

Taylor

CUSTOM
BUILT

Tubes

1937-1938
CATALOG and MANUAL



Taylor Tubes, Inc.

2341-43 WABANSIA AVENUE
CHICAGO, ILLINOIS

TAYLOR TUBES ARE SOLD THROUGH DISTRIBUTORS

There are TAYLOR TUBE Distributors in every logical distribution point throughout the U. S. and many foreign countries. We have attempted to see that all amateur and Broadcast Engineers could easily obtain TAYLOR TUBES when desired; and at the same time, tried to limit the distribution so that each Distributor would have a market large enough to afford carrying the complete line of TAYLOR TUBES.

All TAYLOR TUBE Distributors have been selected

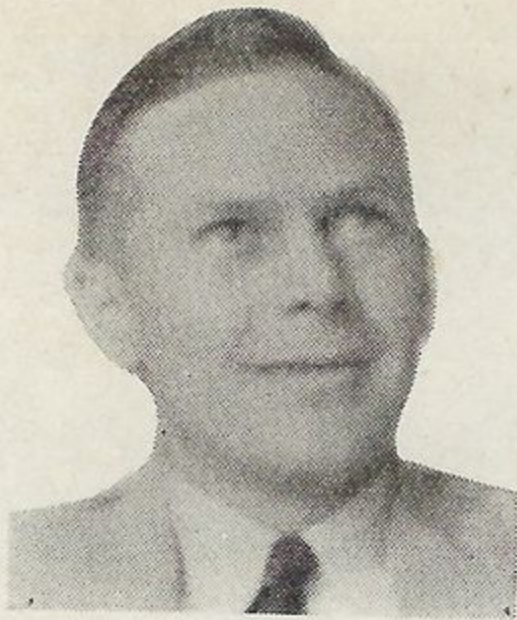
with full consideration of their ability to serve and their reputation for fair dealing. We are extremely proud of the fact that Distributors not only sell TAYLOR TUBES—they RECOMMEND THEM above all others. We feel Radio Amateurs generally should recognize that the Radio Parts Distributors are their Best Friends—anxious at all times to extend the greatest possible cooperation on every transaction.

THERE IS A TAYLOR TUBE DISTRIBUTOR NEAR YOU.

TAYLOR TUBE RATINGS HAVE F. C. C. APPROVAL

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WARREN G. TAYLOR
President



FRANK J. HAJEK (W9ECA)
Sec. & Treas.

THANK YOU

Ever since its inception, TAYLOR TUBES, INC., has faithfully lived up to its motto, "MORE WATTS PER DOLLAR."

That you appreciate these efforts and realize the merits of our products is indicated by our increased sales.

Today TAYLOR TUBES are not only used by thousands of Amateurs, but have found a distinctive place in the commercial radio and industrial field.

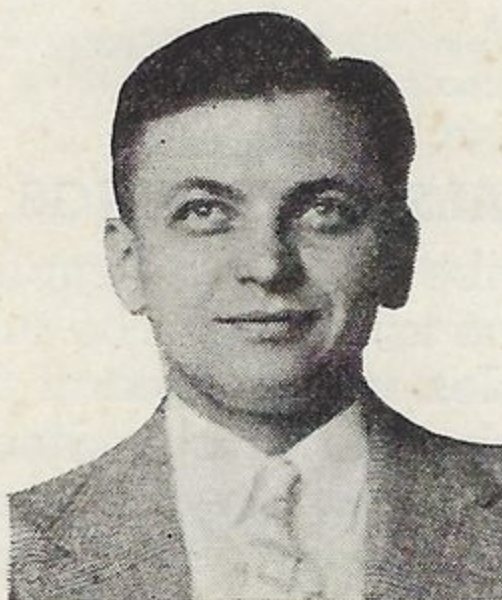
With the introduction of this, our new 1937-1938 Catalog and Manual, we again dedicate ourselves to your service. If you find the information herein of value, we feel that our efforts have been rewarded.

May we continue to have the privilege of serving you?

TAYLOR TUBES, INC.

WARREN G. TAYLOR

FRANK J. HAJEK (W9ECA)



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Vice Pres.



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Sales Manager

A SECTION OF OUR TRANSMITTER TESTING LABORATORY



GENERAL INFORMATION

HEAVY DUTY CONSTRUCTION

When building radio transmitters or any other apparatus which incorporates the use of vacuum tubes, it is well to remember that the tube is the most important component of the circuit in which it is used. Our engineers realize this fact and designed our tubes accordingly. In the old days when tubes were as delicate as they were high-priced, the construction was such that they had to be handled very carefully as the slightest jar might be injurious. This is not the case with the present day TAYLOR Carbon Anode Tubes. The Radio field requires tubes of heavy duty construction. The tubes used in portable medical apparatus which is moved about in hospitals and doctors' offices, in mobile equipment such as police cars and boats and in airplane transmitters, must be built to pass severe tests for vibration and shock. Elements must be rigid and braced to withstand shocks which would otherwise throw them out of alignment. The filament, which is inherently brittle, must be correctly suspended by springs so that vibrations will not shatter it. Many manufacturers have chosen TAYLOR TUBES for the above mentioned uses because they meet these requirements.

NOTE

TAYLOR CARBON ANODES CAN BE RUN AT A RED HEAT WITHOUT INJURING THE FILAMENT EMISSION OF THE TUBE.

FLOATING ANODES

All Taylor Tubes having a plate dissipation rating of 50 watts or more, whether the plate lead is brought out thru the base or top of envelope, have the **Floating Anode**.

With this Taylor feature, (patent applied for) and distinctive design, punctures in the stem are eliminated and dielectric losses are reduced, because the structural supports and collar are not at plate potential.

CARBON ANODES

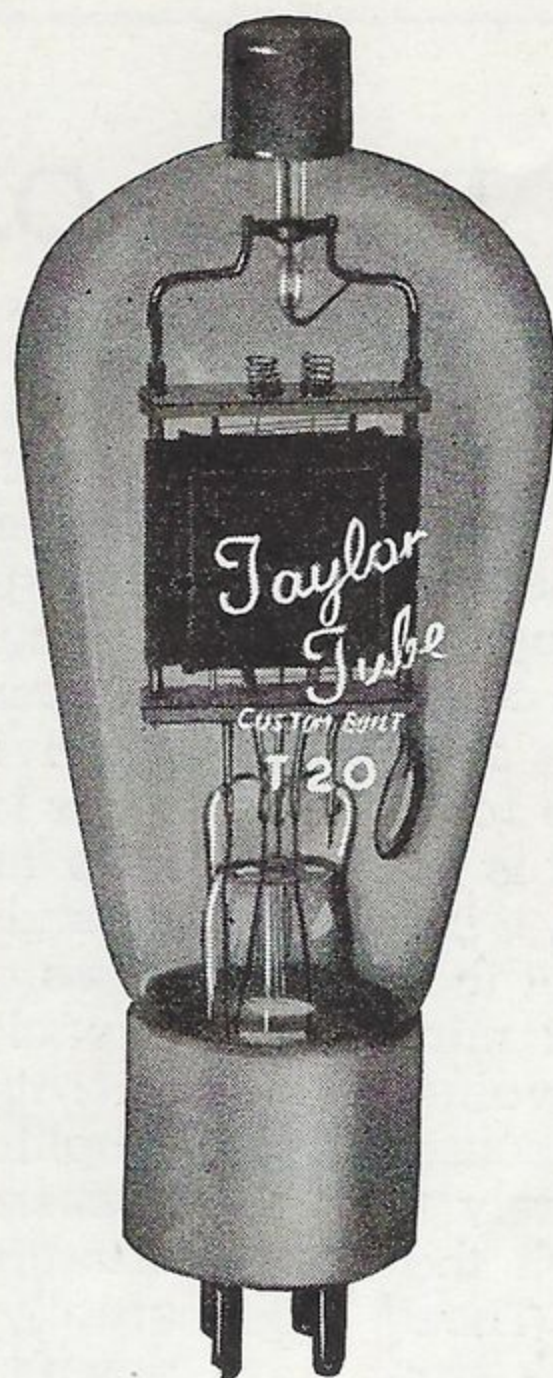
1. Radiate heat four times as fast as bright metals.
2. Do not expand when heated as do metal anodes, and therefore characteristics of Carbon Anode tubes do not vary.
3. Carbon Anodes are machined from a solid block of chemically pure carbon and do not have high resistance contact points as do metal anodes with welded seams.
4. Because Carbon Anodes dissipate heat evenly over their entire surface, hot spots are eliminated.

FUNDAMENTALS OF RATINGS

Remember, a vacuum tube does not amplify power. The power comes from the light line. The tube merely acts as a valve that enables you to control this power and change its form. The tube in changing the D.C. power to Radio Frequency power, wastes some of the energy just as a motor generator does in performing the same function. This wasted energy in a vacuum tube is known as plate dissipation. The watts dissipation is the difference between the watts input and watts output.

T-20**\$2.45****20 WATTS PLATE
DISSIPATION**

A general purpose Triode, offering outstanding value to the amateurs. The T20 has established itself as an extremely fine amplifier on all frequencies up to and including 56 mc., efficient as a doubler or buffer. The T20 is recommended for Class C amplifier purposes.

**GENERAL CHARACTERISTICS
TYPE T-20**

Filament Voltage, volts.....	7.50
Filament Current, amps.....	1.75
Plate Resistance, ohms.....	8000
Mutual Conductance, uMhos.....	2500
Amplification Factor	20

PHYSICAL CHARACTERISTICS

Max. Length, inches.....	6½
Max. Diameter, inches.....	2½
UX Ceramic Base	

INTERELECTRODE CAPACITIES

Plate to Grid, mmf.....	4
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CLASS "C" AMPLIFIER

Max. Operating Plate Volts	
Unmodulated DC, volts.....	750
Modulated DC, volts.....	750
Max. DC Plate Current, mls.....	75
Max. DC Grid Current, mls.....	25
Max. Plate Dissipation, watts.....	20
Max. RF Grid Current, amps.....	2.5
RF Output, watts.....	42
Percentage of Efficiency.....	75%

NORMAL OPERATION

$E_p = 750$	$E_g = -100$	$E_f = 7.5$
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TYPICAL OPERATING CONDITIONS**CLASS "B" A.F. MODULATOR****Push Pull Operation**

DC Plate Voltage.....	800	600
Grid Voltage Approx.....	-40	-30
Load Resistance P-P.....	12,000	8100
AV DC Plate Current per tube.....	68	70
Static Plate Current.....	10	10
Power Output, Watts (2 tubes).....	70	50

**The New
TZ-20****20 WATTS PLATE DISSIPATION
METAL PLATE
ZERO BIAS TUBE****\$2.45**

A High-Mu Triode designed for Zero Bias Class B Audio operation and for efficient frequency multiplying performance. The regular T20 is recommended for all Class C Amplifier purposes.

**GENERAL CHARACTERISTICS
TZ-20**

The electrical characteristics of the TZ20 are the same as the regular T20 except as follows:

Plate resistance, ohms.....	26,700
Mutual conductance, uMhos.....	2,320
Amplification factor, mu.....	62

TYPICAL OPERATING CONDITIONS**CLASS "B" A.F. MODULATOR****Push Pull Operation**

DC Plate Voltage.....	800	600
Grid Voltage Approx.....	-400	-300
Load Resistance P-P.....	12,000	8100
AV DC Plate Current per tube.....	68	70
Static Plate Current per tube.....	20	14
Power Output, Watts (2 tubes).....	70	50

The TZ20 is primarily designed for zero bias Class B audio operation and no bias is required for such operation at voltages up to 800. It is the ideal Class B audio tube for outputs up to 70 watts and 4 of them push pull parallel will form a most economical 140 watt modulator. For pushpull parallel operation the reflected load impedance will be half and the output twice that for two tubes. The Class B operating conditions for the T20 and TZ20 are identical but the TZ20 avoid the necessity for a source of grid bias with good voltage regulation. At 800 volts the no-signal plate current to a pair of TZ20's will be approximately 25 to 30MA. About 35 volts of bias is required with the T20 to limit the plate current to the same value. The audio quality should be the same with either type of tube.

If the TZ20 is used as an RF amplifier the information on the T20 above will apply except that somewhat less bias is necessary. For one TZ20 the bias resistor should be 4000 ohms. Half that value or 2000 ohms would be correct for two tubes push pull or parallel.

The TZ20 is a more efficient doubler than the T20 and is recommended for this purpose. As a doubler the bias resistor should be 6000 ohms or higher if sufficient excitation is available to permit normal grid current with higher values. Efficient doubler operation requires large amounts of grid drive.

Taylor



Tubes

OPERATING DATA ON THE T-20

The T-20 is the latest in the Taylor Series of easy to drive tubes. It thrives on a minimum amount of excitation and its ratings are conservative. At the rated input, no color whatever will show on the plate. While the rated plate dissipation is 20 watts, no color shows on the plate until the dissipation amounts to approximately 32 watts and it takes about 45 watts to cause a cherry red spot in the center of the plate. Any color whatever showing on the plate means that the rated plate dissipation is being exceeded. If the input is not so great that such dissipation may be expected, it is a definite indication that the circuit is less efficient than it should be. To obtain best efficiency with a minimum of harmonics, we recommend that certain values of capacities be used in the plate tank and of course the tank coils should be proportioned accordingly to hit resonance at the operating frequencies with that amount of tuning capacity across the circuit. These capacities should be the actual amount of tank condenser in the circuit across the entire plate tank. A higher value of C will result in lower tank impedance and lower efficiency. Lower values of C will result in slightly higher efficiency, but this will be offset by increased harmonic content as well as poor linearity if the stage is modulated for fone. These values will hold for both single ended and push-pull amplifiers.

1715 KC — 160 MMFD	14000 KC — 20 MMFD
3500 KC — 80 MMFD	28000 KC — 10 MMFD
7000 KC — 40 MMFD	56000 KC — 5 MMFD

Under these conditions with an input of 750 volts 75 MA per tube the efficiency should be approximately 75% and the output 42 watts per tube. For one tube, the recommended grid bias resistor would be 6000

ohms. Half that value or 3000 ohms would be correct for two tubes, parallel or push-pull. For CW or buffer operation, the DC grid current should be 12 MA or more and for phone operation should be 17 MA or more per tube. Under no conditions should the DC grid current per tube, exceed the rated value of 25 MA. Expressed in terms of power approximately 2.5 watts of drive are required for CW or buffer operation or 5 watts for fone operation. This of course, means that the tube may be driven to full output directly from the crystal oscillator stage. The tube has several advantages over others in its size class. The interelectrode capacities are lower, making possible satisfactory operation on frequencies as high as 56 MC. The amplification factor is higher, making less grid drive necessary and simplifying the bias requirements. Bringing the plate lead out of the top of the bulb greatly reduces the possibilities of voltage breakdowns. In addition to its RF capabilities it is an excellent Class B Modulator tube.

CAUTION: These tubes have metal plates and do not have the carbon anode which is characteristic of all other TAYLOR Transmitting Tubes. This does not mean that they will be any less efficient but it does mean that they will not stand as much abuse. The plate voltage should be reduced while making adjustments to prevent excessive heating. Properly handled, the efficiency of these tubes will be as great as though they had carbon anodes and their life will be equally as long.

It is well to remember that it requires 4 to 6 times the power to show color on a black anode than it does on a molybdenum or tantalum anode of the same size.

CLASS B AUDIO DATA - - - TZ-20 - - - T-20

The chart at right gives proper Class B Audio operating conditions for various outputs at different plate voltages. The most important value is the reflected load impedance which is given for the entire primary or plate to plate. The current value is the maximum average value as would be indicated on the plate current meter with sine wave input. For the same peak output with voice input the maximum average plate current will be approximately 50% to 60% of this value. The correct bias for the T-20 will limit the no-signal plate current to between 10 and 15 MA per tube.

D.C. Plate Voltage ↓	30	40	50	60	70	←Audio Watts Output
800	59MA 28,000	78MA 21,000	98MA 17,000	117MA 14,000	137MA 12,000	←Max. Av. Ip ←Load Impedance plate to plate
700	69MA 20,000	92MA 15,000	115MA 12,000	140MA 10,000	←Max. Av. Ip ←Load Impedance plate to plate	
600	85MA 13,500	113MA 10,200	140MA 8,100	←Max. Av. Ip ←Load Impedance plate to plate		
500	109MA 8,200	145MA 6,100	←Max. Av. Ip ←Load Impedance plate to plate			

T-55**55 WATTS PLATE DISSIPATION****Carbon Anode**

The TAYLOR T-55 is a tube of medium power capable of **efficient power output** at **frequencies as high as 120 megacycles** yet it operates at reasonable values of plate voltage and plate current. Its medium low inter-electrode capacities and efficient flat form of construction result in low losses across the elements avoiding the necessity for high voltages for good efficiency and **reducing the grid drive requirements**. The T-55 will give more power output for a given amount of grid drive than any other high frequency tube of the same comparative class. The unique design of this tube permits use of ceramic internal insulators. The misalignment of elements (which so often develop in tubes with self-supporting elements) is impossible in the T-55.

GENERAL CHARACTERISTICS

Filament Voltage, volts.....	7.5
Filament Current, amps.....	2.75
Plate Resistance, ohms.....	9000
Mutual Conductance, uMhos.....	2200
Amplification Factor (Mu).....	20

OVERALL DIMENSIONS

Maximum Length, inches.....	7
Maximum Diameter, inches.....	2 5/8

INTERELECTRODE CAPACITIES

Plate to Grid, mmf.....	3.75
Grid to Filament, mmf.....	4.0
Plate to Filament, mmf.....	1.5

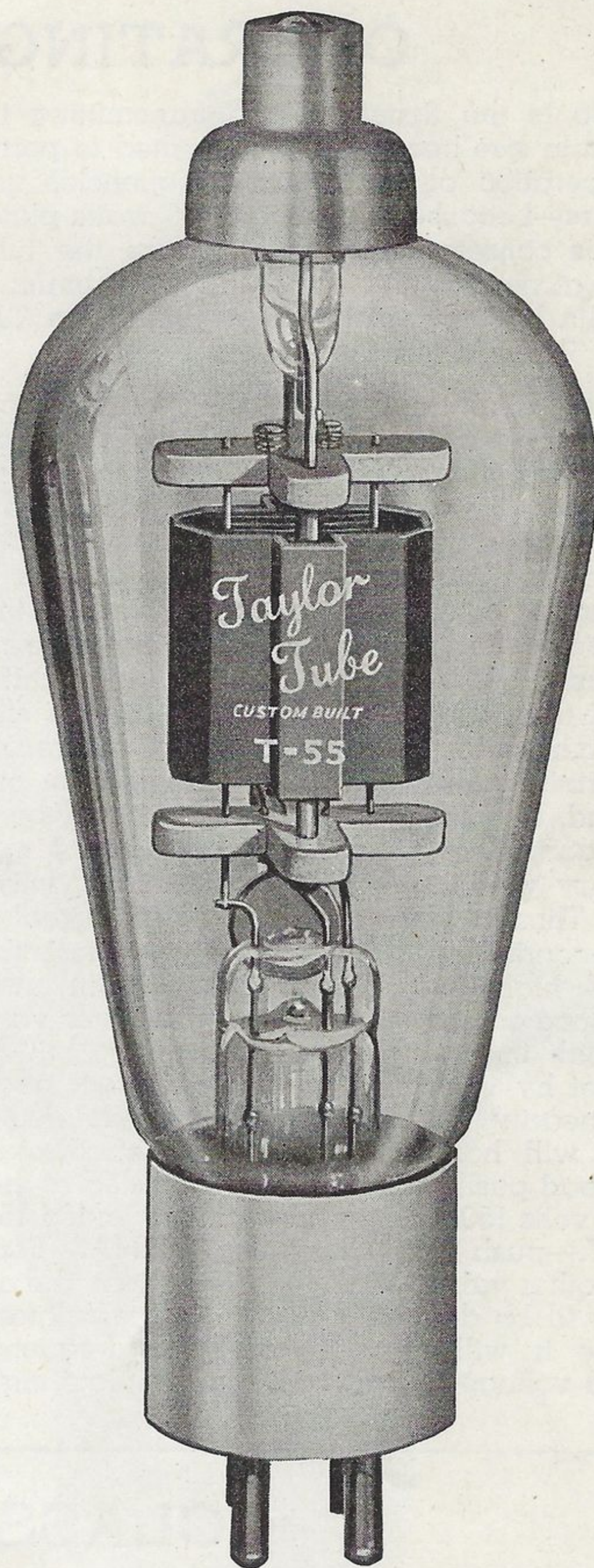
CLASS "C" OSC AND POWER AMP

	Class C	OSC.
Max. Operating Plate Volts		
Unmodulated DC, volts.....	1500	1250
Modulated DC, volts.....	1500	1000
Max. DC Plate Current, mls.....	150	125
Max. DC Grid Current, mls.....	40	40
Max. Plate Dissipation, watts.....	55	55
Max. RF Grid Current, amps.....	5	5
RF Output, watts.....	168	66
Percentage of Efficiency.....	75%	40%

NORMAL OPERATION—Class C

$E_p = 1500 \text{ v.}$	$E_g = -200 \text{ v.}$	$E_f = 7.5$
$I_p = 150\text{MA}$	$I_g = 25\text{MA}$	

The improved T-55 may be used interchangeably with previous T-55's in all applications.

