

WESTINGHOUSE

INFORMATION BULLETIN

SPECIAL PRODUCTS DEPARTMENT WESTINGHOUSE LAMP CO., BLOOMFIELD, N. J.

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WESTINGHOUSE AMPLIFIER AND OSCILLATOR TUBES

U S E S

The Amplifier tube has a very wide field of application since its uses are perhaps more diversified in character than any other type of electronic tube. Perhaps the most important application of all is as an amplifier by which minute voltages and the smallest currents are amplified to such an extent that they may be of practical use. It can serve as a voltage operated relay or it can raise the power of a variable voltage source to a higher level. In addition, it may be used as an oscillator, a grid-controlled rectifier, a detector or a variable resistor.

The distinctive features of the Westinghouse Amplifier and Oscillator tubes are their reliability over long and often unattended periods of time and their especially stable and uniform characteristics. The latter feature is of considerable importance when the question of replacement arrives because it minimizes the change of circuit constants, and this fact alone is worthy of the utmost consideration when designing the necessary auxiliary equipment for any tube application.

From experience gained in the design and the construction of all types of electronic tubes during the past two decades, WESTINGHOUSE has now available a specialized line of amplifier and oscillator tubes possessing a wide variety of characteristics. These range from low power types of extreme sensitivity to high voltage and high power

types able to handle many kilowatts of power continuously.

Due to the extreme care with which the exhaust process is conducted as well as the care used in the control of materials and dimensions of the electrodes, the characteristics of WESTINGHOUSE tubes tends to remain unusually constant. This is of particular importance in laboratory and experimental work where duplication of test results is desirable when determining the inherent



TYPE RJ-550 LOW GRID
CURRENT AMPLIFIER TUBE

characteristics of these tubes.

In connection with the amplification of signals or impulses produced by phototubes, it is necessary to use amplifier tubes with low leakage characteristics to insure the maximum signal amplification. In addition, these tubes must not introduce any electrical disturbances in the signal such as microphonic noises caused by vibration of the tube elements, and WESTINGHOUSE has designed and developed a complete line of non-microphonic tubes just for this and other special types of service.

For small currents, the thermionic amplifier tube can be used as a grid-controlled rectifier so that alternating currents are both rectified and controlled simultaneously. In addition, several amplifier circuits have been devised which obtain the plate power directly from the alternating current line so that for some control applications it is not necessary to use a rectified plate supply. The amplifier tube provides an excellent means of obtaining a continuously variable high resistance over a wide range, thus giving it the characteristics of a variable resistor.

Many electrometers and other sensitive measuring equipments produce extremely minute current changes. For operation of such equipments, it is necessary to use a tube which has an especially low grid current characteristic to register the minute charges on the grid.

The fundamental characteristic of the amplifier tube is its ability to deliver an amplified output wave-form which is identical with the input wave-shape. This characteristic of the amplifier tube is unique in that no other electrical or mechanical device can accomplish the same results.

Its uses range from supplying current to operate relays which activate mechanisms for opening doors, to supplying current of sufficient magnitude to stop and reverse the largest motors employed in the most modern steel rolling mills.

In most cases, particularly in high frequency amplifier work, it is desirable to have tubes which require minimum neutralizing. This property is achieved by placing a screen grid between the usual control grid and plate.

The screen grid is then maintained at a radio frequency ground potential and serves to minimize the feed back from the plate circuit to the grid circuit.

Oscillator operation is merely a modification of the amplifier, whereas instead of obtaining the grid power from an external source, a small percentage of the plate power output is supplied to the grid of the same tube to cause continuous oscillations. This is a very highly efficient arrangement and is employed in various industrial applications.

Some applications for inductive heating of metals require power of high frequency which cannot be economically produced by rotating machinery and tubes have been developed to provide the necessary requirements for this service. The therapeutic properties of high frequency power have resulted in the rapid adoption of the use of WESTINGHOUSE high frequency tubes by the medical profession in the field of physical therapy.

Two or more air-cooled tubes may be used where larger amounts of output are desired. For further increase in power output the use of water-cooled tubes has become quite general. The use of the tungsten filament in the latter tubes permits the obtaining of added life by reducing the temperature at which the filament is operated when the application does not require the full output power from the tube.

