traffic will be sent over the Mackay Radio System but amateur stations throughout the world will play an important part in the communications network set-up to serve the Expedition.

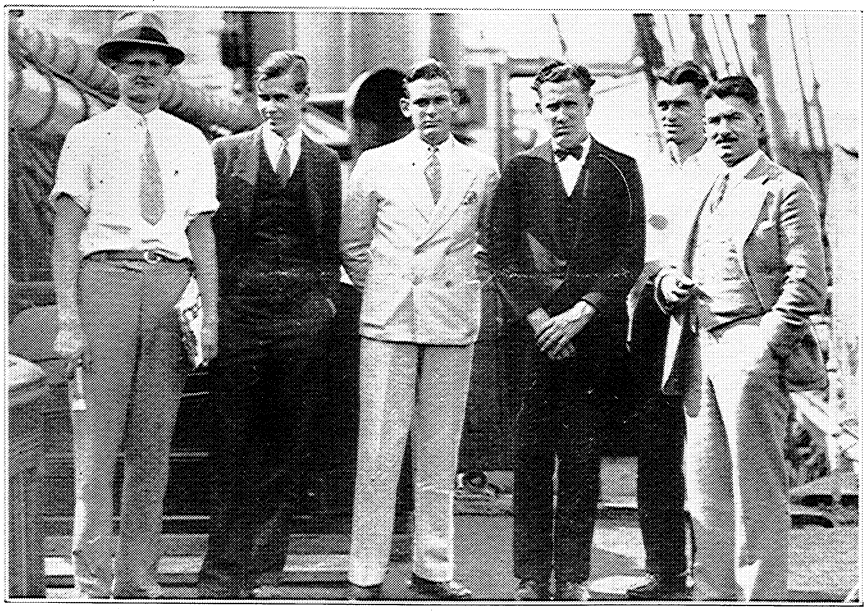
The Men Who Operate Radio Equipment of the Expedition



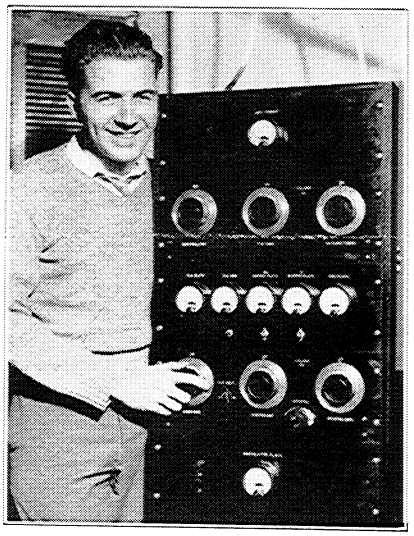
One of the 150B's being loaded aboard the "Jacob Ruppert." This 100 watt job will be used as an exciter for the 20B aboard the "Jacob Ruppert" and also at the Base Camp in Little America. It will drive the antenna direct when full power is not needed for contacting the various parties operating from the Base Camp. Left to right: John N. Dyer, Communication Engineer; Clay Bailey, Chief Operator of the Expedition; Guy Hutcheson, Operator of the "Jacob Ruppert" and a member of the ice party. Mr. Hutcheson will fly in the big Curtiss Condor Plane with the second 150B Transmitter to a position close to the Pole where the 150B will be set up on the ice and Hutcheson will operate it while the plane flies over the Pole.



Guy Hutcheson, Radio Operator on the "Jacob Ruppert," tuning the big 20B, 1,000 watt Collins transmitter in the Radio Shack of the "Jacob Ruppert." The signals from this transmitter have already become familiar under the call of KJTY. The radio room is only a few feet square and it is impossible to show a complete view because of the limited space. At the left is a rack containing Collins 6A, 7B and other amplifiers together with a fading panel. Brush crystal microphones are located not only in the radio room but in other places in the vessel, where the various parts of the programs originate.

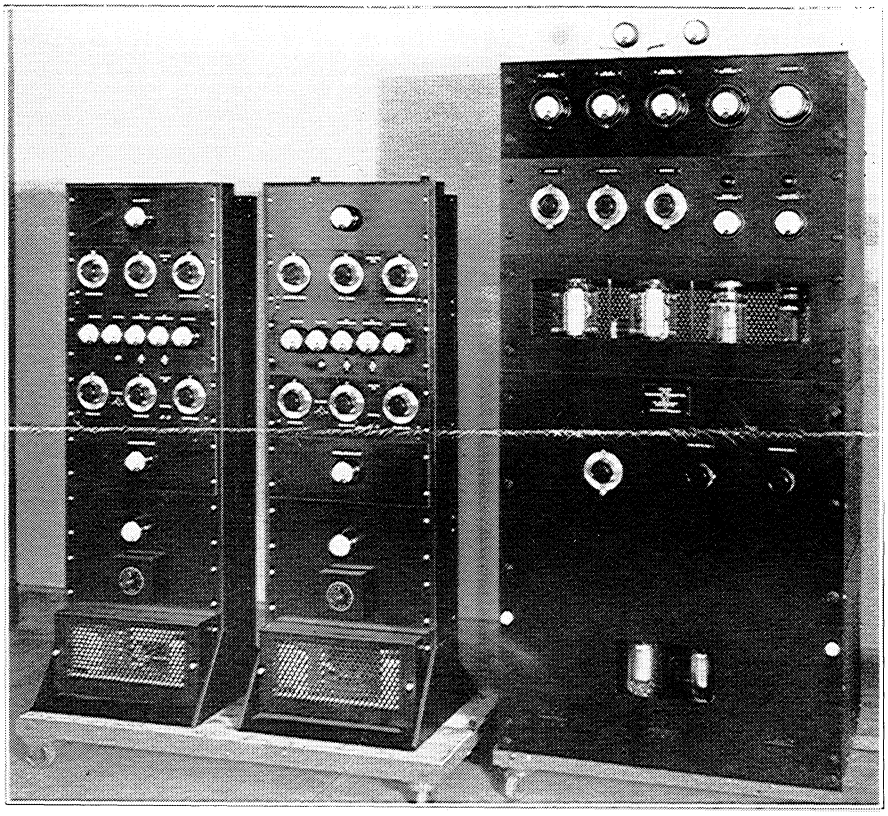


The men who will operate the radio equipment of the Expedition. Left to right they are: Stanley D. Peirce, Assistant Radio Engineer of Expedition, John N. Dyer, Communication Engineer in charge of Radio, Guy Hutcheson, Radio Operator of "Jacob Ruppert" and Operator on Ice Party, Clay Bailey, Chief Radio Operator, Richard Watson, Radio Operator of "Bear of Oakland," Thomas S. McCaleb of Harvard University, Director of Communications of the Byrd Expedition.



Morton B. Kahn, Field Engineer of the Collins Radio Company, who assisted in the installation of the Collins equipment on board the "Jacob Ruppert" and accompanied the Expedition from Boston to New York.