**T-55**

AMATEUR'S FAVORITE TUBE!
OVER 7000 IN USE!

Improved
\$8.00

Now the T-55 has been further improved. No basic changes have been made but small improvements have resulted in superior characteristics, which even more than in the past, will make the T-55 stand head and shoulders above others in its price range. Throughout the world, many commercial companies, as well as amateurs, acclaim the T-55 as "the champion" of all transmitting tubes.

Taylor



Tubes

OPERATING DATA ON THE T-55

The T-55 is the fastest selling transmitting tube of reasonable size because it is designed to permit efficient operation at the highest frequencies used by Amateurs—because the rating of 55 watts plate dissipation is conservative—and because the tube will operate at normal efficiency with a minimum of grid drive. Its low price, of course, fulfills the TAYLOR slogan, **"More Watts Per Dollar."**

At the rated input and normal efficiency, no color will show on the plate. While the rated plate dissipation is 55 watts, no color shows until the dissipation amounts to 75 watts and then it is noticeable only if the filament is turned off. Color becomes noticeable with the filament on at about 85 watts. If the type of operation or input are not such as to result in excessive dissipation, color showing on the plate may be taken as a definite indication that the circuit is less efficient than it should be. To obtain best efficiency with a minimum of harmonic content, we recommend that certain values of capacity be used in the plate tank and, of course, the tank coils should be proportioned accordingly to hit resonance at the operating frequency with the proper amount of capacity in the circuit. These capacities should be the actual amount of tank condenser in the circuit across the entire plate tank. A higher value of C will result in lower tank impedance and lower efficiency. A lower value of C will result in slightly higher efficiency, but this will be offset by increased harmonic content as well as poor linearity when the stage is modulated. These values will hold for both plate neutralized single ended and push pull amplifiers operated at the rating of 1500 volts 150 MA per tube. (Single ended 1500 volts 150 MA—push pull 1500 volts 300 MA.) For operation at other values of voltage or current, the optimum value will be different but may be calculated easily because it will vary inversely as frequency and applied voltage and directly as the plate current.

1715 KC — 160 Mmfd
3500 KC — 80 Mmfd
7000 KC — 40 Mmfd

14000 KC — 20 Mmfd
28000 KC — 10 Mmfd
56000 KC — 5 Mmfd

Under these conditions with an input of 1500 volts 150 MA per tube, the efficiency should be approximately 75% and the output approximately 170 watts per tube. For one tube the recommended grid bias resistor would be 8000 ohms. Half that value or 4000 ohms would be correct for two tubes parallel or push pull. For CW or buffer operation the rectified grid current should be 17 MA or more and for phone operation should be 25 MA or more per tube. Under no conditions should the rectified grid current exceed the rated value of 40 MA. Expressed in terms of power approximately 7.5 watts of drive are required for efficient CW or buffer operation or 15 watts for phone operation. Large outputs may be obtained with lesser amounts of grid drive but the plate efficiency may be expected to be less with reduced excitation and the power gain will increase.

IMPORTANT:

Good efficiency at the higher frequencies with a minimum of operating difficulties necessitates the use of tubes with low interelectrode capacities. The T-55 features as low inter-electrode capacities as are consistent with good plate efficiency at reasonable voltages and at reasonable values of grid drive. Low capacities in a tube are achieved partly by isolating the leads from each other as by bringing the plate lead out of the top but principally by making the elements smaller and spacing them farther apart. Because the T-55 grid is comparatively small and placed at some distance from its heat radiator, the plate, the grid must operate at and is designed for higher temperatures than in more conventional tubes. Under normal operating conditions the grid will operate at a dull red. Dangerous grid temperatures are not reached until the grid supports appear to show red **above** the upper lava supports with the filament lit and in normal light. Such dangerous temperatures will not be reached unless the rectified grid current exceeds the maximum rated value or parasitic oscillations are present. If grid and/or plate leads show color (indicating extremely high circulating R. F. current) or if the grid supports are hotter than the grid wires, it is safe to assume parasitics are present although parasitics may be present with no visible indication in the tube.

CLASS B AUDIO DATA

The chart at right gives proper Class B Audio operating conditions for various outputs at different plate voltages. The most important value is the reflected load impedance which is given for the entire primary or plate to plate. The current value is the maximum average value as would be indicated on the plate current meter with sine wave input. For the same peak output with voice input the maximum average plate current will be approximately 50% to 60% of this value. The correct bias will limit the no signal plate current to 20 MA per tube and will be approximately the plate voltage divided by the Mu.

We do not recommend the T-55 or any of our low C tubes for Class B audio. The operating data is furnished for those who might prefer to use them for Class B audio because of their interchangeability with the RF tubes. This is no reflection on the T-55 but no low C tube is as good a modulator as higher C tubes such as the T-20, 756, 203-B, 203-A or 822 because these tubes will provide higher efficiency at a given plate voltage with less grid drive.

Supply Voltage	100	150	200	250	←Audio Watts Output
1500	100MA 32,000	150MA 21,800	200MA 16,000	248MA 13,000	←Max Av. Ip ←Load Impedance plate to plate
1250	124MA 21,000	185MA 14,000	248MA 10,000	←Max Av. Ip ←Load Impedance plate to plate	
1000	164MA 12,000	245MA 8,000	←Max Av. Ip ←Load Impedance plate to plate		
800	220MA 6,600	←Max Av. Ip ←Load Impedance plate to plate			

T-125

125 WATTS PLATE DISSIPATION CARBON-TANTALUM ANODE

The T125 is the tube amateurs have demanded to fill the gap between the T55 and T200. It's a man-sized tube at low cost and it **features a new TAYLOR invention (patent applied for)** making possible high efficiency at low plate voltages and with low interelectrode capacities. Rated conservatively, one tube will handle a full 400 watts input at the maximum ratings of 2000 volts, 200MA. The interelectrode capacities are low, making possible efficient operation on even the highest amateur frequencies—but the use of **tantalum fins** increases the inherent efficiency of the tube, making it far more efficient than others with comparative interelectrode capacities. Tantalum is used because it will operate satisfactorily at high temperatures but other materials such as carbon might have been used for the fins. These fins projecting inward toward the grid and filament effectively produce the very desirable characteristics of higher C tubes without greatly increasing the capacities. Thus this tube is truly unique in that it possesses the **advantages of a low C tube together with the advantages of a higher C tube**—without the disadvantages of either. In addition, combining a carbon anode and tantalum fins makes it possible to realize the full advantages of both types of plate materials without the disadvantages of either. It is truly a remarkable tube and is a revolutionary step forward in tube design.

GENERAL CHARACTERISTICS

Filament Voltage, volts.....	10
Filament Current, amps.....	3.85
Plate Resistance, ohms.....	5700
Mutual Conductance, uMhos.....	4400
Amplification Factor (Mu).....	25
Thorated Tungsten Filament	

OVERALL DIMENSIONS

Maximum Length, inches.....	8¼
Maximum Diameter, inches.....	3

INTERELECTRODE CAPACITIES

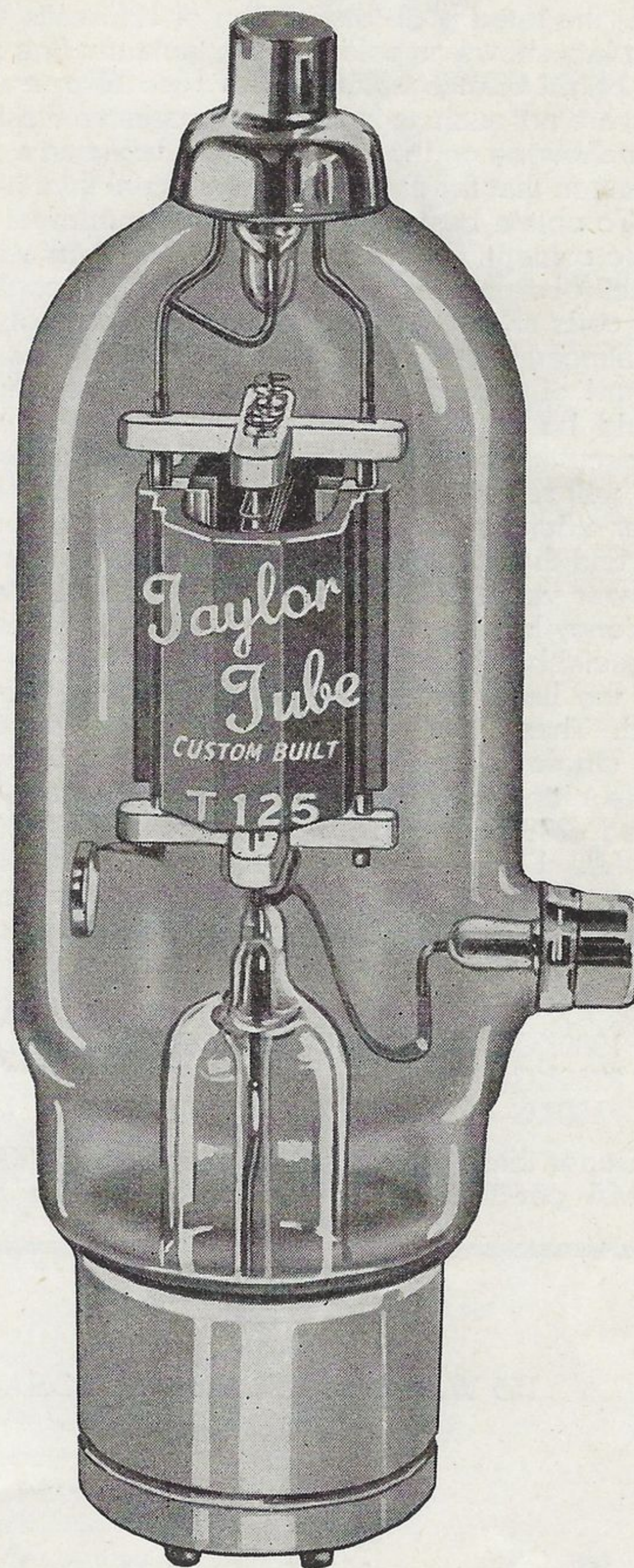
Plate to Grid, mmf.....	4.5
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CLASS "C" AMPLIFIER

Max. Operating Plate Volts	
Unmodulated DC, volts.....	2000
Modulated DC, volts.....	2000
Max. DC Plate Current, mls.....	200
Max. DC Grid Current, mls.....	60
Max. RF Grid Current, amps.....	10
RF Output, watts.....	300
Percentage of Efficiency.....	75%

NORMAL OPERATION—Class C

$E_p = 2000v.$	$E_g = -200v.$	$E_f = 10$
$I_p = 200MA$	$I_g = 50MA$	



T-125

CARBON-TANTALUM ANODE

\$13.50

Taylor



Tubes

OPERATING DATA — T125

At the rated plate dissipation of 125 watts the carbon plate shows no color but the tantalum fins operate at a bright orange color. If the type of operation or input are not such as to result in excessive dissipation, color showing on the plate may be taken as a definite indication that the circuit is less efficient than it should be. To obtain best efficiency with a minimum of harmonic content, we recommend that certain values of capacity be used in the plate tank and, of course, the tank coils should be proportioned accordingly to hit resonance at the operating frequency with the proper amount of capacity in the circuit. These capacities should be the actual amount of tank condenser in the circuit across the entire plate tank. A higher value of C will result in lower tank impedance and slightly lower efficiency but the harmonic content will also be less and the linearity better if the stage is modulated. A lower value of C will result in slightly better plate efficiency but the fundamental output will not increase appreciably. The harmonic content will be higher and the linearity will be poor if the stage is modulated. These values will hold for both plate neutralized single ended and push-pull amplifiers operated at the rating of 2000 volts 200MA per tube. (Single ended 2000 volts 200MA — push-pull 2000 volts 400MA.) For operation at other values of voltage or current the optimum value will be different but may be calculated easily because it will vary inversely as frequency and applied voltage and directly as the plate current.

1900KC—137 Mmfd.	14,200KC—18 Mmfd.
3750KC— 70 Mmfd.	28,500KC— 9 Mmfd.
7150KC— 36 Mmfd.	58,000KC— 5 Mmfd.

Under these conditions with an input of 2000 volts 200MA per tube, the efficiency should be approxi-

mately 75% and the output about 300 watts per tube. For one tube the recommended grid bias resistor would be 4000 ohms. Half that value, or 2000 ohms, would be correct for 2 tubes parallel or push-pull. For CW or buffer operation, the rectified grid current should be 30MA or more and for plate modulated phone operation should be 50MA or more per tube. Under no conditions should the rectified grid current exceed the rated value of 60MA. Expressed in terms of power approximately 10 watts of grid drive are necessary for efficient CW or buffer operation or 20 watts for phone operation. Large outputs may be obtained with lesser amounts of grid drive but the plate efficiency may be expected to be less with lesser amounts of grid excitation though the power gain will increase.

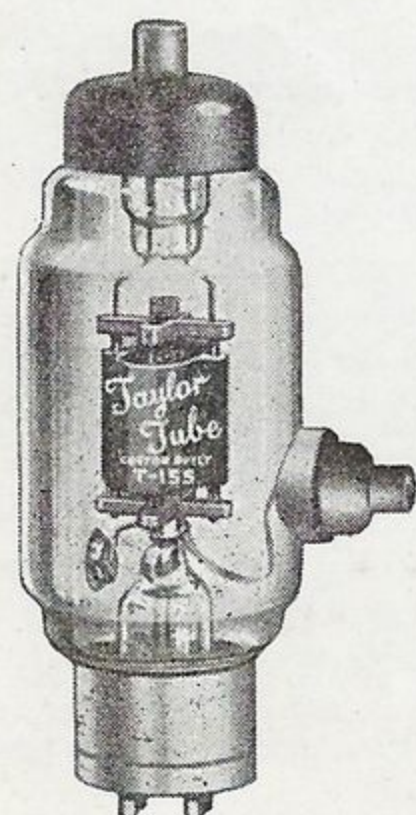
For some time there has been a need for a high frequency tube to replace tubes of the 203A type with the absolute minimum of changes in the transmitter. The T125 fills the need in a most satisfactory manner. Because of the exclusive TAYLOR carbon-tantalum construction, efficiencies on the order of those obtained with 03A's are possible at the same plate voltages and with the same low grid drive requirements. In addition the plate dissipation is greater than that of an 03A and the plate current rating greater making it possible to increase the power at the same Plate voltage as well as gaining the advantages of low C tube operation at the higher frequencies. In order to replace an 03A type of tube with the T125 it will be necessary only to change the grid and plate connections and to re-neutralize. If the minimum capacity of the neutralizing condenser is too high, plates may be removed. No circuit or bias changes are necessary because the Mu of the T125 is the same as that of an 03A.

T-155

155 WATTS PLATE DISSIPATION

CARBON ANODE

\$19.50



The **Taylor T155** is a high voltage low current tube of the same general character as our T55 excepting its size and power rating which is three times that of the T55. The T155 is recommended for use as a Class C Amplifier on High Frequencies. The unique design of this tube permits the use of high resistance internal insulators which prevent the misalignment of elements (which so often develops in tubes with self-supporting elements).

GENERAL CHARACTERISTICS

TYPE T-155

Filament Voltage, volts.....	10
Filament Current, amps.....	4
Plate Resistance, ohms.....	5700
Mutual Conductance, uMhos.....	3500
Amplification Factor.....	20
Thoriated Tungsten Filament.....	

OVERALL DIMENSIONS

Length	9"
Width	4 1/8"

INTERELECTRODE CAPACITIES

Plate to Grid, mmf.....	3
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CLASS "C" OSC AND POWER AMP

Max. Operating Plate Volts.....	*3000
Max. DC Plate Current, mls.....	* 200
Max. DC Grid Current, mls.....	60
Power Output, watts.....	450

*These maximum ratings to be applied where efficiency of Class "C" amplifier is 75% or better.

NORMAL OPERATION

Ep = 2500	Eg = — 250	Ef = 10
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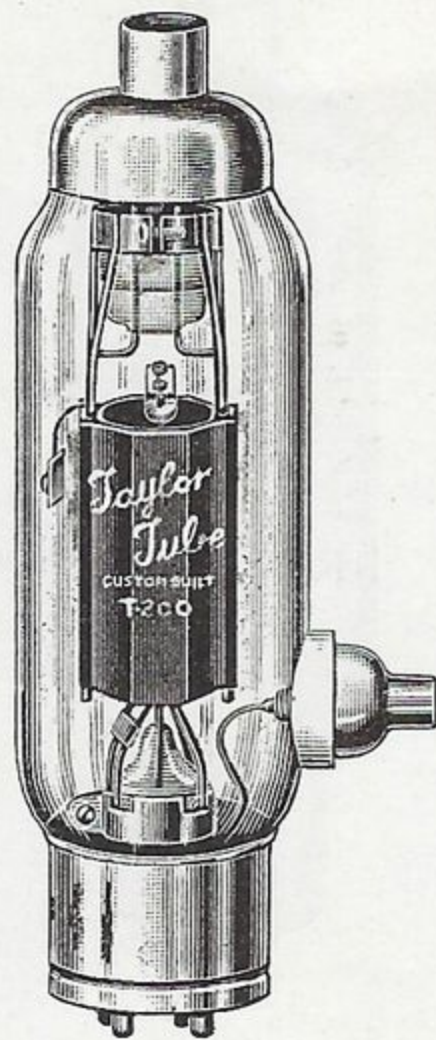
T-200

The T-200 has often been called "The Amateur's Power House Tube." At the maximum plate modulated rating a single tube will handle 700 watts of input, 2000 volts at 350 MA. For CW operation the plate voltage may be increased to 2500 volts for an input of 875 watts to a single tube. A pair of these tubes push-pull will loaf along at far below the ratings with 1 kw input on any frequency from 30 to 1.7MC. This tube in common with all Taylor tubes uses the most efficient flat form of construction and the inter-electrode capacities represent the best possible combination of inter-electrode capacities and other characteristics for best efficiency at moderate plate voltages with minimum grid drive requirements. The inter-electrode capacities are low enough for ease of neutralization even at the highest amateur frequencies yet are not so low that the characteristics of the tube are adversely affected.

For best efficiency with minimum harmonic content, certain L/C ratios which are a function of the type of operation, frequency, plate voltage and plate current are recommended. These optimum ratios may be found for any amateur band and any reasonable values of input in the L/C ratio chart on page —.

Under proper operating conditions with an input of 2000 volts 350MA the efficiency should be approximately 75% and the output approximately 525 watts per tube. For one tube the recommended grid bias resistor would be 5000 ohms. Half that value or 2500 ohms would be correct for 2 tubes parallel or push-pull. For CW or buffer operation the rectified grid current should be 35MA or more and for phone operation should be 60MA or more per tube. Under no conditions should the rectified grid current exceed the maximum rated value of 80MA per tube. Expressed in terms of power, approximately 20 Watts of grid drive are required for efficient CW or buffer operation or 35 watts for phone operation. Large outputs may be obtained with lesser amounts of grid drive but the plate efficiency may be expected to be less with reduced excitation though the power gain will increase.

The T200 is widely used in Diathermy equipment. This type of service is particularly hard on Tubes and the general acceptance of the T200 by many leading manufacturers of Diathermy equipment is convincing proof of the T200's rugged construction and conservative rating. Do not confuse the T200 with smaller tubes bearing the same type number. Compare the size of its Super Carbon Anode with tubes of similar ratings.



T-200

200 WATTS PLATE DISSIPATION

\$21.50

AMATEUR'S POWER HOUSE TUBE

SUPER CARBON ANODE

LENGTH 2½ in.

WIDTH 1⅝ in.

GENERAL CHARACTERISTICS

Type T-200

Filament Voltage	10-11
Filament Current, amps.....	4
Plate Resistance, ohms.....	3400
Mutual Conductance, uMhos.....	4800
Amplification Factor	16.6

OVERALL DIMENSIONS

Maximum Length, inches	9½
Maximum Width, Including Grid Cap, inches.....	3¾

INTERELECTRODE CAPACITIES

Plate to Grid, mmf.....	7
Grid to Filament, mmf.....	5
Plate to Filament, mmf.....	3

CLASS "C" OSC. AND POWER AMP.