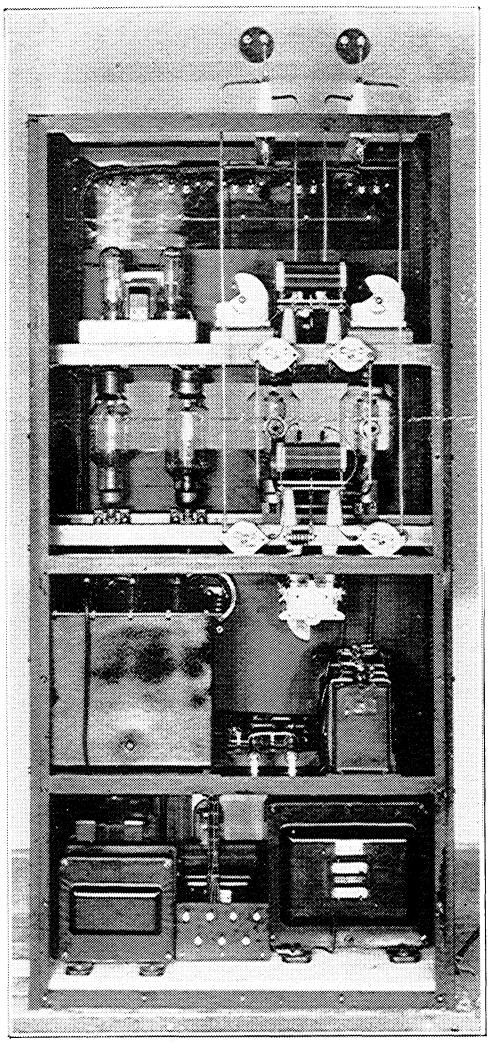
Collins Equipment will bring the News of Little America back to Civilization

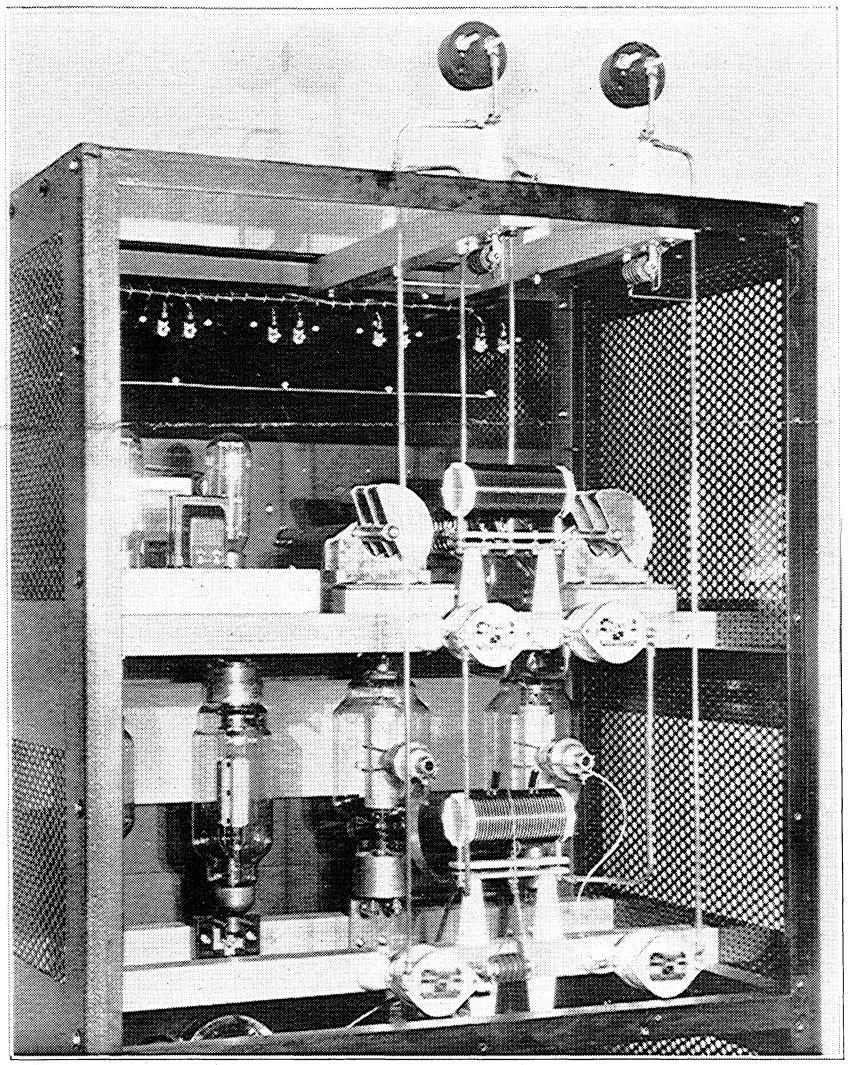


The 1 kw. 20B and the two 150B Collins transmitters on the skids ready for shipping from the Collins plant in Cedar Rapids to Boston Navy Yard, where they were installed on the "Jacob Ruppert."

BON VOYAGE! — Spectators wave good-bye to the "Jacob Ruppert" as she slips away from the pier at the Boston Navy Yard on the first stage of her long trip to the South. The Flagship is a steel freighter carrying the bulk of the supplies for the Expedition and the Collins short-wave transmitters. Her call is KJTY and the radio broadcasts from the Expedition, which are made enroute, originate aboard this ship.

Constructional Details of the Special Byrd 20B





Two Federal F-100A tubes are used in pushpull in the class C stage. The plate input to these tubes is normally 1.5 kw. (0.5 ampere at 3,000 volts.) The 750 watts of audio power required to modulate this input is obtained from the two 849 class B modulators. The Federal tubes give excellent account of themselves and operate efficiently in this transmitter on frequencies up to 30 mc. The tubes have plain tungsten filaments which draw 50 amperes at 11 volts.

The picture at the left discloses the power supply equipment on the lower platform. The large plate transformer weighs 250 pounds and is rated at 5 kva. The other two iron core units are plate reactors handling 1 ampere D.C. The rectifier tubes are Federal 375A's. The class B transformer is mounted in an oil tank on the second platform at the left. At the right of this transformer are the Pyranol, 5000 volt filter condensers and the filament transformer for the F-100A's. Immediately above the filter condensers is the plate tank circuit. Standard Collins-Isolantite coil forms are used, since they exhibit lower losses than copper tubing coils, which have more metal in the magnetic field of the coil. The coils are worked at a low value of tuning capacity at all frequencies. Above the large tubes at the right is shown the grid tuning circuit and the one inch spaced neutralizing condensers. The pushpull 845 class A driving amplifier is at the left.

The close-up photograph at the right shows the RF chokes connected between the feeder lines and ground. This provision is necessary in order to drain off the static charges which accumulate on the antenna during the severe Antarctic storms. The equipment used on the previous Expeditions did not have this feature and static flash-overs damaged the apparatus several times during operation. Thermoammeters are mounted externally and are in series with the antenna feed lines.

The Collins Type 20B ✤ ✤ ✤

(Reprinted from February 1933 Signal)

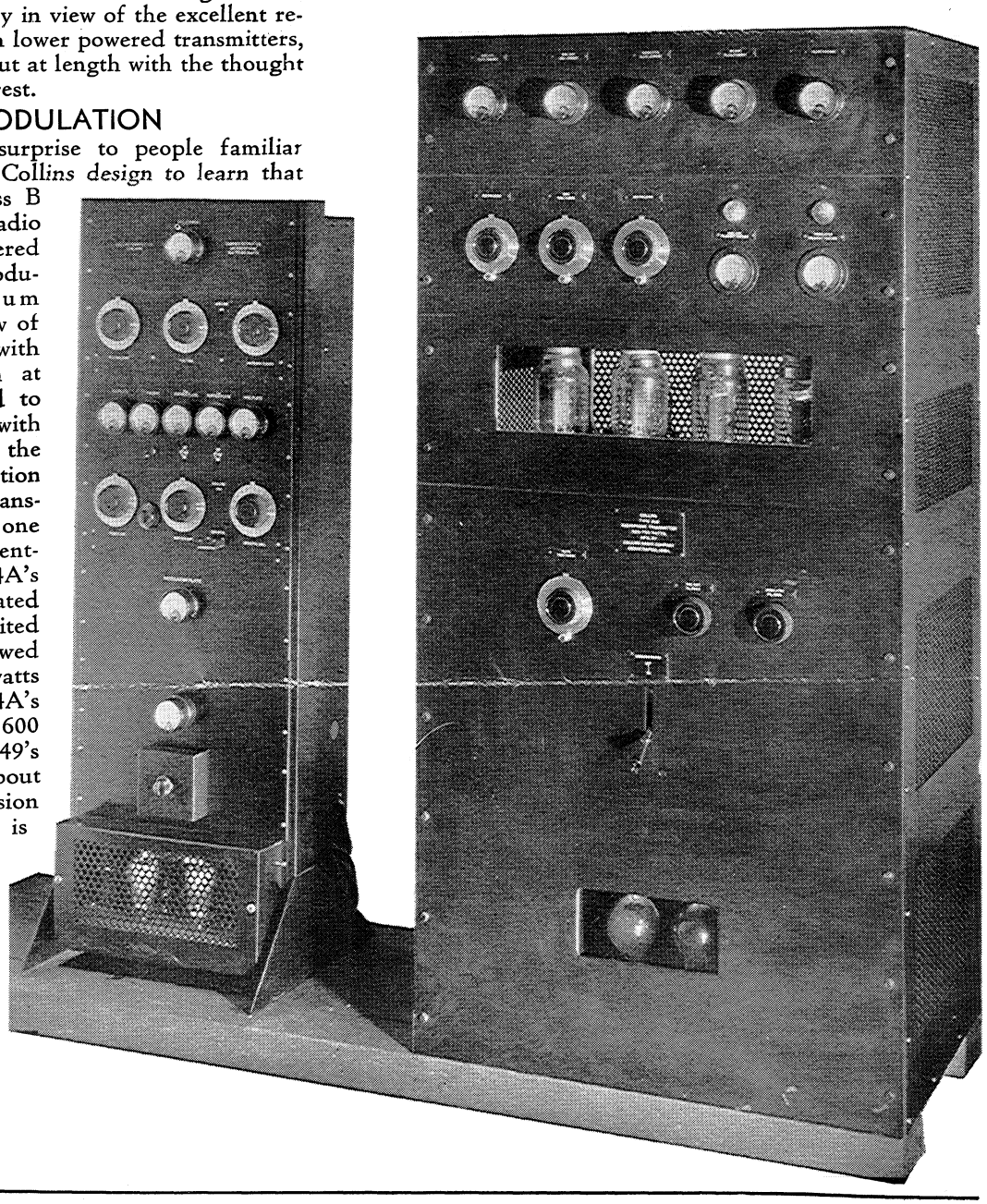
The 20B Transmitter is a continuation into the higher powered field of the series of standard Collins Transmitters. It is capable of a fully modulated carrier output of 750 watts which is perhaps the highest power that can economically be obtained when using air-cooled tubes. The 20B is designed primarily as a broadcast transmitter although it has found application for amateur use where it was desired to obtain the maximum possible modulated output with the limitation of one kilowatt input which is placed upon amateur transmitters. It is a broadcast transmitter which may be used by an amateur to fulfill his dream of an outfit with which he can sit down and talk, by means of either code or voice, with almost any station in any part of the world which it is possible to hear. Although the cost of a transmitter of this size is higher than many amateurs will care to pay in view of the excellent results that can be obtained with lower powered transmitters, a technical description is set out at length with the thought that it will be of general interest.

CLASS B MODULATION

It will, perhaps, not be a surprise to people familiar with the general features of Collins design to learn that this transmitter employs class B modulation. The Collins Radio Company has virtually pioneered the application of class B modulation to low and medium powered transmitters. In view of the excellent results obtained with this method of modulation at lower power, it was decided to carry on extensive tests with larger tubes to determine the suitability of class B modulation at high level for use with transmitters having plate inputs of one kilowatt or higher. Experimental load curves were run on '04A's and '49's. These curves indicated that these tubes were well suited to class B circuits and showed that an audio power of 500 watts could be obtained with the '04A's and a power of slightly over 600 watts could be obtained with '49's using a plate potential of about 2500 volts. Filament emission rather than plate dissipation is the limiting factor in obtaining maximum output from existing radio tubes including these two types.

The load curves indicated that a relatively small amount of power would be required for driving the grids of the modulators and measurements showed that UX 250's could be used for this purpose. However, in order to obtain the least possible distortion and to avoid working close to the limitations of any part of the circuit, it was decided to employ 845's as class A drivers with a class B input transformer having a high step-down ratio. The 845 driver stage is located in the transmitter proper and obtains its power supply from the transmitter power circuits. The audio frequency input to the transmitter is approximately at plus 8db.

The class B modulation transformer is a standard Collins 795 oil insulated type.



Although the 20B is constructed in a manner adapted to high power components, its appearance harmonizes well with rack-mounted excitation and speech units.

A High Power Radiophone Transmitter

Power Supply

When the 20B Transmitter is operated at 750 watts output, the load on the 2500 volt power supply varies from 1.3 kilowatts at zero modulation to 2.6 kilowatts with 100% modulation. This fluctuation in load imposes severe requirements on the design of the main power supply as to regulation and maintenance of low ripple values over fluctuating load conditions. Because of the difficulty in obtaining polyphase power circuits in many locations, it was necessary to design a power supply for operation on single phase current. Of course, mercury vapor type rectifiers were employed because of their economy and their low voltage drop. The type 575 rectifier tubes are used. A special high voltage transformer having a nominal rating of 4.4 KVA is used in connection with two special filter reactors having a relatively high value inductance and very low D. C. resistance. A 2-section filter circuit is employed with choke input and a high value of output capacity to accomplish good transmission of the bass frequencies. The percentage of ripple is very low so that the amount of carrier noise is less than common among broadcast stations. The regulation of power supply is good (approximately 5%) over the range of load values which obtains during modulation.