Max. Operating Plate Volts	
Unmodulated D.C., volts.....	2500
Modulated, volts	2000
Max. D.C. Plate Current, mls.....	350
Max. D.C. Grid Current, mls.....	80
Max. Plate Dissipation, watts.....	200
Max. R.F. Grid Current, amps.....	15
R.F. Output, watts.....	500

NORMAL OPERATION

Ep = 2500

Eg = — 300

Ef = 10-11

T-200 POPULARITY

SOME OF THE BEST HAM PHONE STATIONS USE TAYLOR T200'S. W9EDW, W9UAQ, W9KYM, W9VXZ, W9JDO, W8JOE, W8BWH, W9IPS, W9ORA, W7CEO, W9NLP, W8CKC, W3EOZ, W3DQ, W9PZ, W8UD, W9LIP, W9ECA AND MANY OTHERS ARE T-200 USERS.

Taylor

CUSTOM
BUILT

Tubes

822

200 WATTS PLATE DISSIPATION

CARBON ANODE

\$18.50

500 WATTS

AUDIO OUTPUT

in

PUSH-PULL CLASS "B" AUDIO

GENERAL CHARACTERISTICS

Type 822

Filament Voltage, volts.....	10
Filament Current, amps.....	4
Plate Resistance, ohms.....	5200
Mutual Conductance, uMhos.....	5400
Amplification Factor	27
Thoriated Tungsten Filament	

OVERALL DIMENSIONS

Maximum Length, inches	9½
Maximum Diameter, inches.....	2½

INTERELECTRODE CAPACITIES

Plate to Grid, mmf.....	14
Grid to Filament, mmf.....	8
Plate to Filament, mmf.....	6

CLASS "C" AMPLIFIER

Max. Operating Plate Volts	
Unmodulated D.C., volts.....	2500
Modulated D.C., volts.....	2000
Max. D.C. Plate Current, mls.....	300
Max. D.C. Grid Current, mls.....	60
Max. Plate Dissipation, watts.....	200
Max. R.F. Grid Current, amps.....	7.5
R.F. Output, watts.....	400

NORMAL OPERATION

$E_p = 2000$	$E_g = -220$	$E_f = 10$
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CLASS "B" AS MODULATOR

Push Pull Operation

Filament, volts	10
D.C. Plate Voltage, volts.....	2000
Grid Voltage, appr. volts.....	-90
Load Resistance (plt. to plt.), ohms—	9000
Av. D.C. Plate Current (2 tubes), mls.....	450
Static Plate Current (per tube), mls.....	25
Power Output, (2 tubes), watts.....	500

CARBON ANODES

PRODUCE

More Watts Per Dollar



The 822 is an unusually efficient tube. Its high efficiency is combined with extreme ruggedness and an ability to stand up under tremendous abuse. Its large carbon plate is rated at 200 watts dissipation. We recommend it highly for Class B audio use in large amateur and broadcast transmitters and for RF work on all but the highest amateur frequencies. This tube is the most popular in our line for both RF and audio use in broadcast transmitters. It's a large tube at a small tube price and it is almost immune from voltage breakdown because the plate lead is brought out the top.

For RF operation the 822 is at its best on frequencies below 8MC. On higher frequencies the interelectrode capacities are great enough to place the tube at some disadvantage compared with the T200 although the overall efficiency of a stage using 822's would be about the same as one using T200's at 14MC. The 822 will operate satisfactorily at frequencies as high as 30MC but at this frequency the T200 will prove superior and is recommended.

All ratings on the 822 are exceedingly conservative. The maximum rated plate current is 300MA and maximum modulated plate voltage 2000 allowing an input of 600 watts per tube. For unmodulated operation the maximum plate voltage rating is 2500 volts permitting input of 750 watts.

Under the above conditions the recommended grid bias resistor would be 4000 ohms. Half that value, or 2000 ohms, would be correct for 2 tubes push-pull or parallel. For CW or buffer operation the rectified grid current should be 40MA or more and for phone operation should be 55MA or more per tube. Under no conditions should the rectified grid current exceed the maximum rated value of 80MA. Expressed in terms of power, approximately 20 watts of grid drive are required for CW or buffer operation or 30 watts for phone operation.

The 822 is the finest tube of its size for Class B audio. The maximum output shown on the chart is 500 watts because amateur cannot use more audio power. At that output under the conditions indicated with sine wave input the average plate dissipation will be only 150 watts. The ratio of minimum plate voltage to maximum grid voltage is high making the tube extremely easy to drive. A pair of 2A3's or 6A3's are recommended as drivers and will furnish more than enough grid driving power with good voltage regulation.

822 CLASS B AUDIO DATA

Supply Voltage ↓	300	400	500	←Audio Watts Output
2,000	.240 17,000	.320 12,500	.400 10,000	←Max. Av. Ip ←Load Impedance plate to plate
1,750	.275 13,000	.365 10,000	.455 7,800	←Max. Av. Ip ←Load Impedance plate to plate
1,500	.315 9,600	.405 7,600	←Max. Av. Ip ←Load Impedance plate to plate	

The chart above gives proper Class B Audio operating conditions for various outputs at different plate voltages. The most important value is the reflected load impedance which is given for the entire primary or plate to plate. The current value is the maximum average value as would be indicated on the plate current meter with sine wave input. For the same peak output with voice input the maximum average plate current will be approximately 50% to 60% of this value. The correct bias will limit the no signal plate current to 25MA per tube.

SUPER CARBON ANODE

Length	2¾ inch
Width	1½ inch

203-Z

ZERO BIAS TUBE

The 203Z is an improved high mu zero bias version of the 203A and 203B. It has all the desirable characteristics of these tubes with two additional features of great merit; the amplification factor of the tube is high enough for zero bias class B operation at voltages up to 1250 and the plate lead is brought out the top greatly minimizing the chances of voltage breakdowns.

The 203Z is specifically designed for class B audio. Its characteristics and its low price will make it the most popular tube for this purpose. In practical application of class B audio the average plate dissipation is low compared with the peak output and advantage of this fact has been taken to produce a tube of large capabilities at a low price. The conservative plate dissipation ratings of the tube is 65 watts. As this dissipation the tube shows no color whatever and under normal operating conditions the average plate dissipation will be less than this value under the maximum rated conditions so no color should show on the plate. If the tubes do show color it is an indication that the circuit is less efficient than it should be unless the input or type of operation are such as to result in excessive plate dissipation.

The no-signal or static plate current is about 35MA per tube at 1000 volts and about 45MA per tube at 1250 volts. Because the 203Z is a zero bias tube the grid starts to draw current as soon as excitation is applied the input transformer design requirements are less involved and excellent frequency response with minimum distortion is easily realized. The maximum average grid driving power is approximately 7 watts. Low impedance triodes such as 2A3's or 6A3's should be used in the driver stage.

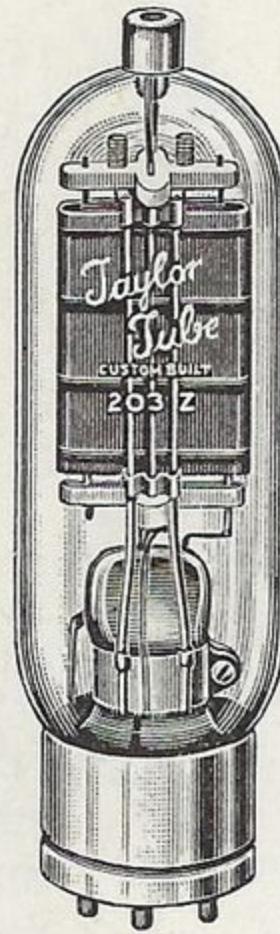
The 203Z is also suited for RF operation on frequencies below 15MC. At the maximum ratings of 1250 volts 175MA the input would be 219 watts, the output approximately 165 watts per tube, and the plate dissipation 55 watts per tube. For one tube the recommended bias resistor would be 2500 ohms. Half that value or 1250 ohms, would be correct for 2 tubes parallel or push-pull. For CW or buffer operation the rectified grid current should be 30MA or more and for phone operation should be 50MA or more. Under no conditions should the rectified grid current exceed the maximum rated value of 60MA. Expressed in terms of power, approximately 8 watts of grid drive are required for efficient CW or buffer operation or 15 watts for phone operation.

Regular Class B input and output transformers as manufactured for type 203A tubes by Thordarson, Utah, Jefferson, General, Stancor, United, Kenyon, Inca, etc., may be used with the 203Z tubes.

203Z CLASS B AUDIO DATA

Supply Voltage ↓	150	200	260	300	←Audio Watts Output
1250	.175 15,800	.233 11,800	.306 9,000	.350 7,900	←Max. Av. Ip ←Load Impedance plate to plate
1100	.204 11,600	.272 8,750	.352 6,700	←Max. Av. Ip ←Load Impedance plate to plate	
1000	.228 9,300	.306 6,900	Max. Av. Ip ←Load Impedance plate to plate		
900	.259 7,200	.345 5,400	←Max. Av. Ip ←Load Impedance plate to plate		

The chart above gives proper Class B Audio operating conditions for various outputs at different plate voltages. The most important value is the reflected load impedance which is given for the entire primary or plate to plate. The current value is the maximum average value as would be indicated on the plate current meter with sine wave input. For the same peak output with voice input the maximum average plate current will be approximately 50% to 60% of this value.



203-Z

65 WATTS PLATE DISSIPATION

METAL PLATE

\$8.50

ZERO BIAS

GENERAL CHARACTERISTICS

Type 203Z

Filament Voltage, volts.....	10
Filament Current, amps.....	3.85
Plate Resistance, ohms.....	16,700
Mutual Conductance, uMhos.....	5,900
Amplification Factor.....	85
Thoriated Tungsten Filament	

GENERAL DIMENSIONS

Maximum Length, inches.....	8¼
Maximum Diameter, inches.....	2½

CLASS "B" AS MODULATOR

Push Pull Operation

D.C. Plate Voltage, volts max.....	1250
Grid Voltage.....	0
Load Resistance (plt. to plt.), ohms.....	7900
Av. D.C. Plate current (2 tubes), mls.....	350
Static Plate Current (per tube), mls.....	45
Power Output (2 tubes), watts.....	300

CAUTION: These tubes have metal plates and do not have the carbon anode which is characteristic of all other TAYLOR Transmitting Tubes. This does not mean that they will be any less efficient but it does mean that they will not stand as much abuse. The plate voltage should be reduced while making adjustments to prevent excessive heating. Properly handled, the efficiency of these tubes will be as great as though they had carbon anodes and their life will be equally as long.

203B—\$7.50

The 203B was brought out to make available a tube of 203A characteristics and capabilities at a lower price. For class C, RF and Class B audio operation the 100 watt plate dissipation of the 03A is rather high in proportion to the other capabilities of the tube. In other words, at the maximum ratings of the 03A the plate dissipation will probably be far below 100 watts. This made it possible to develop the 203B with a less expensive plate capable of dissipating 65 watts with all other characteristics identical with the 203A. The 203B may be used in place of the 203A in all applications where the plate dissipation will not exceed 65 watts. This should include all Class B audio and class C RF applications.

Taylor



Tubes

814

200 WATTS PLATE DISSIPATION
CARBON ANODE

\$18.50

ESPECIALLY RECOMMENDED

for
GRID MODULATED

or
CLASS B LINEAR
PHONE TRANSMITTERS



GENERAL CHARACTERISTICS

Type 814

Filament Voltage, volts.....	10
Filament Current, amps.....	4
Plate Resistance, ohms.....	2400
Mutual Conductance, uMhos.....	5000
Amplification Factor	12

OVERALL DIMENSIONS

Maximum Length, inches	9½
Maximum Diameter, inches.....	2½

INTERELECTRODE CAPACITIES

Plate to Grid, mmf.....	13
Grid to Filament, mmf.....	7
Plate to Filament, mmf.....	5.5

CLASS "C" OSC. AND POWER AMP.

Max. Operating Plate Volts	
Unmodulated, D.C., volts.....	2500
Modulated, D.C., volts.....	2000
Max. D.C. Plate Current, mls.....	300
Max. D.C. Grid Current, mls.....	75
Max. Plate Dissipation, watts.....	200
Max. R.F. Grid Current, amps.....	8
Max. R.F. Output, watts.....	400

NORMAL OPERATION

$E_p = 2000$	$E_g = -400$	$E_f = 10$
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TAYLOR TUBES
ARE RECOMMENDED AND SOLD

by
ALL LEADING

RADIO PARTS DISTRIBUTORS

There is a Taylor Tube Distributor in every important distribution center throughout the world

The 814 is identical with the 822 except for the Mu or amplification factor and is intended for those applications where a tube of lower mu is desired. The mu of 12 is about optimum for grid modulated and class B linear R.F. operation. We recommend the 814 for efficiency modulated amplifiers. In addition, some manufacturers of diathermy equipment prefer a low mu tube. Both the 814 and 822 are widely used in diathermy equipment on frequencies as high as 27MC. Their rugged construction and conservative ratings provide the ample safety factor necessary in high frequency self excited oscillators. High frequency diathermy is harder on tubes than any other form of operation and these tubes are built to stand it.

A class B linear or grid modulated amplifier should be biased to approximately cut off. For an 814 operating at 200 volts the correct bias voltage would be approximately $\frac{2000}{12}$ or 165 volts. This bias must be furnished from a source with good regulation such as batteries or a good rectified AC bias eliminator. The coupling to the antenna must be very tight. The excitation should be adjusted until grid current just begins to flow on excitation peaks. While very little RF grid drive is required for an efficiency modulated stage the ratio of driver output to excitation required must be large to provide good driver regulation. This excess excitation should be dissipated in a resistive load such as resistors or lamps. The circuit diagram for an efficiency modulated amplifier is the same as that for a class C amplifier.

Because the plate efficiency of efficiency modulated amplifiers is low, usually about 33%, the input to and output from, such a stage will necessarily be much less than with the same tube operating class C. Assuming an efficiency of 33% the maximum permissible input to an 814 would be 300 watts, 200 of which would be dissipated on the plate and 100 watts delivered to the output circuit. This low plate efficiency is at least partially offset by the inexpensive modulation equipment necessary. The usual class B driver stage may be used to plate modulate the preceding stage for class B linear operation or to grid modulate the final.

An interesting article containing more complete information on grid modulation and describing a Transmitter using an 814 will be found on pages 154-155 in the January 1937 Radio.

For class C operation the optimum value of bias resistor for one 814 would be 8,000 ohms. Half that value, or 4000 ohms, would be correct for 2 tubes parallel or push-pull. For CW or buffer operation the rectified grid current should be 30MA or more and for phone operation should be 55MA per tube. Under no conditions should the rectified grid current exceed the maximum rating of 80MA per tube. Expressed in terms of power approximately 25 watts of grid drive are required for efficient CW operation or 35 watts for phone operation.

Taylor



Tubes

203-A

100 WATTS PLATE DISSIPATION

CARBON ANODE

\$12.50

GENERAL CHARACTERISTICS

TYPE 203-A

Filament Voltage, volts.....	10
Filament Current, amps.....	3.85
Plate Resistance, ohms.....	6000
Mutual Conductance, uMhos.....	4200
Amplification Factor.....	25
Thoriated Tungsten Filament	

OVERALL DIMENSIONS

Maximum Length, inches.....	7½
Maximum Diameter, inches.....	2½

INTERELECTRODE CAPACITIES

Plate to Grid, mmf.....	14
Grid to Filament, mmf.....	8
Plate to Filament, mmf.....	7

CLASS "C" OSC. AND POWER AMP.

Max. Operating Plate Volts	
Unmodulated D.C., volts.....	1500
Modulated D.C., volts.....	1250
Max. D.C. Plate Current, amps.....	.175
Max. D.C. Grid Current, amps.....	.060
Max. Plate Dissipation, watts.....	100
Max. R.F. Grid Current, amps.....	7.5
Max. R.F. Output, watts.....	160

211-C

100 WATTS PLATE DISSIPATION

CARBON ANODE

LOW INTERELECTRODE CAPACITIES

\$12.50

GENERAL CHARACTERISTICS

Type 211-C

Filament Voltage, volts.....	10
Filament Current, amps.....	3.85
Plate Resistance, ohms.....	2800
Mutual Conductance, uMhos.....	4500
Amplification Factor.....	12.5
Thoriated Tungsten Filament	

OVERALL DIMENSIONS

Maximum Length, inches.....	7½
Maximum Diameter, inches.....	2½

INTERELECTRODE CAPACITIES

Plate to Grid, mmf.....	9
Grid to Filament, mmf.....	6
Plate to Filament.....	6.5

CLASS "C" OSC. AND POWER AMP.

Max. Operating Plate Volts	
Unmodulated D.C., volts.....	1500
Modulated D.C., volts.....	1000 1250
Max. D.C. Plate Current, amps.....	.175 .175
Max. D.C. Grid Current, amps.....	.060 .060
Max. Plate Dissipation, watts.....	100 100
Max. R.F. Grid Current, amps.....	7.5 7.5
Max. R.F. Output, watts.....	100 130

211

100 WATTS PLATE DISSIPATION

CARBON ANODE

\$12.50

GENERAL CHARACTERISTICS

TYPE 211

Filament Voltage, volts.....	10
Filament Current, amps.....	3.85
Plate Resistance, ohms.....	3400
Mutual Conductance, uMhos.....	3530
Amplification Factor.....	12
Thoriated Tungsten Filament.	

OVERALL DIMENSIONS

Maximum Length, inches.....	7½
Maximum Diameter, inches.....	2½

INTERELECTRODE CAPACITIES

Plate to Grid, mmf.....	14
Grid to Filament, mmf.....	7
Plate to Filament, mmf.....	6

CLASS "C" OSC. AND POWER AMP.

Max. Operating Plate Volts	
Unmodulated D.C., volts.....	1500
Modulated D.C., volts.....	1250
Max. D.C. Plate Current, amps.....	.175
Max. DC Grid Current, amps.....	.050
Max. Plate Dissipation, watts.....	100
Max. R.F. Grid Current, amps.....	7
Max. R.F. Output, watts.....	100

**845**

75 WATTS PLATE DISSIPATION

CARBON ANODE

\$12.50

CLASS "A" AUDIO TUBE

GENERAL CHARACTERISTICS

TYPE 845

Filament Voltage.....	10
Filament Current.....	3.85
Plate Resistance, ohms.....	2100
Mutual Conductance, uMhos.....	3000
Amplification Factor.....	5
Thoriated Tungsten Filament.	

OVERALL DIMENSIONS

Maximum Length.....	7½
Maximum Diameter.....	2½

INTERELECTRODE CAPACITIES

Plate to Grid, mmf.....	14
Grid to Filament, mmf.....	6.5
Plate to Filament.....	6

CLASS "A" AF AMP. AND MODULATOR

Max. Operating Plate Volts, volts.....	1000	1250
Max. DC Plate Current, mls.....	75	65
Peak Grid Swing, volts.....	150	205
Max. Plate Dissipation, watts.....	75	75
Max. Audio Output, watts.....	22	28

Taylor



Tubes

756

40 WATTS PLATE DISSIPATION
CARBON ANODE

\$4.95

100 WATTS AUDIO OUTPUT
In Class B

GENERAL CHARACTERISTICS

Type 756

Filament Voltage, volts.....	7.5
Filament Current, amps.....	2
Plate Resistance, ohms.....	15000
Mutual Conductance, uMhos.....	1600
Amplification Factor.....	25
Thoriated Tungsten Filament	

OVERALL DIMENSIONS

Maximum Length, inches.....	5 5/8
Maximum Diameter, inches.....	2 1/4

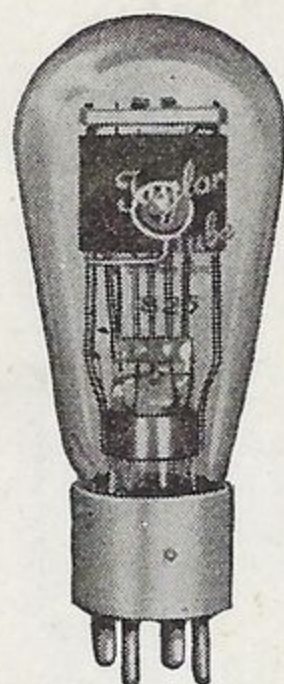
CLASS "C" AMPLIFIER

Max. Operating Plate Volts	
Unmodulated D.C., volts.....	850
Modulated D.C., volts.....	750
Max. D.C. Plate Current, mls.....	110
Max. D.C. Grid Current, mls.....	20

CLASS "B" A.F. MODULATOR

Push Pull Operation

Grid Voltage, appr. volts.....	30
Load Resistance (plt. to plt.) ohms.....	6750
Av. D.C. Plate Current (2 tubes), mls.....	225
Static Plate Current (per tube), mls.....	10
Power Output (2 tubes), watts.....	100



825

40 WATTS PLATE DISSIPATION

CARBON ANODE

\$4.95

GENERAL CHARACTERISTICS

Type 825

Filament Voltage, volts.....	7.5
Filament Current, amps.....	2
Plate Resistance, ohms.....	2800
Mutual Conductance, uMhos.....	2500
Amplification Factor.....	8
Thoriated Tungsten Filament	

OVERALL DIMENSIONS

Maximum Length, inches.....	5 5/8
Maximum Diameter, inches.....	2 1/4

INTERELECTRODE CAPACITIES

Plate to Grid, mmf.....	7
Grid to Filament, mmf.....	3
Plate to Filament, mmf.....	2.7

CLASS "C" OSC. AND POWER AMP.