The Radio Frequency Circuits

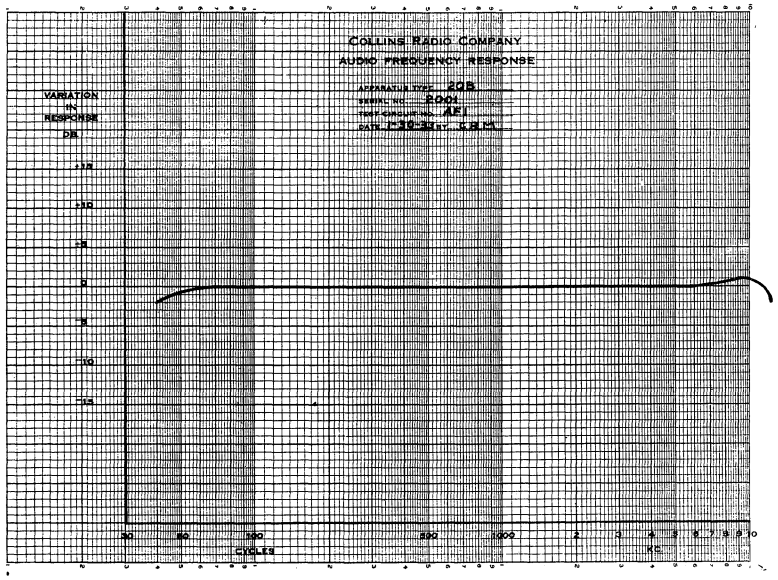
Two '04A's in push-pull are used in the final modulated stage. By careful design of the radio frequency circuits, it is possible to operate the transmitter with excellent stability and efficiency on frequencies as high as 15 mc. Very careful attention has been paid to insulation, reduction of stray RF fields, and the avoidance of high circulating currents. Insulation is chiefly Isolantite. A split stator variable capacitance is used in the plate tank circuit which has several unusual features of construction including Mycalex insulation and an effective air gap spacing of approximately 0.6 inch. This condenser has a relatively low maximum capacity and it is used alone only on the highest frequencies. As the frequency is reduced, low loss fixed condensers are cut into the tank circuit. The tank circuit is maintained at quite low C on all frequencies to obtain maximum efficiency. Standard Collins "E" series inductances are used in both the plate and grid tank circuits. The output of the transmitter is designed for a 2-wire transmission line having a characteristic impedance of from 400 to 600 ohms. Low pass filters can be provided for insertion in this transmission line when a large attenuation of harmonics is required. Parasitic suppressors are used in the grid circuits of the '04A's making their operation entirely stable on all frequencies.

Frequency Control and Excitation

No buffer stages are included in the 20B unit itself. The Collins 150A Transmitter is used for crystal control and excitation and is coupled to the grid circuit of the '04A's by a short 2-wire transmission line. If precision frequency control is required, an additional relay rack is provided for this equipment. This type of construction permits the 20B Transmitter to be added to an existing 100-watt unit.

Provisions for Changing Frequency

Changing the frequency of the transmitter is accomplished by varying both the inductance and the capacity in the final tank circuit. Standard plug-in inductances are used and various values of fixed capacity are cut in or out by bus connections. Exact tuning of the final tank circuit is accomplished by means of the variable condenser Plug-in inductances are also used in the grid circuits and in the preceding buffer stages. All of the tuning controls are provided with a new type of dial lock and a complete tuning chart is furnished which makes it possible to place the transmitter on any predetermined frequency within a few seconds by inserting the proper inductances, setting the dials to the correct position, and locking them in place.



The overall audio response curve (above) was measured from transmitter input to antenna. RF modulation voltages at the various frequencies were measured on cathode-ray oscillograph in order to avoid introducing errors by the use of a linear rectifier.

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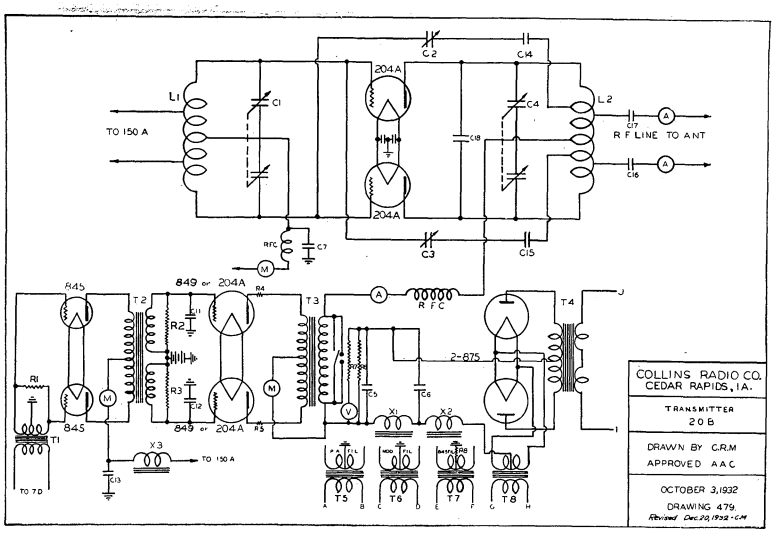
Safety devices and control circuits are not shown in the circuit diagram (right). Following usual Collins practice, the D. C. Plate current to the modulated stage is carried through the modulation transformer windings.



Provisions for Varying Output

It is frequently desirable to operate a transmitter at various output powers. In certain broadcast installations a transmitter is required to operate at a power of 500 or 750 watts during daytime and 250 watts at night. In high frequency work, it is frequently possible to reduce the power of the transmitter when transmission conditions are favorable. A reduction of power is a fairly simple matter in a radio telegraph transmitter but in a radiophone transmitter it is often difficult to maintain the proper load relations between the various circuits when the output is varied unless special consideration is given to this problem. This difficulty is particularly true in transmitters employing low level modulation. The 20B Transmitter is normally supplied for operation at a single output power, namely, 600 watts. However, auxiliary equipment can be supplied on special order making it possible to vary its power between any values from 250 to 750 watts by means of a single control. This is accomplished by the use of a special auto-transformer in the primary circuit in the high voltage power supply. A rotary contactor adjusts the plate voltage to give the required power output. The plate voltage to the modulators and the modulated amplifier is varied simultaneously with the grid bias to the modulators. This makes the simplest possible means of varying the power output and exactly the correct load resistance is placed on the modulators at all outputs. When only two definite power outputs are required, provision can be made for shifting from one power to another by means of a single set of pushbuttons which may be located remotely. The change is accomplished instantaneously and the carrier is not taken off the air.