Max. Operating Plate Volts	
Unmodulated D.C., volts.....	850
Modulated D.C., volts.....	750
Max. D.C. Plate Current, mls.....	110
Max. D.C. Grid Current, mls.....	25
Max. Plate Dissipation, watts.....	40
Max. R.F. Grid Current, amps.....	3
Max. R.F. Output, watts.....	50



841-A

50 WATTS PLATE DISSIPATION

CARBON ANODE

\$7.00

GENERAL CHARACTERISTICS

Type 841A

Filament Voltage, volts.....	10
Filament Current, amps.....	2
Plate Resistance, ohms.....	3600
Mutual Conductance, uMhos.....	4000
Amplification Factor.....	14.6
Thoriated Tungsten Filament	

OVERALL DIMENSIONS

Maximum Length, inches.....	6 1/4
Maximum Diameter, inches.....	2 5/8
Plate to Grid, mmf.....	9

CLASS "C" OSC AND POWER AMP

Max. Operating Plate Volts	
Unmodulated D.C., volts.....	1250
Modulated D.C., volts.....	1000
Max. D.C. Plate Current, mls.....	150
Max. D.C. Grid Current, mls.....	30
Max. Plate Dissipation, watts.....	50
Max. RF Grid Current, amps.....	5

841SW

This tube is identical in characteristics with our regular 841A with the exception that the glass envelope and stem are Nonex glass and all leads are Tungsten. The base of the 841SW is Isolantite. A very efficient tube for 7 1/2 to 160 meter operation as either an oscillator or amplifier. This tube was especially designed for use in Portable Diathermy apparatus and has been adopted by many leading manufacturers. A pair in the push-pull oscillatory circuit will give 100 watts output.

Price on request

DATA ON THE 756

The Taylor 756 is an extremely efficient tube for use in Class B modulator circuits. At 750DC plate volts, a pair will deliver up to 100 watts of audio power output. Because of its high amplification factor and its ability to produce strong harmonics, the tube is ideal for use as a frequency multiplier.

Taylor



Tubes

TUBES FOR DIATHERMY APPARATUS

HD 203-C

\$17.50

Widely used in many standard Diathermy machines. Has same general specifications as the HD 203A except the interelectrode capacities are lower. Grid to plate capacity is 9 mmf.

HD 211-C

\$17.50

Also on accepted tube in the Diathermy apparatus field. The HD 211C is the same as the 203C except it is a low Mu tube having an amplification factor of 12.

204-A

250 WATTS PLATE DISSIPATION

CARBON ANODE

\$90.00

The Taylor 204A is a three element air cooled power tube designed for use in transmitters as an oscillator, Radio Frequency Amplifier, and Class "B" Audio modulator. A Super Heavy Duty Carbon Anode is used which enables the tube to withstand overloads and still maintain stable characteristics. Because of its heavy duty construction and long life this tube is highly recommended for use in Broadcast transmitters where uninterrupted service is very essential. The characteristics of the Taylor 204A are standard. Detailed data will be supplied on request.



PERFORMANCE CURVE OF THE
TAYLOR 204-A
WILL BE SUPPLIED ON REQUEST



HD 203-A

150 WATTS PLATE DISSIPATION

CARBON ANODE

New Low Price!

Now— \$14.50

The Heavy Duty 203A is truly a heavy duty tube and was the first tube designed with the floating anode. The anode is suspended from a stem sealed in the top of the envelope and is not connected electrically to any part of the tube assembly other than the top stem and plate lead. Before the introduction of the HD 203A punctures and flashing over in the stems of the standard 203A were very common especially in Class B audio circuits. These faults have been entirely eliminated in the construction of the HD 203A. The HD 203A is a general purpose tube and is used in circuits built for 203A tubes where more power is desired. A pair of these tubes will furnish 400 watts of audio in a Class B audio circuit. Now more than ever an outstanding value!

GENERAL CHARACTERISTICS

Type HD 203A

Filament Voltage, volts.....	10
Filament Current, amps.....	4
Plate Resistance, ohms.....	5600
Mutual Conductance, uMhos.....	4800
Amplification Factor	25
Plate to Grid, mmf.....	12
Thoriated Tungsten Filament	

OVERALL DIMENSIONS

Maximum Length, inches	9½
Maximum Diameter, inches	2½

CLASS "C" AMPLIFIER

Max. Operating Plate Volts	
Unmodulated D.C., volts.....	2000
Modulated D.C., volts.....	1500 1750
Max. D.C. Plate Current, mls.....	250 250
Max. D.C. Grid Current, mls.....	60 60

CLASS "B" A.F. MODULATOR

Push Pull Operation

D.C. Plate Voltage, volts.....	1500	1750
Grid Voltage, appr. volts.....	—45	—67.5
Load Resistance (plt. to plt.) ohms.....	9600	10,000
Max. D.C. Plate Current (2 tubes), mls.....	315	365
Static Plate Current, per tube, mls.....	18	18
Power Output (2 tubes), watts.....	300	400

Supply Voltage ↓	200	250	300	400	←Audio Watts Output
1750	.180 20,000	.225 16,000	.275 13,000	.365 10,000	←Max. Av. Ip. ←Load Impedance plate to plate
1500	.210 14,500	.265 11,500	.315 9,600		←Max. Av. Ip. ←Load Impedance plate to plate
1250	.255 10,000	.320 8,000	.380 6,900		←Max. Av. Ip. ←Load Impedance plate to plate

Taylor



Tubes

TAYLOR 866

The multistrand filament used in TAYLOR 866 Rectifiers has twice the emitting surface of the nickel alloy ribbon type filaments used in ordinary 866's. This multistrand filament together with the exclusive TAYLOR method of applying the oxide coating results in the coating adhering to the filament more closely. You have probably noticed how the oxide flakes off of ribbon type filaments—this cannot happen with the TAYLOR multistrand filament construction. The result is longer tube life. The greater filament area in the TAYLOR 866 gives increased ability to withstand heavier current overloads.

For over three years the TAYLOR 866's have been made with a Svea Metal Anode (chemically pure iron). Svea Metal does not amalgamate with mercury.

When back emission occurs in a Rectifier using a carbonized anode, small particles of carbon adhere to the filament ruining the filament emission. This condition cannot take place in a TAYLOR 866 Rectifier which has a Svea Metal Anode.

GENERAL CHARACTERISTICS

866

Filament Voltage, volts.....	2.5
Filament Current, amps.....	5.0
Inverse Peak Voltage, volts.....	7500
Peak Current, amps.....	.600
Appr. Voltage Drop per tube, volts.....	15
Multistrand Filament	
Svea Metal Anode	

WARNING: Do not use condenser input where the output voltage exceeds 1000 if the current is 200 milliamperes or more. Condenser input permissible at higher voltages at low current values.

We recommend choke input in all cases as it insures much longer tube life.

SPECIAL NOTE

In transit mercury in tube splatters over filament—therefore when first placing this tube into operation filament should be lighted for fully 15 minutes to allow mercury to condense to bottom of bulb.

THE WORLD'S FASTEST SELLING 866



TAYLOR 866

HALF-WAVE MERCURY VAPOR
RECTIFIER TUBE

\$1.65

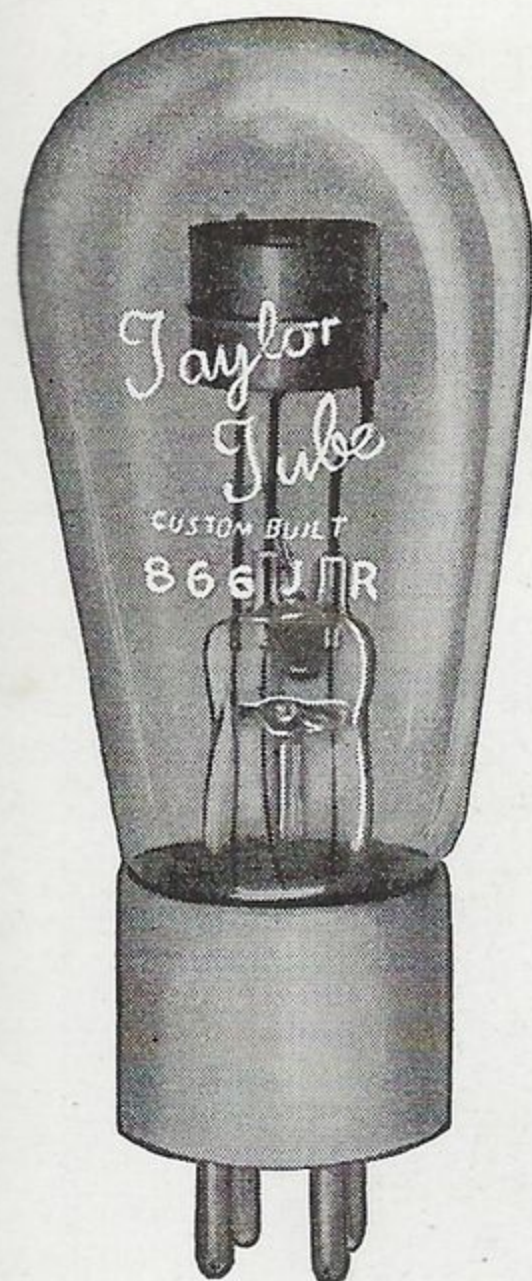
THERE ARE OVER 25,000 TAYLOR 866's IN USE IN COMMERCIAL, BROADCAST AND AMATEUR RADIO TRANSMITTERS. TAYLOR 866's ARE KNOWN THE WORLD OVER TO BE THE LONGEST LIVED AND MOST TROUBLE-FREE 866's EVER MADE.

"WHEN YOU BUY 866's—SAY 'TAYLOR 866's' AND YOU'LL GET THE BEST."

Taylor



Tubes



The New 866 JR. \$1.00

HALF-WAVE MERCURY VAPOR RECTIFIER

The 866 Jrs. will fill a real need for intermediate power requirements. They are intended to be used as rectifiers in power supplies of from 600 to 1000 volts D.C. where the receiving type full-wave rectifiers will not stand up and where the power capabilities of the Heavy Duty 866's are not necessary. The smaller size of the 866 Jrs. is another feature that will prove to be of great advantage in the layout of compact power supplies.

866 JR.

GENERAL CHARACTERISTICS

Fil. Volts	2.5V
Fil. Current	2.5A
Max. RMS A.C. Volts	1250
Max. D.C. Current per pair (Choke input)	250 M.A.

PHYSICAL CHARACTERISTICS

Max. Length, Inches	5 1/4
Max. Diameter, Inches	2 1/4
UX Ceramic Base	

Connect Plate Terminal to Usual Position Standard On All UX Bases

866 JR.

The 866 Jr. uses the multi-strand filament introduced by TAYLOR TUBES. The multi-strand filament construction used in TAYLOR rectifiers has twice the emitting surface of the nickel alloy ribbon type filaments used in ordinary 866's. The longer life secured with TAYLOR heavy duty 866's has proven that the use of the multi-strand filament and of a svea metal anode results in better rectifiers.

SPECIAL NOTE

In transit mercury in tube splatters over filament—therefore when first placing this tube into operation filament should be lighted for fully 15 minutes to allow mercury to condense to bottom of bulb.



872 HALF-WAVE MERCURY VAPOR RECTIFIER TUBE New Low Price!

\$9.00

The 872 is a Half Wave Mercury Vapor Rectifier for use in higher voltage and current power supplies capable of delivering a uniform supply of D.C. Voltages.

CHARACTERISTICS

Filament Voltage, volts	5
Filament Current, amps	10
Inverse Peak Voltage, volts	10000
Peak Current, amps	2.5
Bulb (50 Watt)	T-18
Base—Standard 50 Watt, prongs	4
Appr. Voltage Drop per Tube, volts	15
Multistrand Filament	
Svea Metal Anode	

866-B

HALF-WAVE MERCURY VAPOR RECTIFIER TUBE

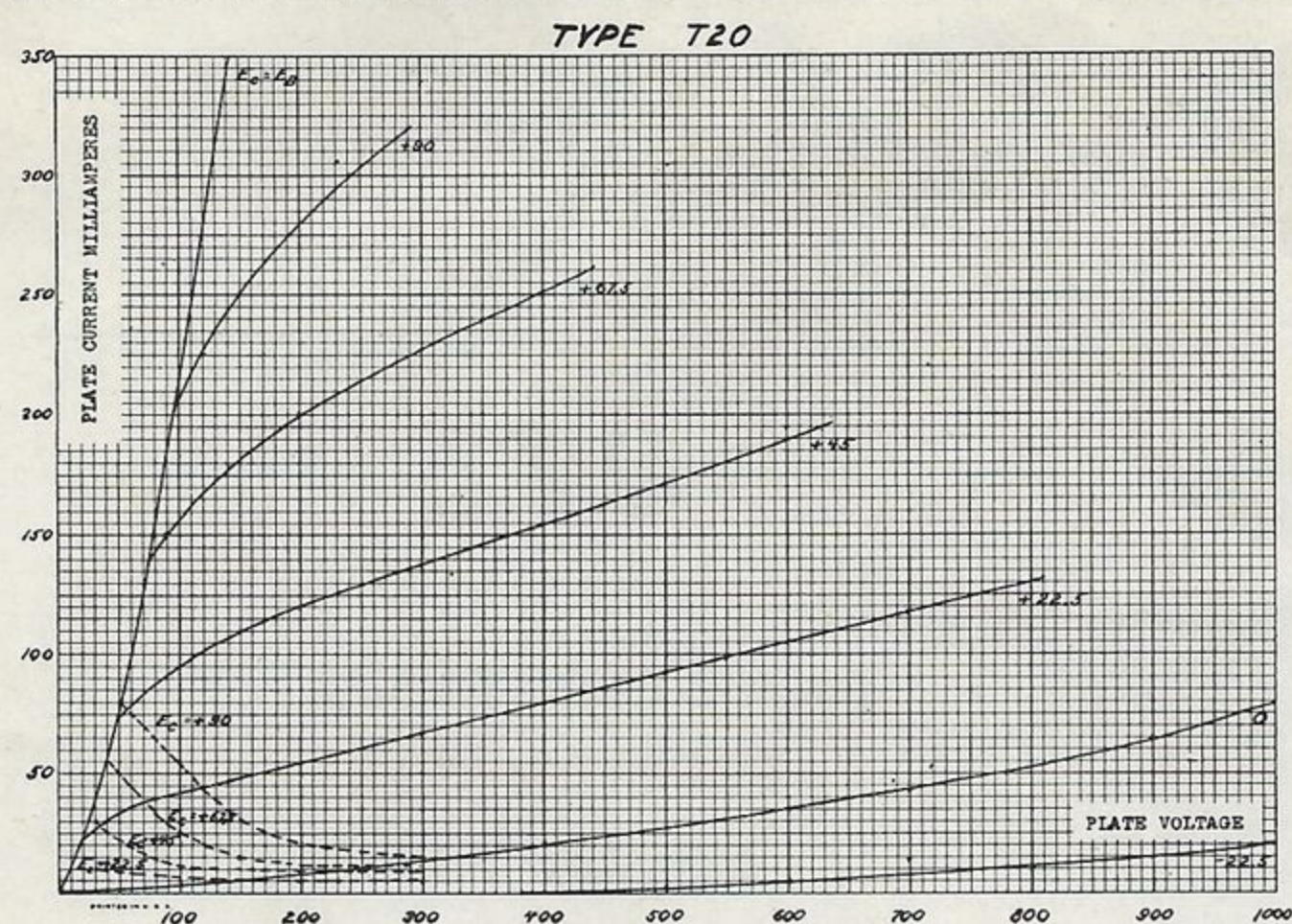
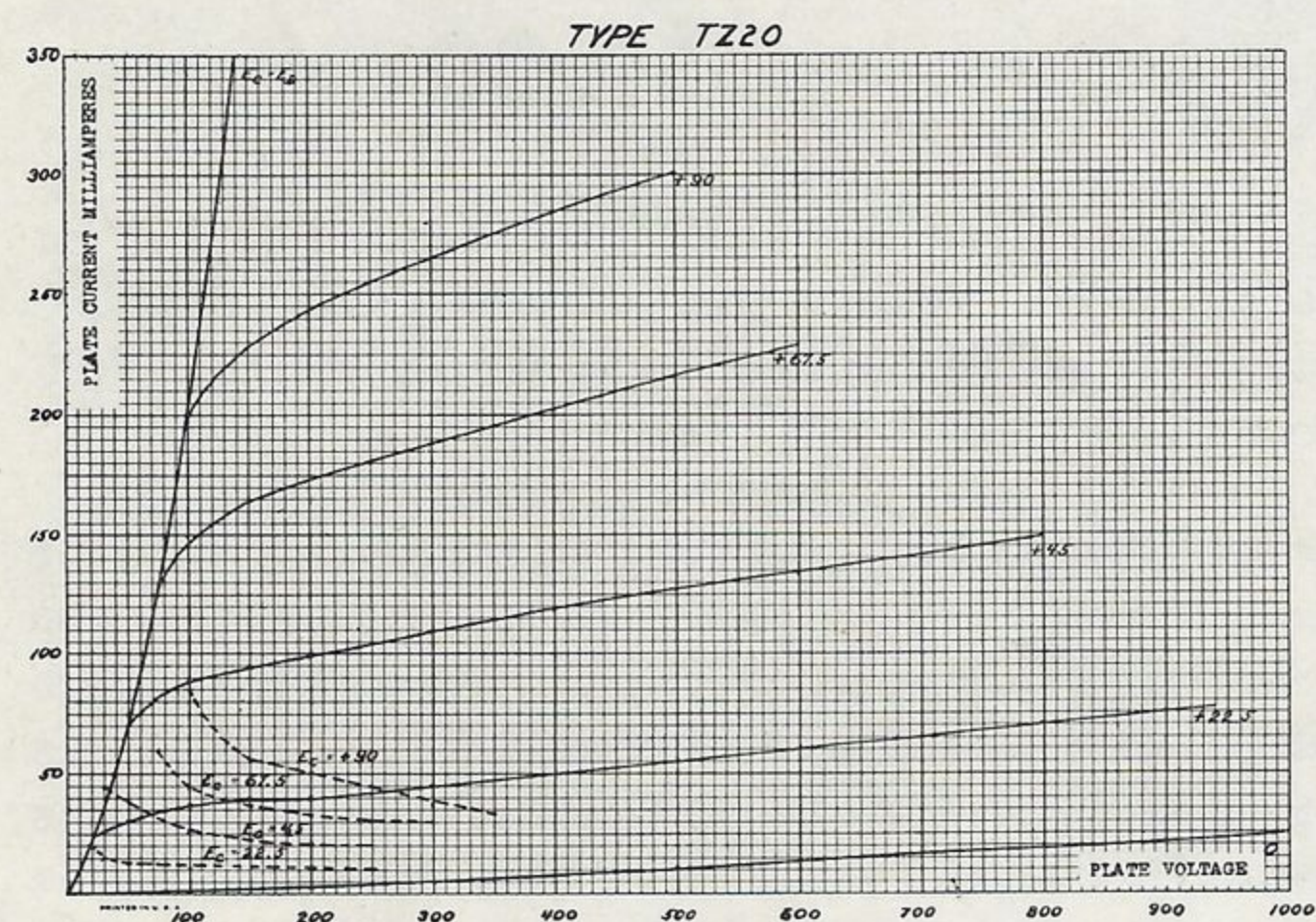
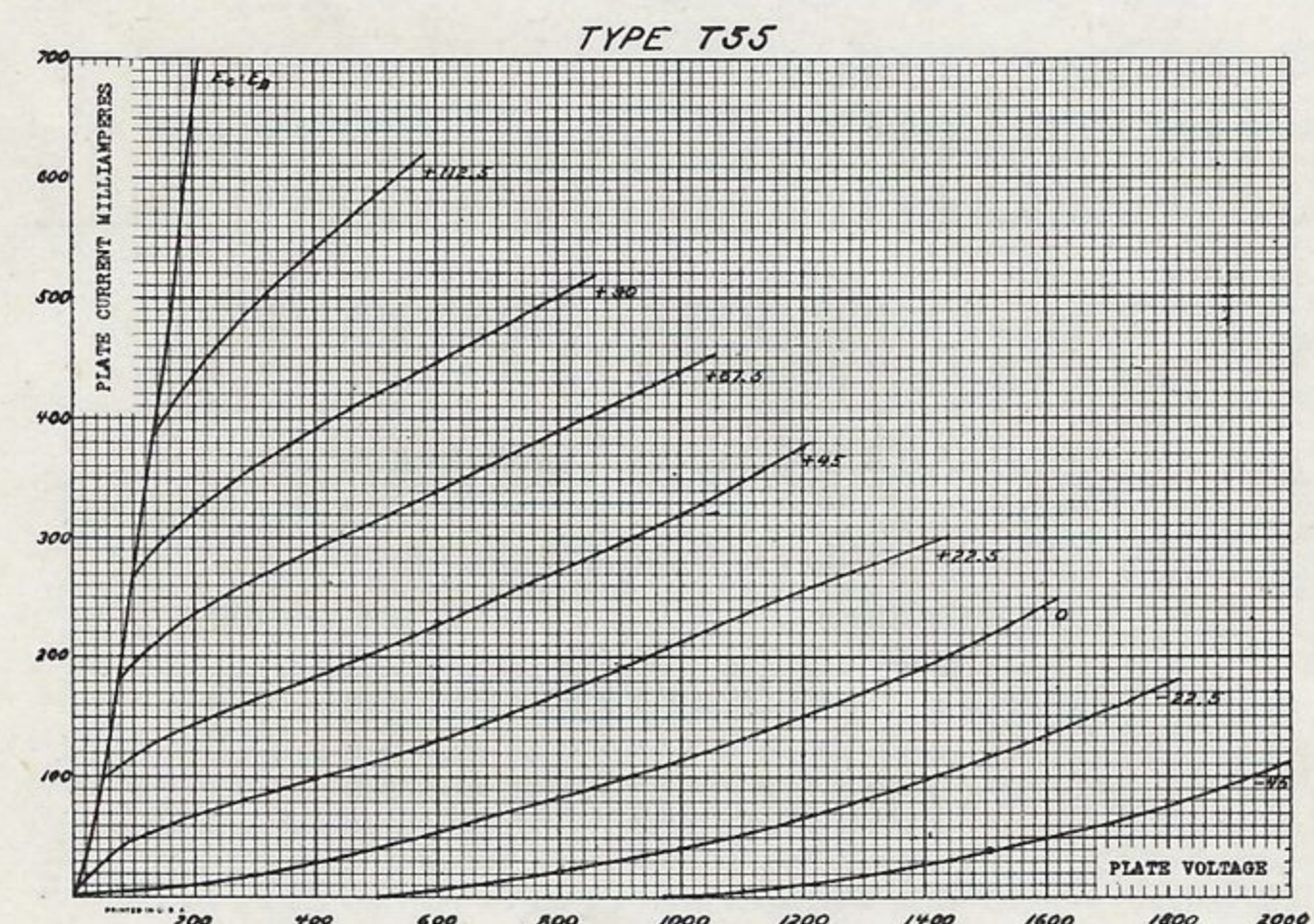
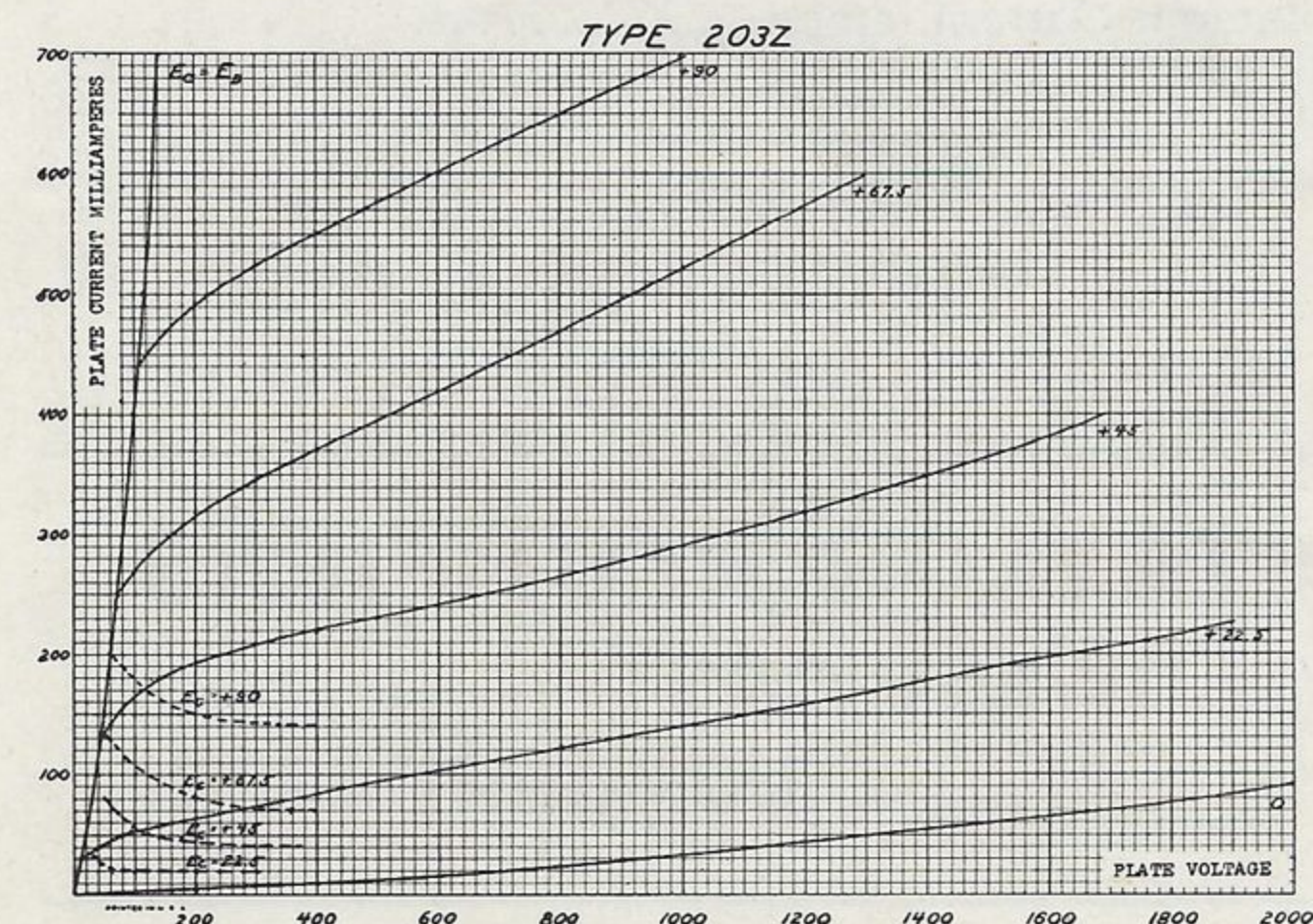
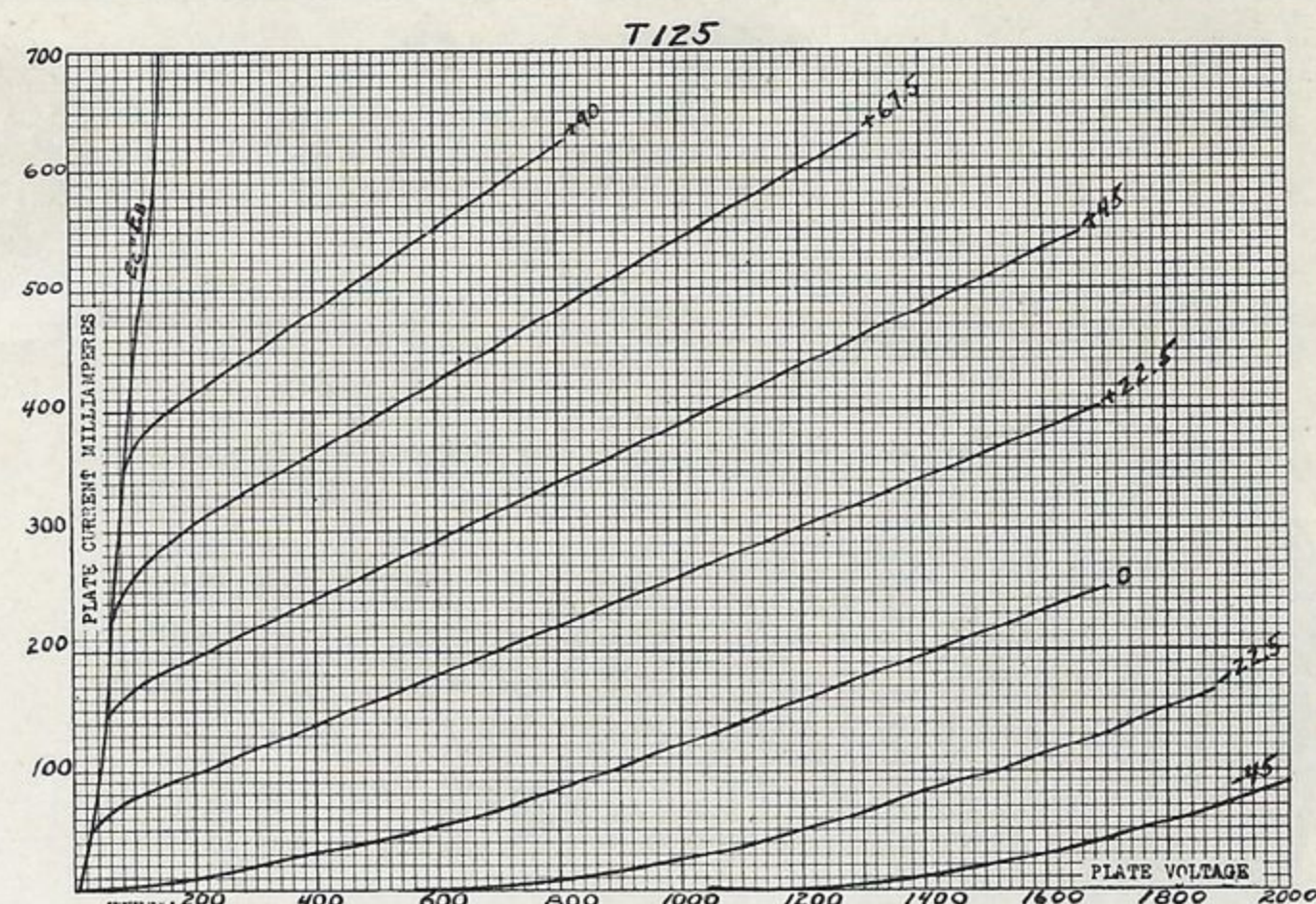
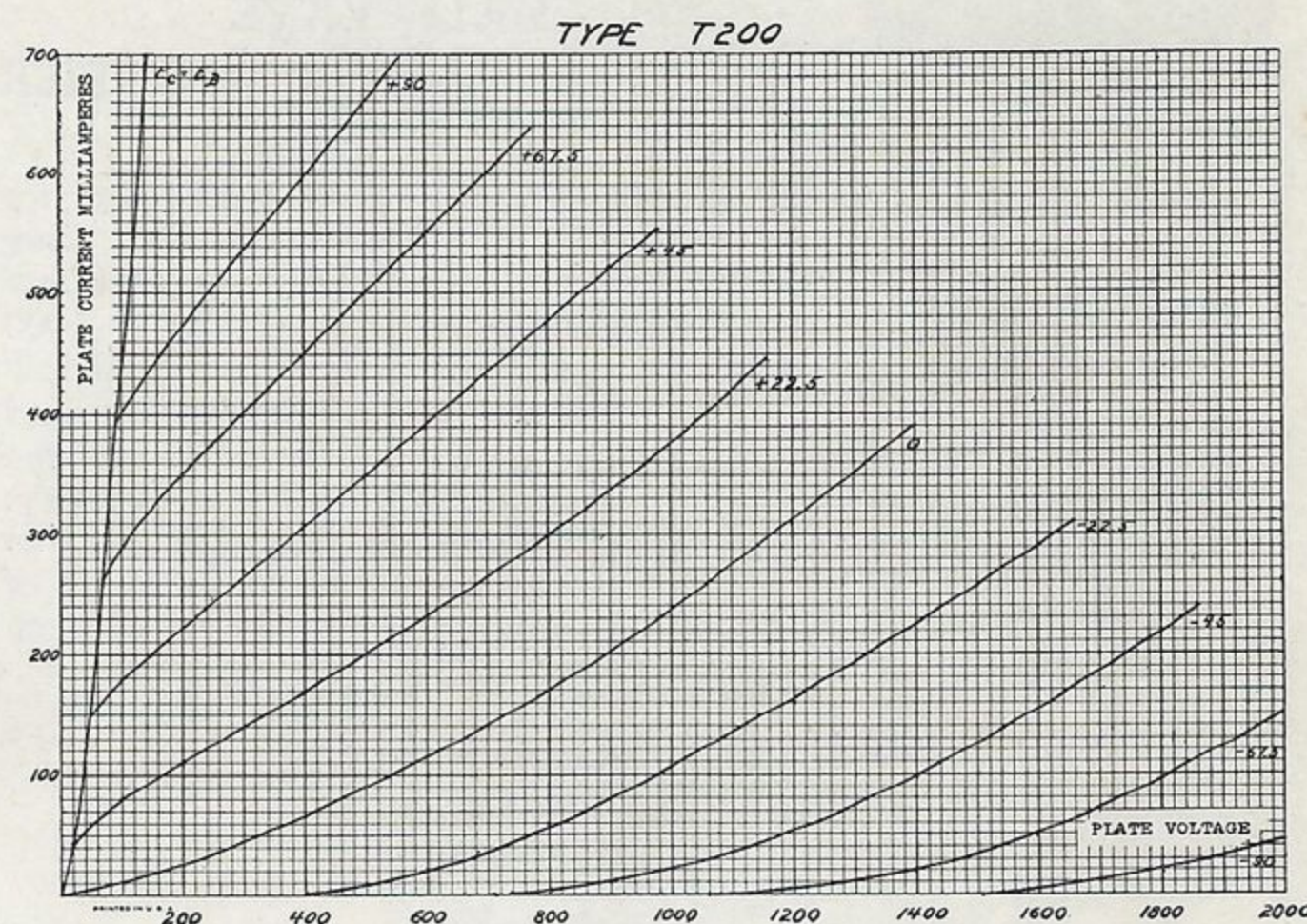
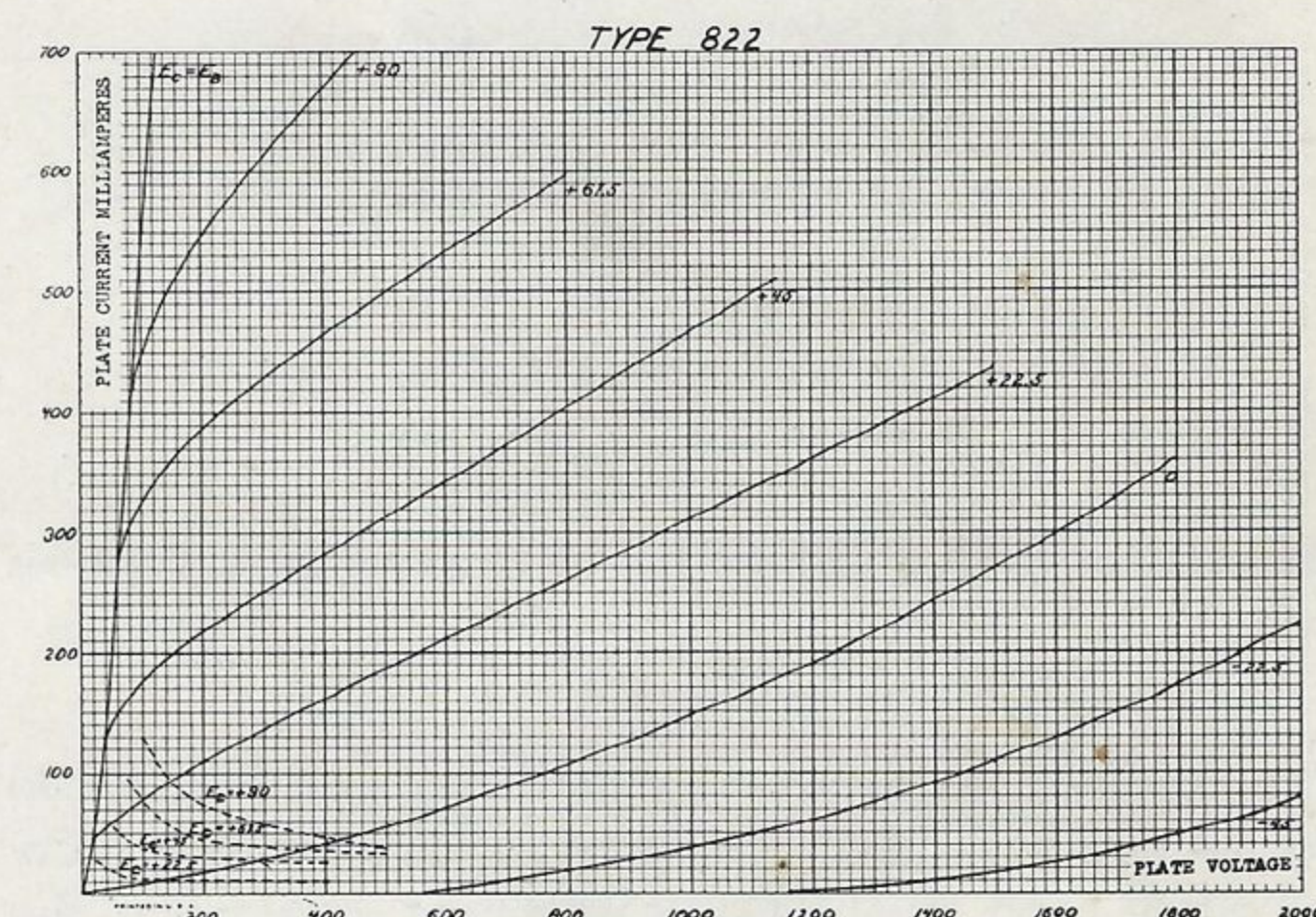
\$3.00

CHARACTERISTICS

Filament Voltage, volts	5
Filament Current, amps	5
Inverse Peak Voltage, volts	8500
Peak Current, amp	1

RECTIFIER CIRCUIT INFORMATION ON PAGE 44

TAYLOR RECTIFIERS LOWEST COST— LONGEST LIFE!



CALCULATING BIAS

To calculate necessary bias for a Class "C" stage (any type tube) divide the plate voltage by the amplification factor and multiply by two for approximate double cutoff. For higher efficiency add at least 40% more to this figure. For C. W. Class "C" or buffer stages, multiply by 1.5.

For example take a 203A tube which is to be used as an amplifier with 1000 volts on the plate. This tube has an amplification factor of 25

$$\frac{1000}{25} = 40 \times 2 = 80 + 32 (40\%) = 112 \text{ volts}$$

necessary for double cutoff plus 40% for phone operation.

For CW

$$\frac{1000}{25} = 40 \times 1.5 = 60 \text{ volts}$$

Taylor



Tubes

GENERAL TUBE INFORMATION

In all Radio circuits the tubes are the most important factor and the choice of tubes should be given the fullest consideration before attempting to build up any apparatus.

SELECTING TUBES

In selecting the proper tube for the particular purpose for which it is to be used, the first consideration would be that of power rating and plate dissipation. It is sound economy to purchase tubes that will give the desired amount of power within the ratings since the overloading of tubes results in shortened tube life.

Attempting to operate tubes and circuits at higher than normal efficiencies is false economy. 75% efficiency in Class C is considered normal and can be easily obtained with TAYLOR TUBES at reasonable values of plate voltage, excitation, bias and L/C tank circuit ratios. In order to realize abnormally high efficiencies, all of these conditions must be changed. The excitation must be increased by several times which means that a larger driver tube must be used and perhaps another stage added. The bias must be increased to several times cutoff. The plate voltage must be increased to 1.5 times normal. The L/C ratio must be extremely high because the tank impedance has to be as high as possible and the tank and condenser losses reduced to a minimum. The entire process is very expensive and the result is an improvement of 5% to 15% (maximum) in efficiency. The plate current must not exceed the rated value, the increase in input being gained by increasing the plate voltage. Raising the excitation, bias and L/C ratio inevitably result in excessive harmonic content, a condition which is very undesirable.