Constructional Features

The 20B unit is built on a steel frame which is assembled by welding in a special jig giving unusual strength and accuracy to the mechanical construction and avoiding the use of unsightly gussets. The front panels are of heavy aluminum and bakelite and the sides and rear are enclosed with perforated grilles. Maple spars are used to carry Isolantite insulators used in the high voltage circuits. The power tubes and the rectifiers are visible from the front of the transmitter through plate glass windows. All direct current and low frequency wiring is accomplished by a single cable. Radio frequency circuits are connected by copper piping with lug fittings. The interior of the transmitter is very neat and attractive in appearance.

Safety Devices

In order to protect fully the various parts of the transmitter and to afford complete safety to the operators, a number of safety devices have been incorporated in the construction. Safety switches are used on the rear door of the transmitter so that it is impossible to gain access to any of the high voltage circuits with power on. The front panel of the transmitter is entirely "dead front" and all dials and other metal parts on the front panel are grounded. The meters are protected by means of grounded shields (not shown in the photograph). Isolating condensers are provided in the transmission line connections, and static charges are drained off the antenna through bleeder resistances. Possibly the most important features from the standpoint of proper operation of the transmitter and tube life is a delicately adjusted overload switch which removes the plate voltage whenever the transmitter is seriously over-modulated or the radio frequency tubes draw an unusual amount of current due to damage to the antenna or for some other reason. An additional safety relay is provided which removes the audio frequency excitation to the modulators whenever the plate current to the modulated stage falls below normal, thus preventing the modulators from operating without their proper load. All parts of the circuit are designed with a wide margin of safety so that the failure of any part during continuous operation is a remote possibility.

Control Devices

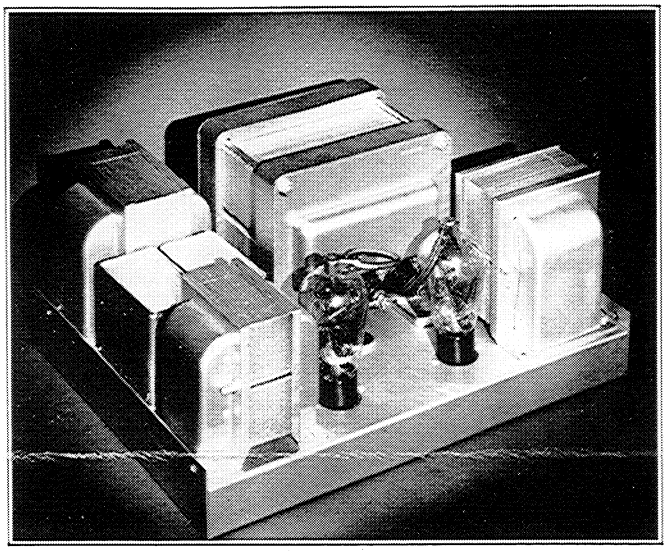
All power conduits to the 20B and the 150A excitation unit, as well as any auxiliary apparatus which may be used, are brought to a single junction box. This box contains line switches, primary fuses and also a full set of relays for control of the circuits. The time delay relay insures the closing of the various circuits in the proper sequence. Provision is made for turning the transmitter on and off from any position. A neat pushbutton box is furnished with the transmitter which has master control as well as buttons for turning on the various parts of the transmitter individually.

Audio Frequency Fidelity

Every effort has been made to achieve the greatest possible audio fidelity in the 20B Transmitter. It is not possible in this brief description to describe the various methods used to this end but it is significant to point out that the overall frequency response of the 20B Transmitter is flat within 2db from 40 to 12,000 cycles. The wave shape distortion is extremely low. Very careful measurements of the audio performance of this transmitter have been made. One important feature from the operator's standpoint is the ease with which it can be adjusted for proper modulation. It is much simpler to obtain excellent quality with a high level class B modulated transmitter of this type than it is to properly adjust a low level modulated transmitter.

(Note: Unlike other Collins Transmitters which are carried in stock for immediate delivery, the 20B is custom built for each user. Delivery can ordinarily be made within thirty days upon receipt of order. Prices on request.)

New 1200C Power Supply



The new 1200C Power Supply replaces the 1200B Power Supply which has been used in Collins Transmitters for some time as a source of voltage for 203A tubes. The 1200C has an additional filter section so that the hum level is extremely low and is entirely suitable for broadcast station work. The 1200C makes an ideal plate supply for a 100 watt transmitter, employing Class B modulation. A 250 watt transmitter can use one 1200C unit for the Class C modulated tubes and a second 1200C for the Class B modulators.

Tubes Employed—Two 866 Mercury Vapor Rectifiers.

Circuit—Full wave rectification with choke input and two section high C filter.

Power Output—
High voltage 1100-1000 V. D.C. 400 M.A.
Filament supply 10 V. A.C. 15 A.

Source of Power—110 V. 60 cycle A.C.

Chassis — Copper plated steel aluminum duco, 13" x 17-7/16" x 8¾" high. Suitable for relay rack mounting.

Weight — 95 pounds. Shipping weight 150 pounds.

1200C POWER SUPPLY—Code word, WYDAD.

150B—the Popular 100 watt Transmitter

The 150B is a general purpose 100 watt radio telegraph and radio telephone transmitter. It is entirely self-contained except for speech input equipment and is ideal for amateur broadcast and general communication work. General specifications follow:

Rated Output—100 watts.

Frequency Range—1500—15,000 kc. (Provision for operation on higher and lower frequencies on special order.) Coils for one band furnished with transmitter.

Frequency Control — Direct crystal control.

Radio Frequency Tubes — 47 crystal oscillator, 46 first buffer, 2-46's second buffer, 203A final amplifier.*

Rectifier Tubes — 2-866's in 1200C 1000 volt power supply, 1-80 and 1-83 in low voltage power supplies.

Type of Modulation—The final class C amplifier is modulated by two 203A's class B.

Audio Frequency Range—70--10,000 cycles within ± 1.5 db.

Amplitude Distortion — Less than 5% at 100% modulation.

Maximum Percentage of Modulation—100%.

Keying—Grid block in second buffer. Provision is made for switching off the crystal oscillator to permit reception on the crystal frequency.

Power Source—110 volts, 60 cycles, single phase is standard. Provision for other voltages and frequencies on special order. Special converters and engine generators are available for use when no AC supply is obtainable.