INTER-ELECTRODE CAPACITIES:

The next consideration should be that of inter-electrode capacities. If the transmitter is to be used on more than one frequency, your selection should be a tube whose capacities will permit efficient operation on the highest frequency to be used. The tube will then operate on all lower frequencies with equal efficiency.

Because of the great interest in high frequency operation most of the newer tubes have featured low interelectrode capacities. There are two reasons why this type of tube is better for the higher frequencies. The first is the fact that the RF current through a given capacity is proportional to frequency if the voltage is constant. This refers to the RF current which flows in the Grid and Plate leads and not to the direct current which you read on your meters and is the current that often causes the failure of medium C tubes at the very high frequencies. Reducing the inter-electrode capacities allows operation on a proportionally higher frequency for a given safe amount of RF current. You, no doubt, have noticed that where medium C tube operation on high frequencies is specified, the permissible maximum safe applied input becomes less as the frequency becomes greater because lower applied voltages mean proportionally less RF current; therefore, the plate input must be limited to the point where excessive current cannot flow. Excessive RF current will burn off grid or plate leads or cause punctures in the tubes where the leads enter the glass envelope.

The second reason for the use of low C tubes at the high frequencies, is the fact that the tube capacities themselves may be high enough to prevent a suitable L/C ratio in the tank circuit making it impossible to use a tank circuit with enough impedance to permit efficient operation.

Low C in a tube is obtained partially by isolating the grid, plate and filament leads from each other, but most of the capacity reduction is accomplished by using comparatively small elements and

increasing the separation between them. However, increased spacing between elements leads to a disadvantage as well as the advantage gained. This increased spacing means that for a given plate current the voltage drop across the tube will be higher. Low C tubes because of their high voltage drop require a higher plate voltage than medium C tubes in order to realize the same efficiency. The amount of RF grid drive required for the low C tube will be greater than required for the medium C tube assuming, of course, that the tube is used at a frequency where it will operate efficiently.

AMPLIFICATION FACTOR:

The amplification factor is the ratio of change in plate volts to change in grid volts necessary to maintain a constant plate current, and can be simply described as the increase in plate volts required to keep the plate current unchanged when the grid bias is increased one volt.

To calculate the amplification factor of any tube, using a Class A circuit, apply a plate voltage with a set bias and note the plate current value. Next, increase bias one volt and then increase plate voltage until the plate current value is brought up to the original value, since an increase in bias will decrease the plate current. The number of plate volts required to bring the current value back to original reading will be the amplification factor.

From this it might seem that the tube with the highest amplification factor would be the best and easiest to excite. However, it is an unfortunate fact that (other conditions being equal) increasing amplification factor also increases the plate resistance. Since low plate resistance is desired along with a high amplification factor, a happy medium must be decided upon. From our tests and experiments we find a tube with a μ of 15 to 25 is best adapted for all around amateur use.

MUTUAL CONDUCTANCE:

Mutual conductance has some relationship to amplification factor or μ since it also involves plate current change by grid voltage change over a small range and is expressed in mhos which is the inverse of ohms. The mutual conductance of a tube in micro mhos is the ratio of amperes plate current change to volts grid voltage change $\times 1,000,000$. For example, a tube whose plate current changed 5 MA with a grid voltage change of 2 volts would have a mutual conductance of:

$$.005/2 \times 1,000,000 = .0025 \times 1,000,000 = 2500 \text{ micro mhos}$$

Another way to calculate mutual conductance is to divide the plate resistance of the tube by the amplification factor.

PLATE RESISTANCE:

The plate resistance of a tube is the ratio between a small plate voltage change to the plate current change it effects. Assuming that in a given tube a change in plate voltage of 50 volts caused a change in plate current of 5 MA, its plate resistance would be:

$$50 \div .005 = 10,000 \text{ ohms}$$

Taylor Tubes are evacuated to the highest degree. There is no danger of gas being released from the **TAYLOR CARBON ANODES** when the Anode shows a red color during operation.

Each and every **TAYLOR CARBON ANODE** tube is checked for emission while the Anode is white hot at 60% of the tube's rated filament voltage.

Leading manufacturers of Therapeutic Apparatus have chosen **TAYLOR CARBON ANODE** tubes, because they can stand generous overloads and have a high plate dissipation rating which is so desirable in this type of apparatus.

TRANSMITTERS

The principle aim of the Taylor Tubes, Inc., has been to manufacture for the Amateur transmitting tubes that will deliver More Watts Per Dollar. With this in mind, our engineering staff has developed the following line of transmitters so that the Amateur may obtain More Output Watts Per Dollar from his transmitter as well as from his choice of Taylor Tubes.

Whether you desire low, medium or high power, on any amateur band you will find herein a circuit to fill your requirements.

Each and every transmitter was built and put into actual operation. In some instances, models were demonstrated at Conventions and Hamfests. From the comments noted, we sincerely feel that these transmitters have the stamp of approval of the Amateur.

Circuit simplicity, Efficiency, Eye Appeal, Ease of Operation and construction, Quality of all components, along with getting the Most Watts Output for every dollar spent, were given the utmost consideration.

TRANSMITTER CONSIDERATIONS

A transmitter which presents a neat and workmanlike appearance is a great source of satisfaction when visitors drop in. Not only is neat appearance desired, but stability, in the sense of reliability, dependability and consistency, is a very important requisite.

Transmitters which fail to function properly when line voltage drops and whose adjustments change as the stages warm up, are provoking. The maximum amount of operating pleasure can only be obtained from a transmitter that works perfectly every time the switch is thrown.

A dependable and stable transmitter is not difficult to construct; the use of good components and good design are the major requirements. Each stage must function properly with no interaction between it and other stages and should be free of spurious or parasitic oscillations or regeneration except in the case of a frequency doubler where regeneration is important and almost indispensable. The transmitter must have a sufficient number of stages so that more excitation is present at the grid of each tube than is actually required. This point is of particular importance yet there should not be more stages than are necessary to accomplish a reasonable surplus of excitation. It is almost mandatory that trick circuits be avoided since they usually involve critical adjustments.

Each layout which we recommend fulfills the foregoing requirements. If the layouts are duplicated no spurious or parasitic oscillations should be present, no regeneration is used except where desirable or necessary, and the amount of excitation available at any given point is about twice the amount used or required at that point. In some cases this means that one stage might be eliminated, at least on some bands, without appreciable reduction in output; but doing so might not permit the smooth stable operation which is so important.

In general, for transmitter use, Taylor triodes combine low cost, efficient operation, ease of adjustment, and ruggedness to an extent which must make them the Amateur's choice to the exclusion of tubes having a larger number of elements. There is one exception:—for crystal oscillator stages, pentodes or tubes with pentode characteristics have advantages which dictate their being used for this purpose in preference to triodes.

CIRCUITS

Basically, the requirements for a triode amplifier are an input circuit capable of being tuned to the desired operating frequency, an output circuit capable of being tuned to the same frequency, a source of RF voltage of opposite phase for neutralization, and suitable sources of filament, plate, grid and excitation voltages.

Starting with the grid circuit, the plate circuit of the preceding stage may also act as the grid coil for the amplifier under consideration. See Figure 1. This is the case when capacity coupling is used. The advantages of this system are its low cost and simplicity. If the impedance of the grid circuit is approximately the same as that of the driver plate circuit this coupling system is equally as efficient as any other, at least on the three lowest frequency bands. On 20 meters and higher frequencies the com-

bined input and output capacities plus the capacities of associated equipment to ground may be high enough to prohibit the use of enough inductance in the circuit and the plate efficiency of the driver stage may become poor. If the grid impedance of the driven stage is lower than the plate impedance of the driver stage maximum efficiency may be obtained by tapping down on the plate tank at a point which gives maximum grid drive at minimum plate current to the driver stage. Such an arrangement will provide maximum power efficiency but it is not commonly used since it usually creates new circuits which invite oscillation at parasitic frequencies.

In cases when the grid impedance of the driver stage is sufficiently different from the plate impedance of the driven stage to prohibit using the same tuned circuit for both or where the capacities resulting from this connection would be too great it is common practice to use a separate tuned circuit for the plate of the driver stage and the grid of the driven stage. The coil may be placed in the field of the driver plate coil or it may be placed out of the direct field of the plate coil and coupled thru a low impedance line. This latter method is usually called link coupling. See Figure 2. Inductive coupling in one of its forms is usually of greatest advantage at the higher frequencies and when working from a single ended stage to a pushpull stage and from a pushpull stage to a single ended one and when the driven grid impedance is widely different from the driver plate impedance. A further advantage is the elimination of or minimization of the importance of RF chokes. The disadvantages are higher cost because of more parts, greater space requirements, and more tuning adjustments and coils to change when shifting bands.

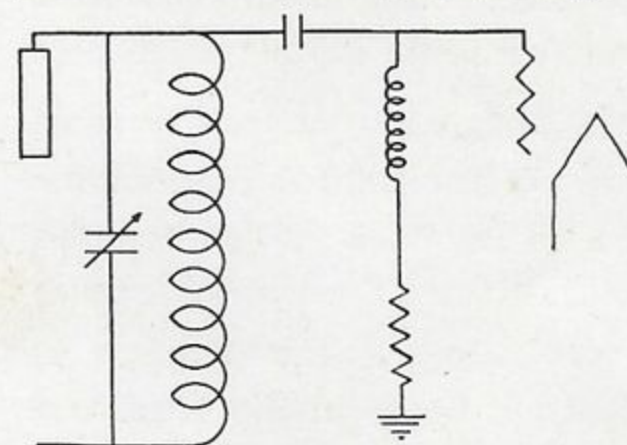


Fig. 1

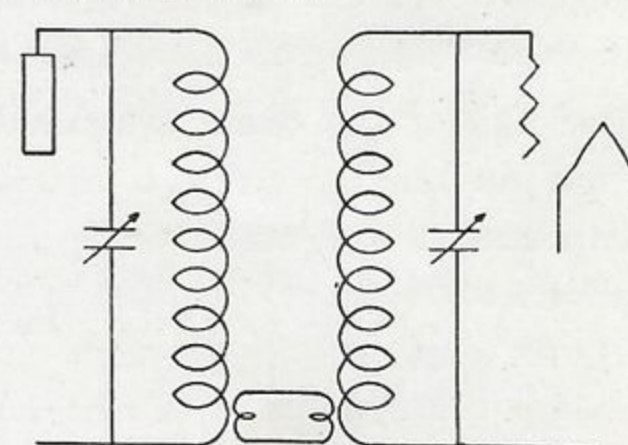


Fig. 2

Your choice of an input circuit will depend upon all of the considerations previously mentioned and when not duplicating a complete unit already designed the various factors should be weighed carefully that an intelligent selection may be made. The present trend toward link coupling is probably due to the fact that with it best results may be obtained under most any conditions even tho the cost is higher and the complexities greater.

Your plate circuit considerations are quite well determined for you in advance. The important considerations are the L/C ratio to provide maximum unloaded tank impedance consistent with minimum harmonic content and if fone is used to have sufficient capacity in the circuit to provide for linear action under modulation. All of the necessary calculations have been made for you in the L/C charts.

Neutralization also ties in with grid circuit and plate circuit design, except in the case of push-pull. With push-pull the fundamental circuit arrangement is identical whether the stage is a tuned grid tuned plate oscillator or a neutralized amplifier. The only practical method of neutralizing a push-pull stage is the so-called cross neutralizing method employing two neutralizing condensers, each connected from one grid to the plate of the other tube. See Figure 3.

However in a single ended stage either of two methods may be used. With grid neutralization the center of the grid coil is at ground RF potential. See Figure 4. One end of the coil goes to

the grid of the driver tube and the other end to one side of the neutralizing condenser. Grid neutralization will usually operate satisfactorily and may be of advantage if an unbalanced output stage is desirable as in our all-band 3 stage job using a 6L6G-T20-T55. However, the grid of the tube puts a resistive load across half of the input coil resulting in the opposite end of the coil being other than 180° out of phase if the coupling in the grid coil is less than unity. Unity coupling is never realized in practice at radio frequencies but satisfactory neutralization may usually be realized if the turns of the grid coil are wound as close together as possible. If difficulty is experienced it will usually be at the higher frequencies.

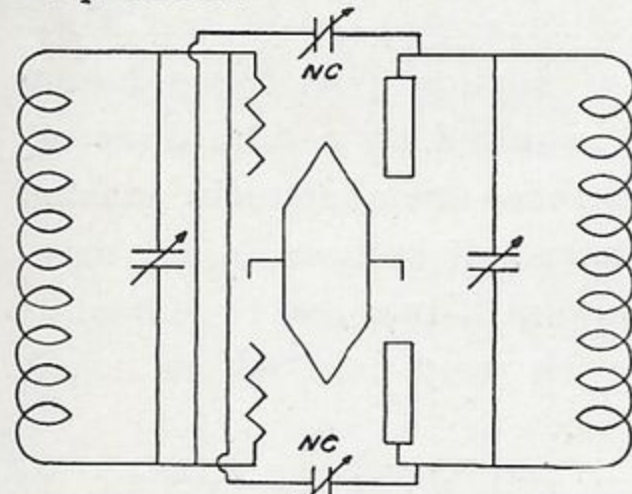


Fig. 3

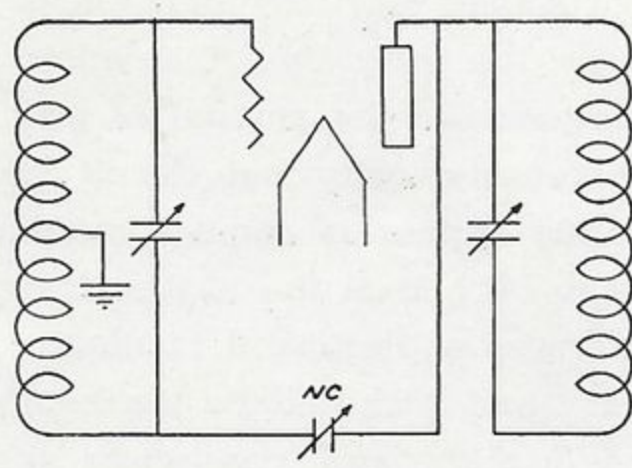


Fig. 4

Plate neutralization of a single ended amplifier necessitates operating the center of the plate coil at ground RF potential. One side of the neutralizing condenser is connected to the opposite end of the plate coil to which the plate of the tube is connected and the other side of the neutralizing condenser goes to grid. See Figure 5.

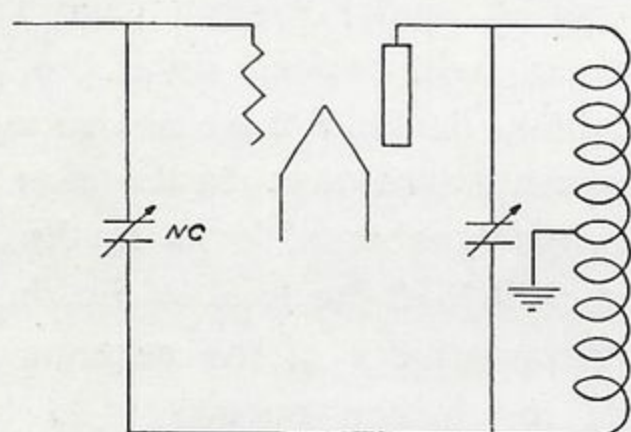


Fig. 5

Our L/C ratio calculations are based on the plate neutralized type circuit because it seems more or less the standard practice in amateur transmitters.

For maximum power gain with reasonable efficiency the bias should be approximately cutoff and the grid current the normal recommended value. An amplifier of this type is suited for use as an intermediate or buffer stage or as the final stage in a CW transmitter.

Class C operation requires somewhat greater than twice cutoff bias with normal recommended grid current. This stage would be characterized by slightly better plate efficiency than the one previously described and would be suitable for intermediate or buffer stage, final stage CW, or plate modulated phone.

Another type of Class C operation would require bias of several times cutoff with normal grid current flowing. With the plate circuit tuned to the same frequency as the grid circuit and with a high impedance plate tank, higher voltages may be applied and higher plate efficiencies, over 75% obtained. However, the harmonic content will be high and unusual precautions to prevent harmonics being radiated by the antenna must be taken. This grid bias and excitation condition is also ideal for the operation of a doubler stage with the plate circuit tuned to twice the frequency of the grid circuit. Reasonable efficiency may be obtained from a doubler if the bias and excitation are high.

The Class B linear of grid modulated amplifier requires approximately cut off bias and little or no grid current. The unmodulated efficiency will be low, varying between approximately 25% and 35%. This type of operation necessitates the use of fixed voltage bias sources. The voltage must remain constant regardless of current variations. Batteries are probably the most satisfactory source because the smaller types may be used and the life will be long.

For all other types of operation it makes little or no difference how the necessary bias is obtained. The simplest and cheapest method is the use of a resistor in the grid return circuit. This arrangement is entirely satisfactory in every respect except that no protection is afforded the tubes in the event the excitation fails or is removed while the plate voltage is on. Batteries are frequently used and they make an excellent bias source from every standpoint except that of cost, life, and in some cases, size. The same amount of power which would be dissipated in a resistor in the same circuit is dissipated in the batteries. This heat dries out the batteries so rapidly where any great amount of grid current is present that the use of batteries can become very expensive.

Bias supplies of one type or another are becoming more common. A discussion of the units would be too involved and lengthy for the space available. Let it suffice to say that even the simplest types should prove entirely satisfactory for RF stage bias since regulation, except in the case of efficiency modulated amplifiers, is not a factor.

Cathode bias also is used. It consists of a resistor between filament center tap and ground. It must be capable of carrying the total grid and plate current and as the plate current is increased the bias also increases. If the stage is modulated the

(Con't. on Page 34)

CRYSTAL OSCILLATOR

Because no triode can provide the versatile crystal oscillator operation obtainable with tetrodes and pentodes, we do not recommend triodes as crystal oscillator tubes in amateur transmitters. Any time our tubes are not the best for a certain purpose we will not hesitate to recommend others.

In selecting a crystal oscillator circuit we had 5 requirements in mind.

1. High output on fundamental and second harmonic frequencies.
2. Minimum number of coils to wind and change.
3. Minimum number of tuning controls.
4. Lowest current thru crystal for best frequency stability and crystal safety.
5. Lowest cost consistent with maximum performance.

Every popular crystal circuit was set up for comparison. The one selected using a 6L6G was first popularized by Jones of Radio Handbook. It fulfills the first, third and fifth requirements perfectly and to a greater degree than any other circuit. It has only one tuning adjustment and one coil to change. The tri-tet its nearest competitor, has two coils to change and two tuning adjustments. The only bad feature, which is the fault of the 6L6 and not of the circuit, is that when working straight thru on the fundamental frequency with a 20 or 40 meter crystal the RF current thru the crystal is too high. When doubling in the oscillator the crystal RF current is extremely low—about 10 to 20MA. A type 6F6G in the same circuit provides satisfactory fundamental operation with safe RF crystal current with all crystals including 20 and 40 meter ones but when doubling the output is only a small fraction of that obtained with a 6L6G. As a result we use a 6L6G with an 8 prong ceramic base when doubling in the oscillator and replace it with a 6F6G when working straight thru. Both tubes fit the same socket and no circuit changes are necessary. Merely place the 6L6G in the socket when the output of the oscillator stage is twice the crystal frequency and the 6F6G when the oscillator stage output frequency is the same as the crystal. With a 40, 80, or 160 meter crystal working straight thru the oscillator output will be about 15 watts. With a 20 meter crystal it will be about 10 to 12 watts. The 40 meter output from an 80 meter crystal will be about 12 watts and the 20 meter output from a 40 meter crystal will be 6 to 9 watts.

While even badly cracked crystals will operate on their fundamental in this circuit a good crystal is required for harmonic output. It must not only be active but must have only one frequency. 20 meter crystals will be very satisfactory in this circuit for straight thru operation but do not provide satisfactory 10 meter output. Most 20 meter crystals are 60 meter crystals operating on their 3rd harmonic. In this circuit the 10 meter output is apparently the 6th harmonic of 60 rather than the second harmonic of 20.

When not oscillating the 6L6 will draw about 140MA. With the crystal oscillating and the plate circuit off resonance the current will be about 100MA. When the plate circuit is brought into resonance on the fundamental or harmonic frequency a very pronounced dip in plate current will be noticed.

With the 6F6G, the non-oscillating plate current will be about 80MA and will dip in the conventional manner near resonance.

The fact that we prefer this crystal circuit does not mean that it has to be used. There is probably more difference of opinion concerning which is the "best" crystal oscillator arrangement than there is concerning any other unit in the transmitter. If you prefer

the tri-tet because it works best for you, by all means use it. However, the circuit as shown delivers 20 to 25MA of grid current to the following stage even on 20 from a 40 meter crystal and the circuit used should do equally as well if equivalent results are expected. The only fault that we can find with the circuit we recommend is that an occasional 40 meter crystal which will double with the tri-tet will not double in this circuit. However, all crystals of reputable manufacture tested in this circuit doubled excellently. In addition some badly cracked crystals which would not operate at all in other circuits worked excellently straight thru on the fundamental frequency.

BUFFER DOUBLER 1

In all of the units we show a T20 or T55 as a buffer. At the maximum ratings of 750V and 75MA input, a T20 will deliver about 40 watts of output. At frequencies lower than 15MC where circuit losses may be kept at a reasonable value and practically the whole 40 watts delivered to the final stage, a T20 will furnish sufficient grid drive for a plate modulated final stage with an input of approximately 500 watts or less. For cw only the T20 will probably drive a 700 watt stage. No definite statement on this subject can be made because the amount of grid drive required can vary over wide limits in different transmitters.

A T20 as a straight buffer on 10 meters may be expected to adequately drive a 250 to 300 watt final stage.

As a doubler to 10 from 20 the efficiency will vary greatly with the excitation, the bias and the L/C ratio but 15 watts of output should be obtained under average conditions without any color showing on the plate. This excitation would permit an input of about 150 watts to the final stage.

For those applications where the T20 does not have sufficient output a T55 may be substituted. The grid drive from the oscillator shown is sufficient for full rated input to the T55. 150 to 170 watts of output may be obtained which will be far more excitation than is required for a 1 Kw final stage. No changes need be made in the circuit when replacing the T20 with a T55 except to use components with adequate voltage ratings so that breakdowns will not be experienced if higher voltages are applied to the T55 than to the T20.

The first two stages, a 6L6 and T20 or T55, will make an excellent 2 stage all band transmitter, and would be ideal for portable operation. The excitation on all bands from 40 to 160 is sufficient for plate modulation with full input. On 20 the excitation is adequate for plate modulation with 100 to 150 watts of input. If operating 20 meter phone with two stages a 40 meter crystal should be used. The 6L6 operates as an oscillator and doubler and apparently the isolation on 20 is adequate to keep frequency modulation to a negligible amount.

DOUBLERS

A doubler is used to obtain an output frequency of twice the input frequency and one or more of these stages are usually necessary when working on the higher frequency bands. Because the plate circuit is not tuned to the same frequency as the grid circuit, neutralization is not necessary to prevent oscillation. However, the efficiency of a doubler may be improved greatly if regeneration is added. The circuit for a regenerative doubler is exactly the same as for a neutralized amplifier so the same stage may be used for either purpose by merely changing the plate coil. The neutralizing circuit provides regeneration when doubling.

As a doubler the plate efficiency of a stage will be much less than when working as a straight amplifier. Consequently for a given plate dissipation the output must be much less. More grid drive is required also so the power gain will be less. The grid bias should be several times that for straight thru operation. The L/C ratio should be as high as possible.

If a stage is used for both straight thru and doubler operation it may be neutralized and the neutralizing condenser setting left the same for doubler operation. If it is used for doubler operation

only, the neutralizing condenser adjustment should be for maximum efficiency without oscillation.

INSULATION

If you are going to operate on the lower frequencies only insulation is no great problem. Below about 8MC bakelite or most any of the various commonly used types of insulation are sufficiently good. About the only important consideration is that it be able to stand the voltages involved without breaking down.

Above 8MC the situation is much different and at 28 and 56MC only the very best insulation is good enough. **(At these higher frequencies the amount of grid drive required by a tube does not increase greatly but circuit losses increase tremendously making tubes appear to require more grid drive.)** If sufficient grid drive is to be had at the higher frequencies and if reasonable efficiency is to be experienced insulation should be used only where necessary and it should be the best available.

Sockets and condenser insulation should be of ceramic or Mycalex. Wherever possible the inductances should be self supporting with no foreign objects in their field.

ANTENNA COUPLING

The method of coupling the transmitter to the antenna will depend upon the type of feeder system used and the characteristics of the antenna coil will depend upon the impedance of the feeders at the transmitter. Because there are so many variables we cannot provide any quantitative data. In the case of untuned transmission lines the correct number of turns in the pick up coil will be the number which will load the final to the desired input. With tuned feeders the characteristics of the antenna coil will depend upon the amount of inductance necessary to tune the antenna system to resonance. With single wire fed or end fed antenna systems, a separately tuned circuit coupled to the final tank is probably advisable because of the lack of harmonic discrimination with these antennas. If the L/C ratio in the final stage is low enough for reasonable harmonic suppression the L/C ratio of the separately tuned coil may be very high.

Any pick up coil coupled to a tank circuit should be placed at the point of minimum RF voltage to minimize capacity coupling. In the case of a balanced output tank as with push pull or a plate neutralized single ended stage the coupling coil should be at the center of the output tank. With a grid neutralized single ended final stage the coupling coil should be at the cold end of the tank coil.

A faraday screen between tank and pickup coil is usually very helpful in preventing even harmonic radiation but sometime presents mechanical difficulties if the coils are changed for multi-band operation. Grounding the center of the pick up coil to the final stage filament or ground circuit is usually equally effective and far more simple mechanically.

With transmission lines it is legal to tap the feeders, single or double wire, directly onto the final tank but this is likely to result in high mutual impedance between plate circuit and radiating system at the harmonic frequency. It is almost impossible for this condition to exist with a two wire line and a pick up coil whose center is grounded so it would be wise to avoid direct coupling and to use a two wire line to keep harmonic radiation at a minimum.

SPECIAL OFFER

ALL TAYLOR TUBE distributors have competent men who are acquainted with these units and transmitters and will assist you with any problems that may pertain to these units.

Visit these men, they offer this service to you FREE.

L/C RATIOS

Your tank circuits are worth your careful consideration for they will greatly influence the operation of your transmitter. As far as the tubes are concerned the inductance and capacity in the circuit when tuned to resonance are a resistance as shown in Fig. 1. With no load coupled to the tank, the impedance (AC resistance) should be high and its value will be proportional to $\frac{L}{CR}$ where L is the amount of inductance, C the amount of capacity, and R the resistance. When you couple a load to the tank you have the situation shown in Fig. 2. R_{p1} is the unloaded impedance of the tank circuit. R_{p2} is the load impedance reflected across R_{p1} , and the

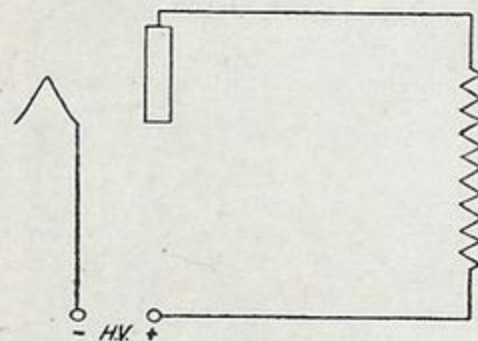


Fig. 1

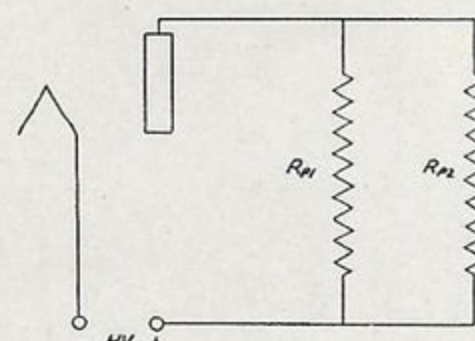


Fig. 2

power developed across R_{p2} will be delivered to the load or antenna. It is useful output. However, the power developed across R_{p1} is power wasted in the tank circuit and shows up in the form of heat. It may easily be seen that as the ratio of R_{p1} to R_{p2} is raised less power will be wasted and more will be delivered to the load. Because R_{p1} is the unloaded tank impedance it can be seen why, as the impedance of the tank circuit is raised less power will be wasted in the tank and more delivered to the load. As shown from the formula L/CR the impedance may be increased by increasing the amount of L and reducing the amount of C. If efficient coils and condensers are used it probably would not be practical to attempt to reduce R but if C were reduced to $\frac{1}{2}$ its former value, L would have to be doubled to hit resonance at the same frequency so the impedance would have increased to four times its former value. Actually, it would not be four times because R would increase slightly with an increase in L but the gain in impedance would approach four.

From the foregoing it would seem advisable to use as much inductance and as little condenser as possible. From a plate efficiency standpoint only this is more or less true, however, after a certain value of tank impedance is reached the efficiency increases only very slightly, yet the driver power required continues to increase and from an over-all efficiency standpoint there might be no improvement.

However, increasing the L/C ratio leads to one disadvantage for CW operation and an additional disadvantage for fone operation.

As the L/C ratio is increased the harmonic content is also increased. If these harmonics reach the antenna, and it is sometimes difficult to prevent them from doing so, they will be radiated and may cause interference to other services. Consequently it is necessary to select an L/C ratio which must necessarily be a compromise between plate efficiency and harmonic content. Fortunately, a ratio may be selected which does not result in appreciably lower efficiency yet the harmonic content is kept at a reasonably low value. In fact measurements seem to indicate that excessively high L/C ratios do not result in increased fundamental or useful output. The increase seems to be composed entirely of harmonics which are not useful and are to be avoided.

For phone operation a certain amount of capacity is necessary if the amplifier is to be linear. Less than this minimum of capacity will result in distortion and carrier shift. This amount of capacity is usually somewhat greater than the amount required to reduce harmonics to a satisfactory value and for this reason different L/C ratios have sometimes been specified for CW and phone operation. However, the permissible L/C ratio for fone is high enough that increasing it to the permissible CW value for that type of operation results in so small an increase in efficiency that it seems desirable to specify L/C ratios for all forms of operation which are capable

of linear phone operation to permit modulation if desired and to obtain greater harmonic suppression. However, if only CW operation is contemplated the L/C ratio may be quadrupled by using about half as much capacity and twice as much inductance as would be required for phone. Twice as much inductance may be obtained with about 41% more turns.

Correct L/C ratios become the greatest problems on the highest and lowest frequencies when all band operation is desired. For example, any condenser with enough capacity to provide a reasonable ratio on 160 meters would undoubtedly have a minimum capacity so high that efficient operation would be impossible on 10 whereas a condenser with suitable capacities for 10 meters would have so low a maximum capacity that poor linearity and high harmonic content must necessarily be present on 160 even though the efficiency would be good on both bands. Probably the most satisfactory answer to this problem would be to build the circuit for the highest frequency to be used and connect another condenser in parallel with the HF tuning condenser for low frequency operation.

If your L/C ratios are correct you will obtain maximum fundamental frequency output with minimum harmonic content and minimum distortion if modulated. If your L/C ratios are not correct you will sacrifice one or more of these desirable characteristics.

In general if your L/C ratios are right the minimum plate current with no load coupled to the output circuit will be about 10 to 20% of the loaded value. Minimum plate currents in excess of 25% of the loaded value are usually an indication that circuit losses are higher than they should be. However, tank circuit losses drop rapidly as the loading is increased so minimum plate currents unless greatly excessive need not be taken too seriously.

Optimum L/C ratios are not directly a function of the type of tube or tubes used. The factors used in the calculations are plate voltage, plate current, frequency, and the type of operation.

TUBE INSTALLATION HINTS

To obtain efficient performance from any radio circuits where tubes are used great care should be exercised in the installation of tubes in these circuits.

The heart of a vacuum tube is its filament. Improper operation of the filament will shorten its life.

Although small variations in filament voltage are compensated for in the designing of our tubes, most satisfactory results are obtained when filaments are operated at their rated voltage. Lower voltage limits the electron emission of the filament and generally results in the over heating of the tube, while higher voltage will rapidly dissipate the supply of thorium in the filament.

Use sockets with large sweeping contacts. Poor contact between socket springs and tube prongs will cause a drop in filament voltage. Heavy well soldered leads are very essential. Light tube at rated filament voltage for ten minutes before applying plate voltage for the first time. Preheating of filament after first installation is not necessary.

The ground return should be connected to center tap of the filament. Where the ground is returned to one side of the filament, connections should be reversed at intervals of 100 hours. Using one side of the filament for ground return causes the opposite side of the filament to function harder. Where D.C. is used on filaments, connect grid and plate returns to negative side of the filament.

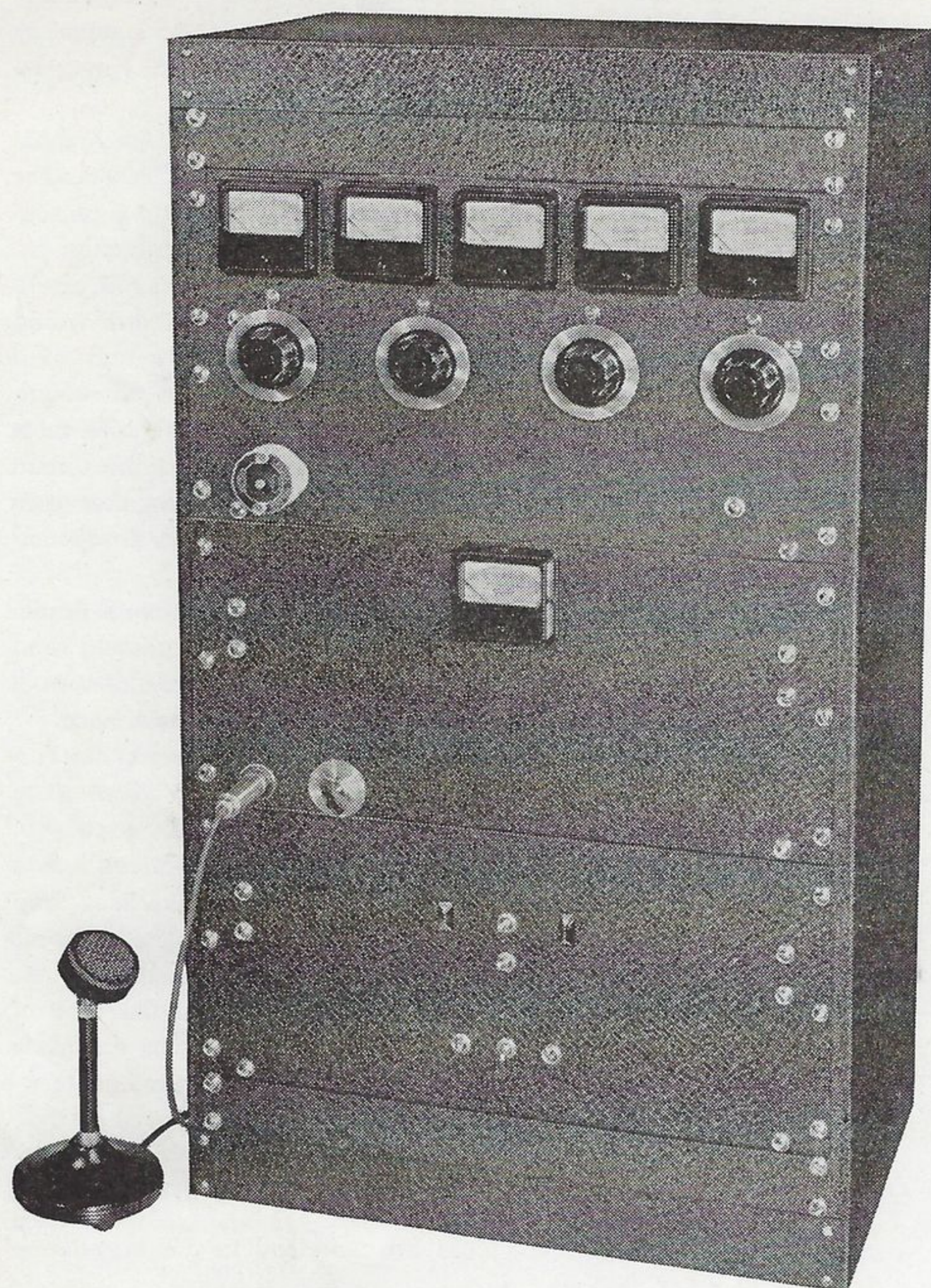
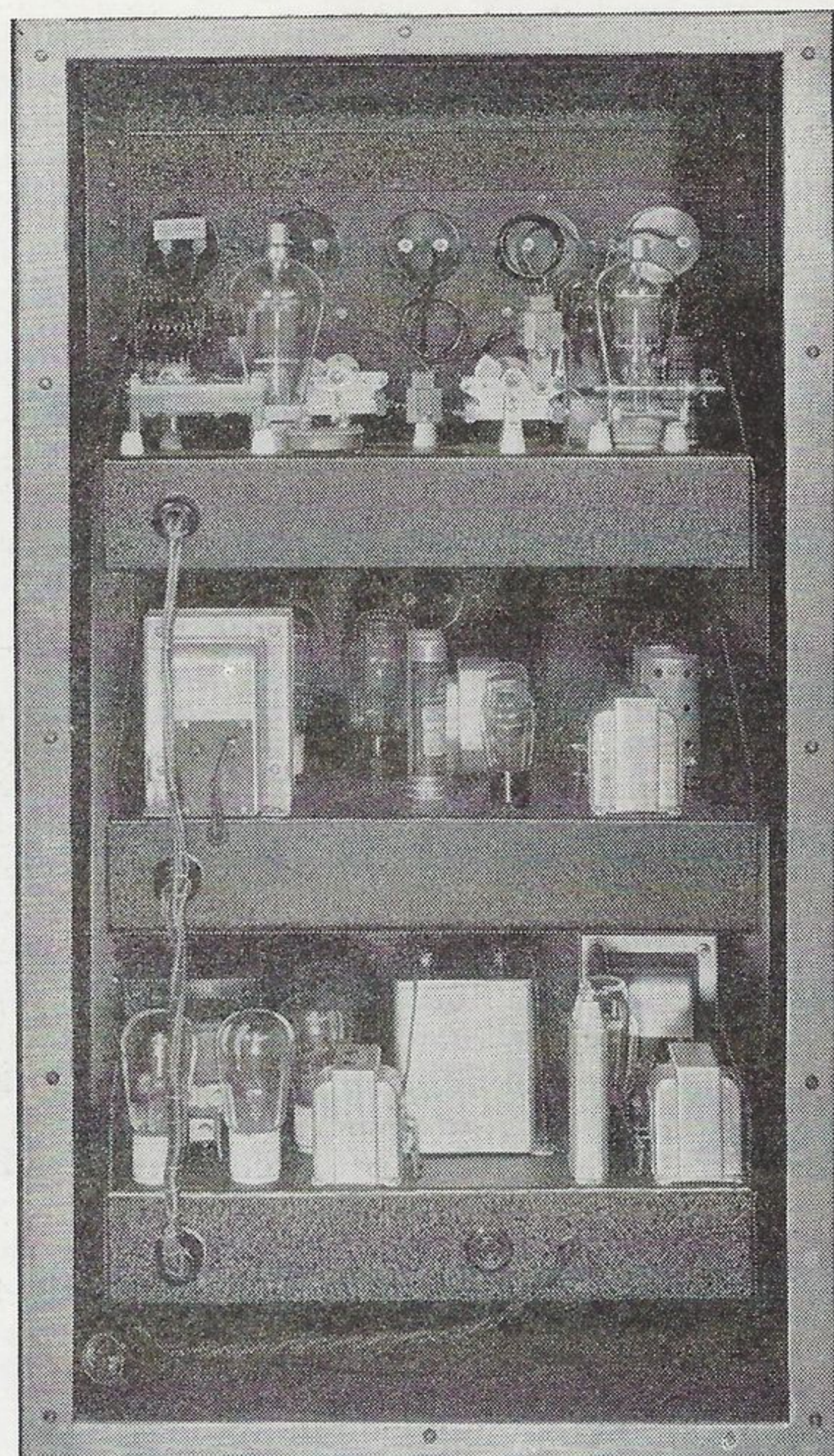
All connections in the plate tank circuit should be heavy enough to stand the circulating R.F. current. At frequencies higher than 14,000 k.c. bolted connections are recommended as the heat at these frequencies will melt ordinary solder.

In testing out circuits do not apply full rated plate voltage. It is best to cut plate voltage down to at least one half. After proper adjustments are made, then apply full voltage. At no time should full input be applied to a Class "C" stage with no load coupled to it. Do not key or try to modulate a final stage unless an antenna or dummy load is coupled to this stage.