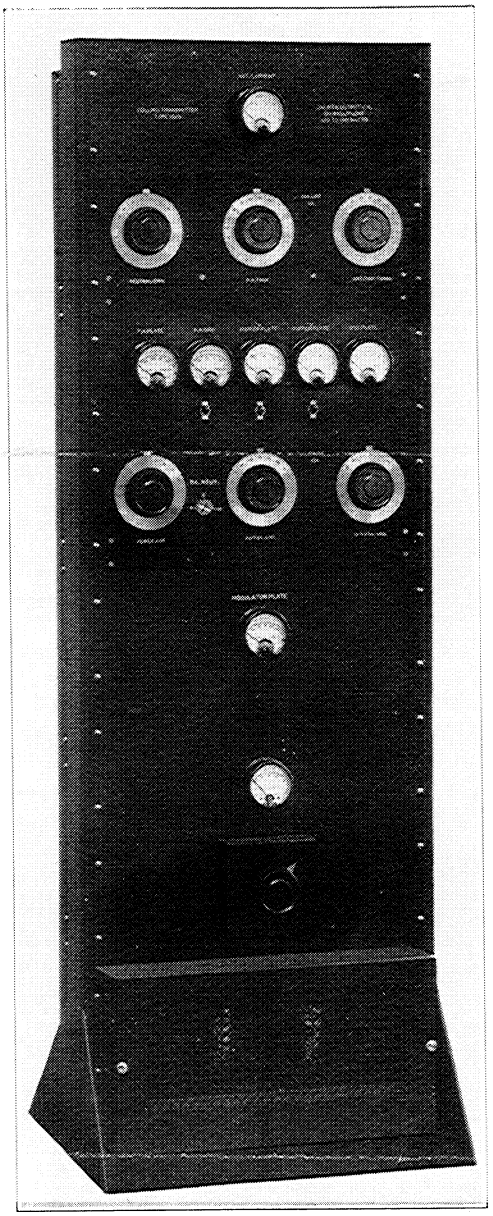
Instruments — Seven surface type high grade instruments are furnished. All tuning operations and adjustments can be checked by means of the meters.

Dimensions — 60½" high, 20½" wide, 20" deep overall. The transmitter is mounted in a standard size relay rack with special rear enclosures.

Weight—Approximately 290 pounds. Shipping weight 350 pounds.

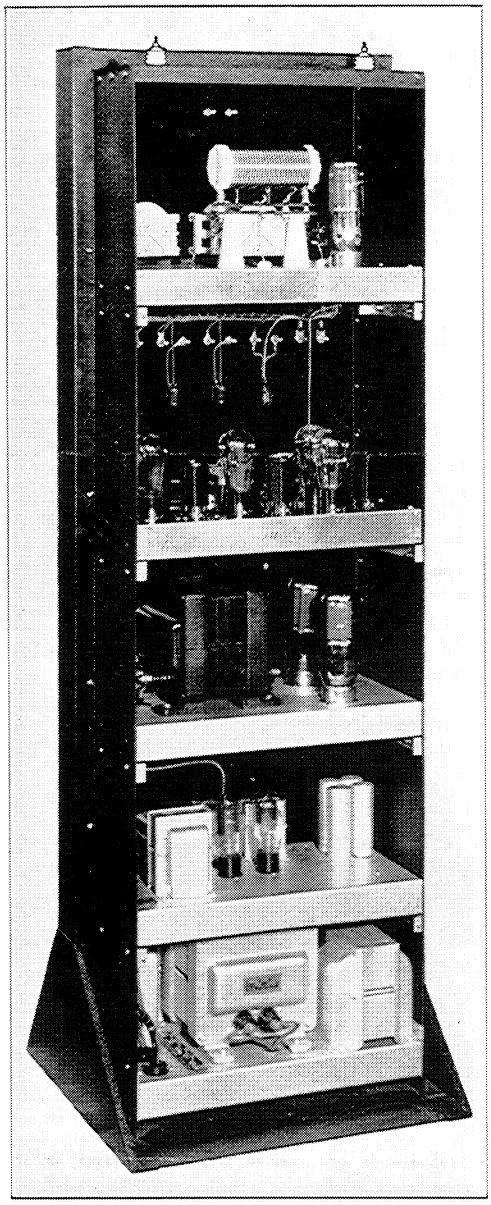
The 150B transmitter is built up of standard Collins units including type 3A radio frequency power amplifier, type 10B radio frequency excitation unit, type 404A 400-300 volt dual power supply, 30B class B modulator unit, 1200C power supply. These units are assembled in the 150B rack with appropriate meters and panels and are interconnected by means of a special interunit cable. Electrical design and mechanical construction are consistent with usual Collins practice.

*Some current models use the 10A excitation unit with a type 10 second buffer — otherwise identical.



Quick change of frequency is possible as in other Collins transmitters by means of interchangeable coils and calibrated dial settings. The final amplifier is heavily excited so that its efficiency is high.

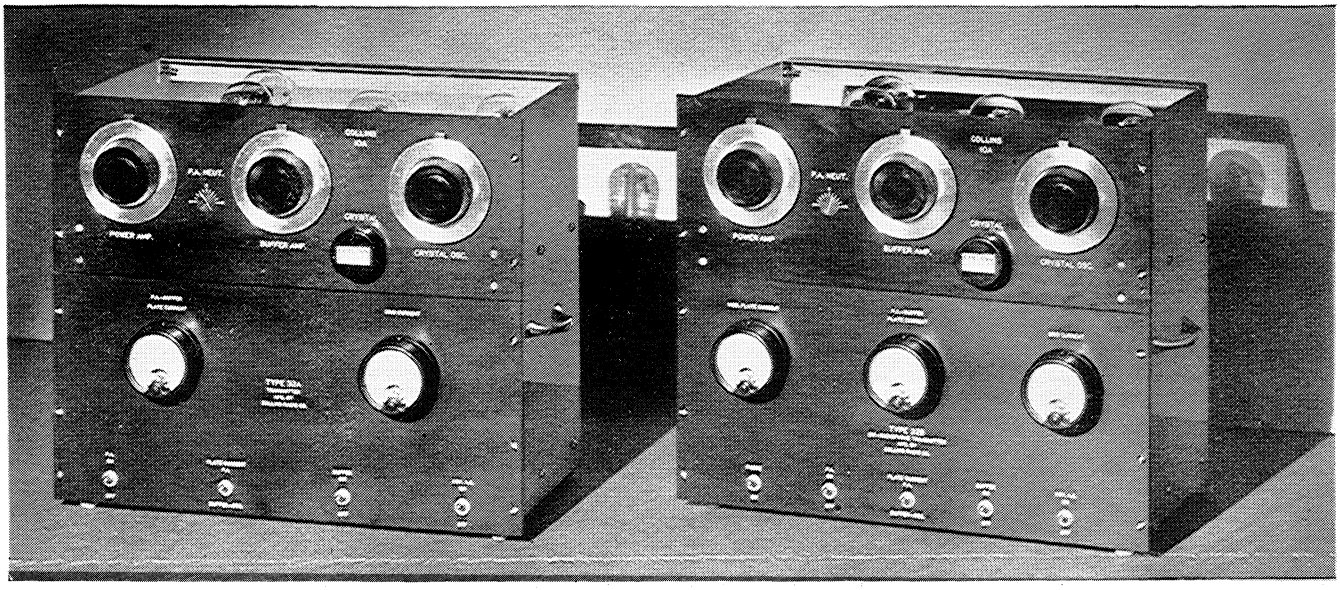
The class B modulation system embodies numerous refinements which make possible a high degree of audio fidelity. The 7B amplifier is the only external speech equipment required exclusive of microphones. Provision is made in the 150B transmitter to receive the output of the 7B amplifier over a short shielded line.