When operating two or more tubes in parallel insert a non-inductive 100 ohm resistor in the grid leads right at the grid terminal on the tube socket to prevent parasitic oscillations.

When it becomes necessary to operate a tube in a horizontal position, place the tube so that the grid turns are in a vertical position, otherwise the expansion of the filament when heated causes the filament to sag and short against the grid.

A TAYLOR TUBE TRANSMITTER



A Complete Taylor Tube Transmitter

This transmitter was built up as a complete unit to illustrate how well any of the RF units described will work into a complete transmitter with a finished and commercial appearance. It was made as small and compact as possible to facilitate carrying or shipping it to conventions and hamfests so you may be able to see and operate it. All of the RF units are designed for equally successful relay rack or cabinet mounting.

It was originally mounted in a Bud No. 1249 32-inch Midget Relay Rack but was remounted in the No. 1262 Bud Cabinet Relay Rack to afford the equipment better protection when being transported. In addition the cabinet rack has $3\frac{1}{2}$ inches more panel space allowing more leeway in power supply parts selection if desired. The finished appearance is somewhat better also.

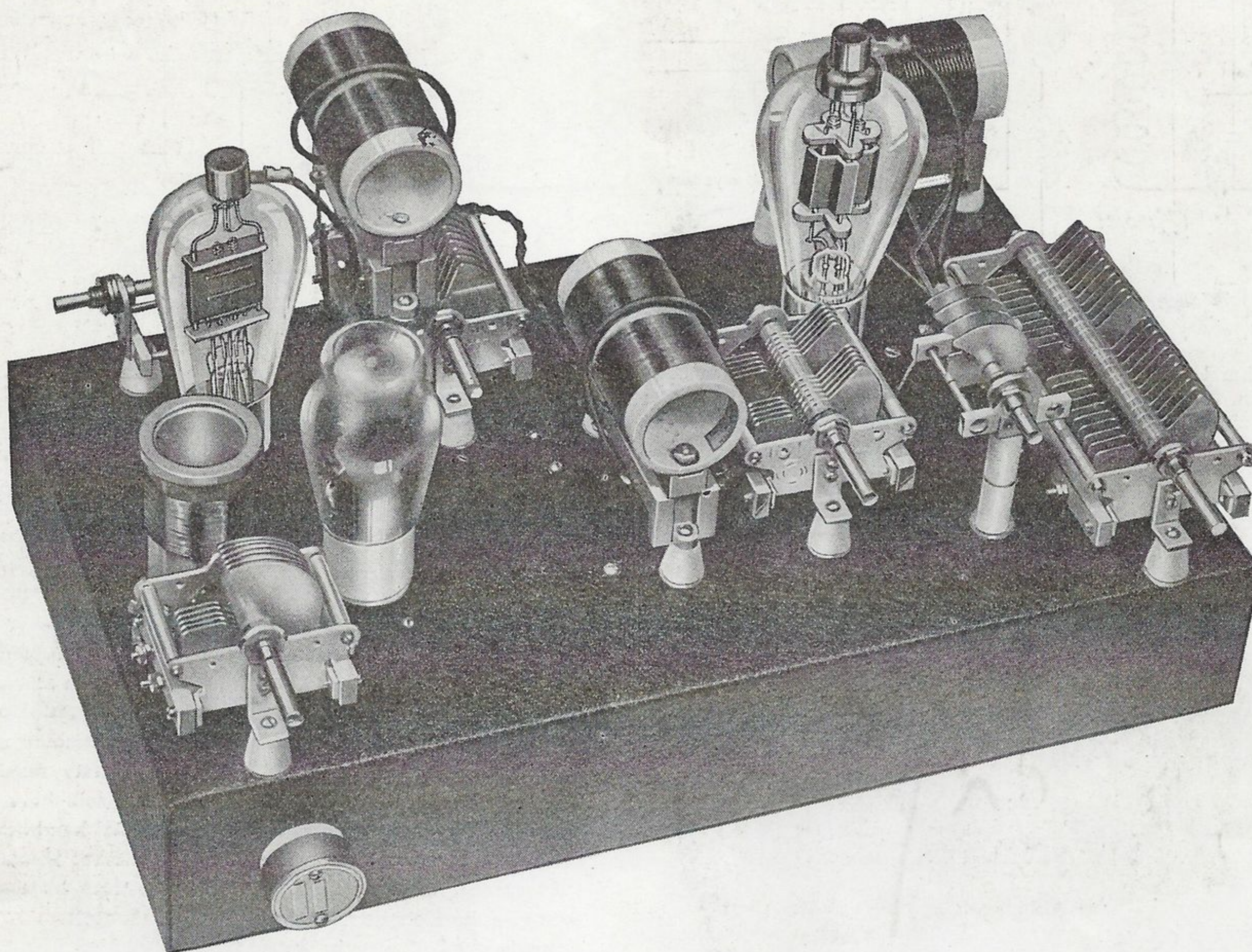
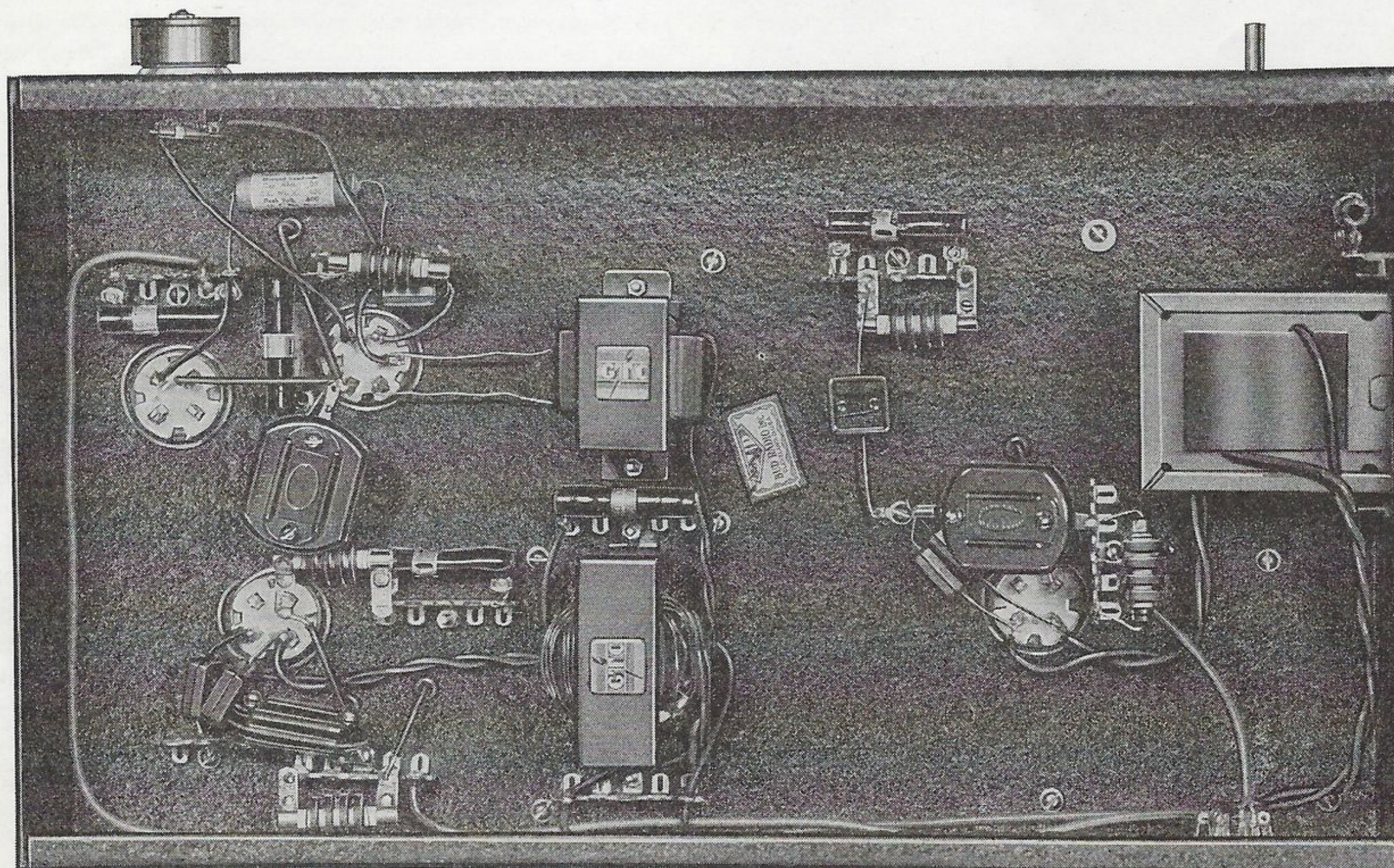
The panels on the power supply and modulator are $8\frac{3}{4}$ x 19 inch Bud Relay Rack panels. The power supply chassis is set down 2 inches below the lower edge of the panel and the modulator chassis is set down 1 inch below the lower edge of the panel to take advantage of all the space available in the smaller rack. The RF panel measures $12\frac{1}{4}$ " x 19". The small $1\frac{3}{4}$ " x 19" panels at top and bottom fill in the addition space in the larger rack.

The meters are the new Triplett Series mounting in a $2\frac{1}{4}$ -inch hole but having the same scale length as a 3-inch meter. From left to right, the meters are oscillator plate, buffer plate, buffer or final grid, final plate, and RF feeder current. The toggle switch in the lower right hand corner of the RF panel is the DPDT switch shown in the RF diagram for reading grid current on either the buffer or final with only one meter. The meter in the audio panel is in the Class B plate circuit.

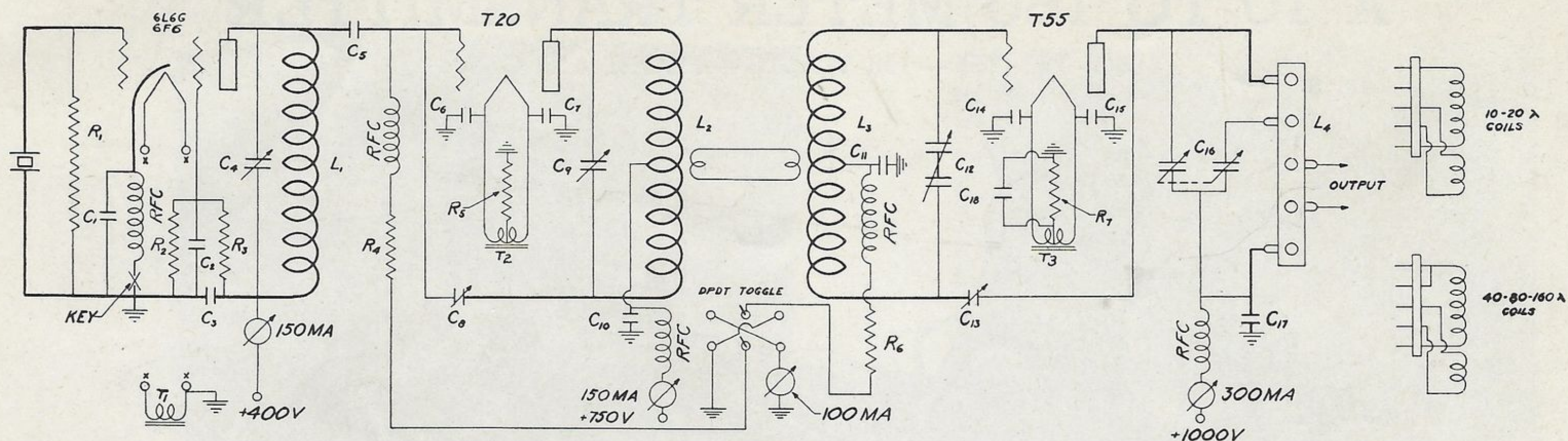
The Turner crystal microphone shown is one of the new VT73 communication type. Its high output level simplifies greatly the problems of hum and RF feedback so often encountered in amateur transmitters.

A 10 TO 160 METER TRANSMITTER

6L6G - T20 - T55 — 150 WATTS — PHONE and C.W.



CONSTRUCTIONAL DATA

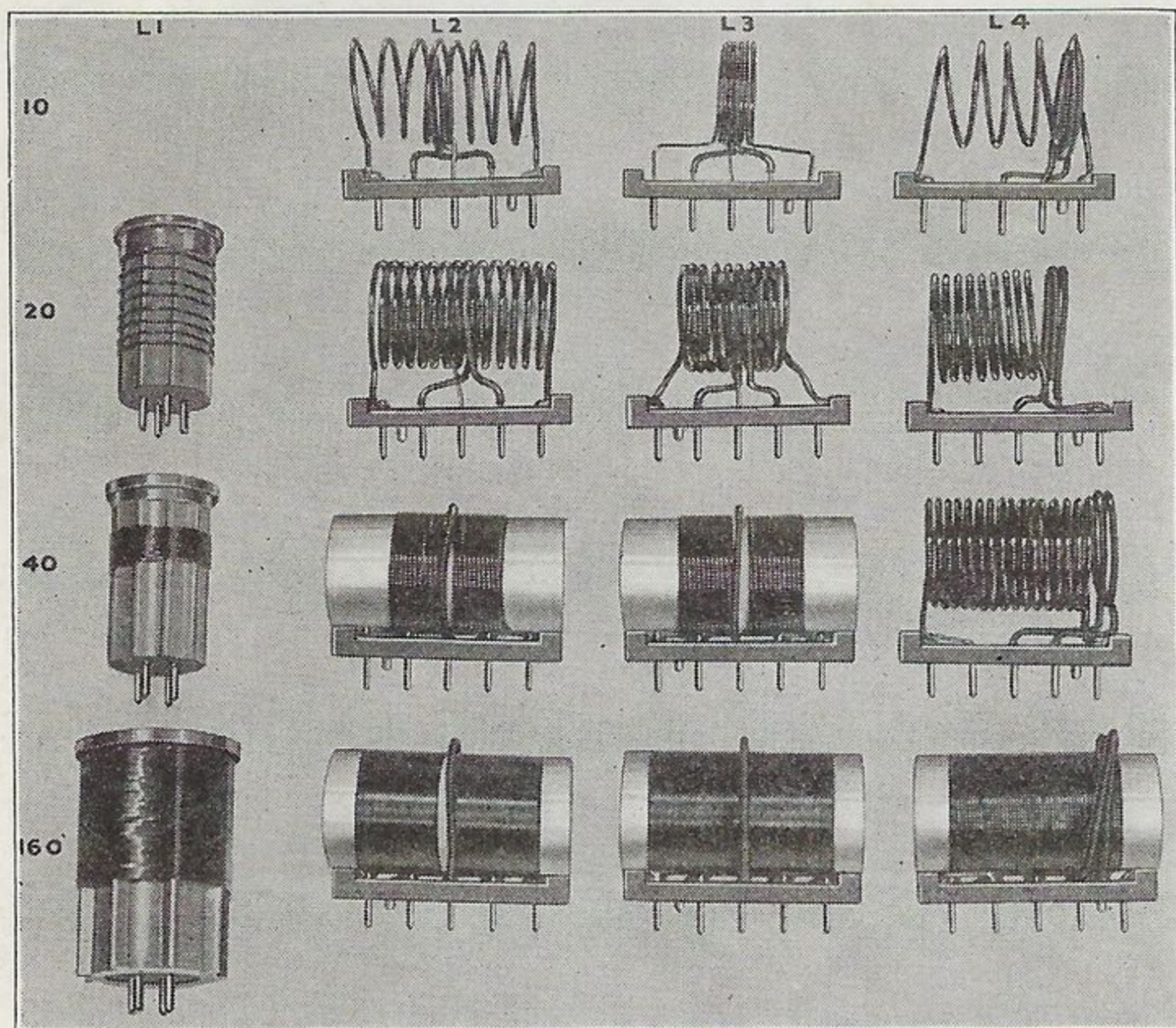


6L6-T20-T55

R₁—100,000 ohm 1 watt.
R₂—35,000 ohm 2 watt Ohmite.
R₃-R₄—10,000 ohm 10 watt Ohmite.
R₅—400 ohm 10 watt Ohmite.
R₆—5000 ohm 10 watt Ohmite.
R₇—400 ohm 10 watt Omite.
C₁—.00015 mica 600V.
C₂-C₃—.01 paper 600V.
C₄—.0001 Cardwell Mr-105-BS.
C₅—.0001 mica 2500V.

C₆-C₇—.006 mica 600V.
C₈—8 mmfd. max with one stator plate removed Bud 564.
C₉—100 mmfd. Cardwell MT-100-GS.
C₁₀—.002 mica 2500V.
C₁₁—.002 mica 600V.
C₁₂—Double section 100 mmfd. Cardwell MR-100-BD.
C₁₃—8 mmfd. max. 2 outside stator plates removed Bud 564.
C₁₄-C₁₅—.006 mica 600V.

C₁₆—Double section 100 mmfd. Cardwell MT-100-GD.
C₁₇—.002 mica 5000V.
C₁₈—8 mfd. 450V electrolytic.
RFC—2.5 mr. RF chokes Bud.
T₁—6.3V General 1052, Stancor XP-4019, Thordarson T-61F85.
T₂—7.5V General 8008, Stancor XP-3022, Thordarson T-16F13.
T₃—7.5V General 8009, Stancor XP-4018, Thordarson T-16F14.



COIL DATA

Band	L ₁	L ₂	L ₃	L ₄
1.75 Mc.	45 t. No. 18 2 1/4" dia. close wound	72 t. No. 20 1 3/4" dia. close wound	78 t. No. 20 1 3/4" dia. close wound	46 t. No. 16 1 3/4" dia. close wound
3.5 Mc.	26 t. No. 18 1 1/2" dia. close wound	36 t. No. 14 1 3/4" dia. close wound	44 t. No. 16 1 3/4" dia. close wound	19 t. No. 14 1 3/4" dia. close wound
7 Mc.	12 t. No. 18 1 1/2" dia. close wound	22 t. No. 14 1 3/4" dia. close wound	24 t. No. 14 1 3/4" dia. close wound	16 t. No. 10 1 3/4" dia. 2 1/2" long
14 Mc.	8 t. No. 18 1 1/2" dia. 1 3/4" long	14 t. No. 10 1 3/4" dia. 2 3/4" long	10 t. No. 10 1 3/4" dia. short as possible	10 t. No. 10 1 3/4" dia. 1 7/8" long
28 Mc.		8 t. No. 10 1 3/4" dia. Approx. 3" long	6 t. No. 14 1 3/4" dia. short as possible	5 t. No. 10 3 3/4" dia. 2 3/4" long

A THREE STAGE TRANSMITTER UNIT FOR 1.75 to 30MC OUTPUT

By far the greatest problem in the design of an all-band amateur transmitter is that of maintaining suitable L/C ratios in the final stage. Insufficient capacity results in high harmonic content and poor linearity if modulated. Too much capacity results in poor efficiency. Because most transmitting condensers have a capacity ratio of about 4-to-1, a maximum of 3 adjacent bands may be covered with proper ratios. Operation on any other bands will leave a great deal to be desired. The transmitter to be described approaches the ideal condition over the full range from 1.75 to 30MC. Actually, the L/C ratio on 30Mc. is slightly lower than the optimum value but the performance should be entirely satisfactory. On 1.75 Mc. the L/C ratio is slightly higher than is desirable for 'phone operation but is adequate for reasonable harmonic suppression.

Only 3 stages are used, a 6L6G or 6F6, a T20 and a T55. Using a 20 or 40-meter crystal more than enough excitation to the final may be obtained on 30MC and on the lower frequencies the T20 loads along delivering only about 1/4 of full output when exciting the T55.

In order to obtain the necessary high capacity ratio, grid neutralization, permitting an unbalanced output circuit, is used in the final stage. The plate tuning condenser is a Cardwell MT-100-GD selected because of its high maximum to minimum capacity ratio (100mmfd. maximum, 13 mmfd. minimum per section). By using only one section or both sections in parallel, the ratio is 15.4 to 1. The final stage voltage and current were then selected to fit the L/C ratios available and the condenser spacing. The T55 should be operated at a 1000 volts and 150MA or less. Operation over so wide a range cannot be achieved without some compromises. One section of the condenser is used on 28 and 14MC and both in parallel on 7, 3.5 and 1.75 mega cycles.

In one respect grid neutralization is rather a bad actor at the higher frequencies. The grid of the tube puts a resistive load across half of the input coil which results in the opposite end of the coil being other than 180° out of phase, the condition necessary for neutralization, if the coupling is less than unity. Unity coupling is never realized in actual practice but satisfactory results are obtained if the coil is made as short as possible with the minimum spacing between turns. The best cure, that of putting a resistor across the neutralizing half of the coil equal to the grid of the tube, wastes too much driver power on 10 meters but could be used on the lower frequencies if desired. The 10 and 20 meter grid coils