150B TRANSMITTER—Code word ZONPA.

The 150A transmitter is identical to the 150B except that the modulation equipment is omitted, thus providing an efficient CW transmitter. Provision is made for addition of the modulators at any time.

150A TRANSMITTER—Code word ZONYV.



THE 32B TRANSMITTER

NEW SPECIFICATIONS

The 32B transmitter was first announced during March, 1933, as an interesting addition to the general line of Collins transmitters. It was originally intended for use by amateurs who wanted an all-purpose transmitter delivering a high-quality signal of medium power. Within the few months that the 32B has been available it has established itself as the most popular and most versatile of all of the transmitters which the Collins Radio Company has built to date. This enthusiastic acceptance is probably due to the fact that its power (25 watts) is sufficiently high to afford reliable communication and yet the transmitter is compact, self-contained, easy to install, has a high-quality audio system requiring only the connection of a suitable microphone, and the price is within the reach of almost every user of transmitting equipment.

Improvements and refinements of the original design have been made and, therefore, it seems desirable to issue this new description of the 32B transmitter. Complete specifications and discussion of its design and operation follow:

GENERAL SPECIFICATIONS OF 32B TRANSMITTER

Power Output—25 watts.

Frequency Range—1500-15,000 kc. (Provision for operation on higher and lower frequencies on special order.) Coils for one band furnished with transmitter.

Frequency Control—Direct crystal control with isolation of the crystal oscillator from the power amplifier by suitably designed buffer stage.

Radio Frequency Tubes—47 crystal oscillator, 46 buffer, two 46 power amplifiers.

Audio Tubes—57 voltage amplifier, 46 driver, 2-46's class B modulators.

Rectifier Tubes—80 and 83.

Maximum Percentage of Modulation—100.

Audio Frequency Range—70-10,000 cycles within ± 1.5 db.

Amplitude Distortion—Less than 5% at 100% modulation.

Keying—Grid block in final amplifier. Provision is made for switching off the crystal oscillator to permit reception on the crystal frequency.

Power Source—110 volts, 60 cycles, single phase is standard. Provision for other voltages and frequencies on special order.

Special converters and engine generators are available for use when no AC supply is obtainable. The total power drain is less than 250 watts under complete modulation.

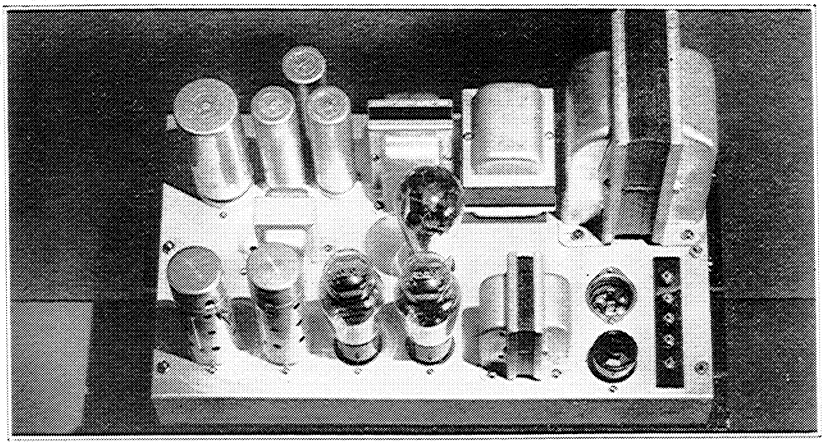
Instruments — Three surface type high grade milliammeters are furnished for reading plate and grid currents in the various stages. All tuning operations and adjustments of the transmitter can be checked by means of these meters.

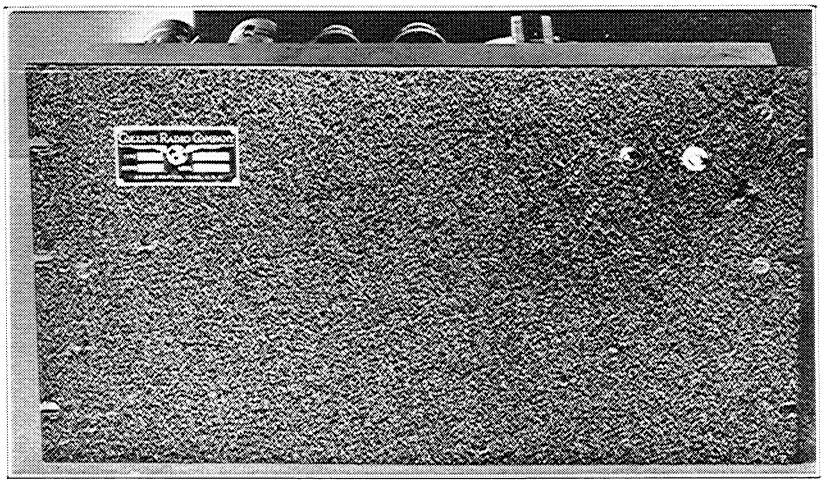
Dimensions—16" high, 19" wide, 11½" deep. The standard frame furnished with the transmitter is for table mounting. The panels, however, are of the correct dimensions to fit a standard 19" relay rack and and the transmitter can be so mounted on special order.

Weight — Approximately 50 pounds. Shipping weight 90 pounds.

RADIO FREQUENCY TUBE LINE-UP

The 32B transmitter makes use of the standard Collins 10B radio frequency excitation unit. A 47 crystal oscillator drives a 46 buffer and the latter can be neutralized if the transmitter is to be operated on the crystal frequency or can be operated as a buffer-doubler for operation on a multiple of the crystal frequency. The final amplifier using two type 46 tubes is always operated as a straight neutralized amplifier. For instance, for radio telephone operation on 14,200 kc. a crystal having a frequency of 7,100 kc. may be used with a crystal oscillator coil for the same frequency. Coils for 14,200 kc. will be inserted in the buffer-doubler and power amplifier and their plate circuits tuned to that frequency. Very careful attention has been paid to the subject of neutralization so that this can be accomplished without critical adjustments. The buffer is neutralized by a small variable condenser mounted on the buffer inductance so that the neutralization adjustment is not disturbed when coils are changed. Neutralization adjustments of the final amplifier are made with a small inset knob having readily legible calibrations. The tuning chart furnished with the transmitter shows the proper setting of the neutralizing control for each frequency and the neutralization adjustment can be checked accurately with the grid current milliammeter. Shifting from one band to another is merely a matter of changing the plug-in coils and setting the dials to the calibrated position. The entire operation can be performed in a minute's time. The adjustment of the transmitter has been so simplified that it is pos-





Collins 7P Amplifier

The 7P Amplifier (shown at left) is a general purpose amplifier well adapted to class B modulation systems. The circuit and performance are essentially the same as those given for the 7A Amplifier. (See April-August Signal.) A 57 Input Tube is followed by a 56 and push-pull 2A3's in true class A.

A power supply with a 5Z 3 rectifier is incorporated on the same chassis and it is sufficiently large to supply 100 ma at 350 volts to any external load, such as, speaker fields, receivers, microphone amplifiers, etc. The undistorted output is 10 watts, with wide range fidelity. The hum is reduced to a low value by using an external input transformer.

Rack mounting space required is 10½".

Code word, YAECT.

Net weight: 33 pounds.

Shipping weight: 45 pounds.

sible to make use of the all-band feature of the transmitter to the fullest extent. The 46 tubes are operated at full efficiency with adequate grid excitation which provides a remarkably high output without resorting to the more expensive "transmitting" type tubes.

The 10B unit can also be used for exciting a larger power amplifier of the 203A type if it is desired to increase power.

AUDIO FREQUENCY SECTION AND POWER SUPPLIES

The speech amplifier, modulators and the two power supplies are mounted on the lower chassis. A type 57 voltage amplifier receives the output of a condenser, crystal or double button microphone at approximately minus 40 db. The 57 is resistance-coupled to a 46 class A driving the 46 class B modulators. The audio system makes use of exclusive Collins features which have established a wide reputation for high fidelity.

In order to provide most efficient operation two power supplies are used. A 400 volt power supply using a heavy duty transformer, type 83 rectifier and a choke input filter delivers plate voltage to the buffer, power amplifier, and class B modulators. A second power supply with an 80 rectifier delivers 300 volts to the crystal oscillator and the 57 and 46 audio tubes. This arrangement effectively prevents fluctuations in load resulting from keying or modulation effecting the frequency stability of the crystal oscillator.

CONSTRUCTIONAL DETAILS

The external dimensions of the 32B transmitter have been outlined under GENERAL SPECIFICATIONS. The 10B unit employs a dull finish Bakelite panel with white engraving. The chassis sub-assembly is of burnished aluminum accurately formed and pierced. Wiring is rigid conductor or laced cable. Coupling condensers are high-grade mica and resistors are of the wire wound vitreous enamel type. Special Cardwell condensers are used for tuning. Inductances are wound on low-loss synthetic resin forms.

The audio-power supply chassis is heavily copper-plated steel finished with aluminum duco. Transformers are fully encased and every component is designed for continuous duty under full load. Wiring is entirely in laced cables. Power connection is made by means of a heavy duty rubber covered cord and flexible connectors are provided for the key and stand-by switch. The transmitter frame is finished in aluminum crinkle and is fitted with soft rubber friction feet.

MICROPHONE CONNECTION

Audio input to the transmitter is made directly to the grid cap of the 57 tube. Normally a microphone control box is located near the transmitter. The Collins 1A microphone input unit is designed for this purpose and contains a gain control and a microphone transformer.

PERFORMANCE

In spite of its compact construction and very moderate cost, the 32B transmitter has a performance which does justice to a much more bulky and expensive installation. On telegraph the transmitter delivers a powerful crystal-clear signal to the antenna with clean cut keying so that the transmitter attracts immediate attention on the air. Numerous reports of international DX are constantly being received from users of 32B transmitters and very reliable communication can be carried on over moderate distances. When the 32B transmitter is used for radio telephone work, the 100% modulation feature and high fidelity gives the signal ability to cut through heavy interference and be readily intelligible. Several 32B transmitters have established records for international DX communication **on voice** where they have been used with an efficient antenna system.

Guarantee: In common with other Collins products, the 32B transmitter is unconditionally guaranteed to give complete satisfaction and every purchaser is given individual attention to see that his particular installation is performing at greatest efficiency.

32B TRANSMITTER—Code word, ZOVAB.

To those operators who are interested in telegraph transmission alone or who wish to start out with a CW outfit and later add equipment to change over to phone, the 32A transmitter is available. The 32A is identical to the 32B in every respect except that the modulation equipment is not supplied. The price is proportionately lower.

32A TRANSMITTER—Code word, ZOWOC.

New Data on the 4A

The 4A Transmitter was first announced in the April-August issue of the Collins Signal and only a moderate amount of importance was attached to it at that time. However, during the intervening months this model has proved to be one of our most important products. It has filled a very insistent demand for a low-cost, all-band CW transmitter which was not burdened by the extra cost and complication of a lot of meters and tuning controls, but, at the same time, was capable of giving consistent performance.

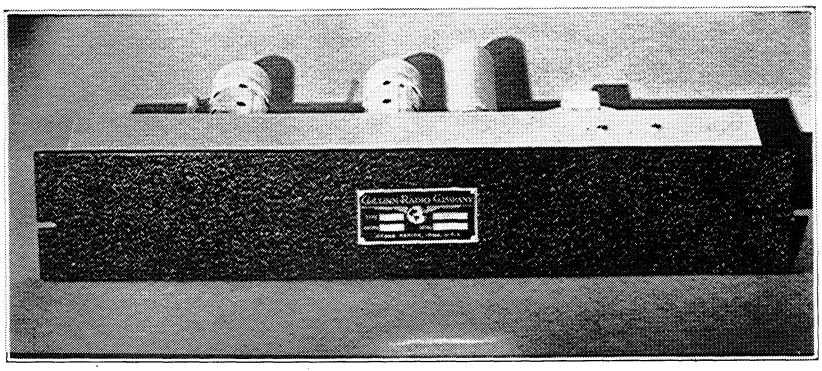
We have been very much gratified by the letters we have received from the many amateurs who have purchased this transmitter. Transcontinental schedules are maintained regularly with the 4A's and several users have reported working Mexico City, Hawaii and New Zealand within the first week or so of operation.

Some slight refinements have been made in the circuit of the 4A so that the measured output is now 28 watts on 3500 and 1700 kcs., 25 watts on 7,000 kcs. and 13.2 watts on 14,000 kcs. Of course, the outfit is crystal controlled with a D. C. note.

We have a few inquiries as to why we do not incorporate the new "universal exciter" in some of our transmitters. The universal exciter is a very clever arrangement, but no advantage is found over our existing 4A and 10B circuits. It should be remembered that the output of the universal exciter is scarcely high enough for serious transmission work, unless it is followed by another amplifier, whereas, the 4A Transmitter puts out a relatively powerful signal and it also contains dual power supplies, so that no additional equipment has to be purchased.

We strongly recommend the 4A Transmitter for the consideration of every amateur who wants the most efficient telegraph transmitter obtainable at a very moderate investment.

THE 6A AMPLIFIER



The 6A is an input amplifier for use with crystal, moving coil or velocity microphones. Either 77 and 76 tubes, or their 2.5 volt heater equivalents, the 57 and 56, are used with a gain of 45 decibels. The tubes are carefully decoupled so that rectified plate voltage can be used.

Optional input and output impedances are 50, 200, 500, and 20,000 ohms.

The Amplifier is constructed on a 3½" relay rack panel so that several can be mounted in a restricted space and their outputs mixed at a relatively high level, rather than in the microphone circuits.

Code word, YAACS.
Net weight: 6 pounds.
Shipping weight: 12 pounds.