For general laboratory use, the oscillating vacuum tube should prove of great value, either as a source of a few volts of a-c power for bridge measurements of frequency adjustable to any degree desired, or as a source of complex a-c forms from which exact octaves are obtainable. The oscillator tube used in combination with a suitable sound generator, such as a piezo electric crystal or untuned telephone receiver, is invaluable in a laboratory for measurements on sound.

D E S C R I P T I O N

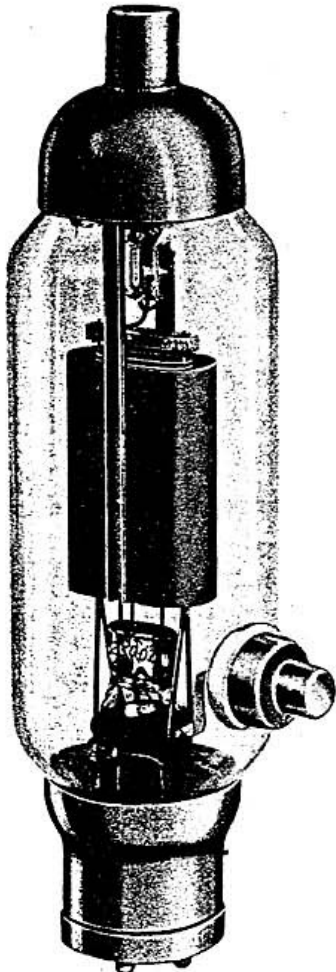
The elements of WESTINGHOUSE thermionic amplifier tubes comprise the usual cathode or emitter of electrons, the anode or collector of electrons, and the control grid which is interposed between the other two electrodes to control the flow of electrons. In the smaller tubes, the cathodes are usually of

the flat ribbon, directly-heated, oxide-coated type, which are operated at low temperatures conducive to long life.

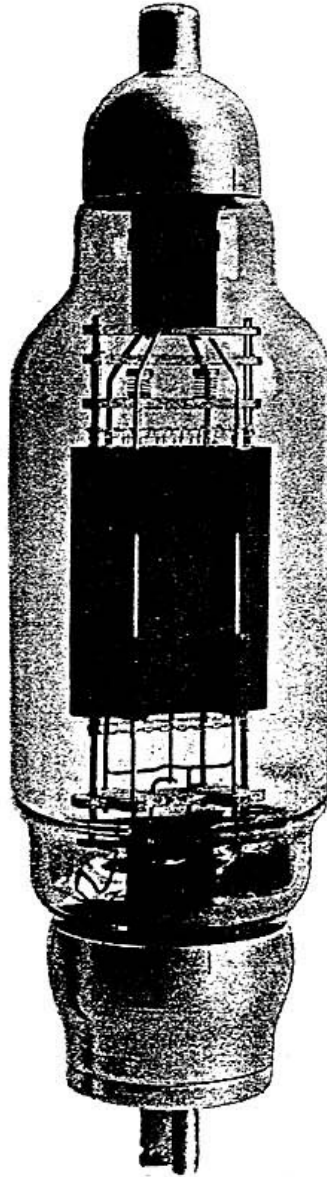
The RJ-550, 553, 557 and 572 tubes are of the low grid current type, while the RH-507 has an even smaller grid current characteristic which makes it particularly suitable for electrometer work. The RJ-526, WL-204A, 207, 211, 849 and 851 tubes represent a wide variety of sizes which may be used in general purpose amplifier and control work, as well as in high frequency oscillator service. The WL-195, 196, 460, 463 and 464 tubes have been especially designed to give high output at the various frequencies used in ultra-short wave therapy service. The RJ-551 and 563 are able to handle relatively high plate currents and are called current amplifier tubes. Somewhat similar tubes, in that the amplification factor is low, are the WL-845, 848 and 891

types, and they are particularly useful for audio frequency power amplifiers or modulator service. The WL-203A, 858, 863 and 892 types are the high amplification factor types of rather large power output capabilities. The AW-200 tube has been especially designed and constructed to deliver several kilowatts of power, particularly in high frequency applications above 50 megacycles.

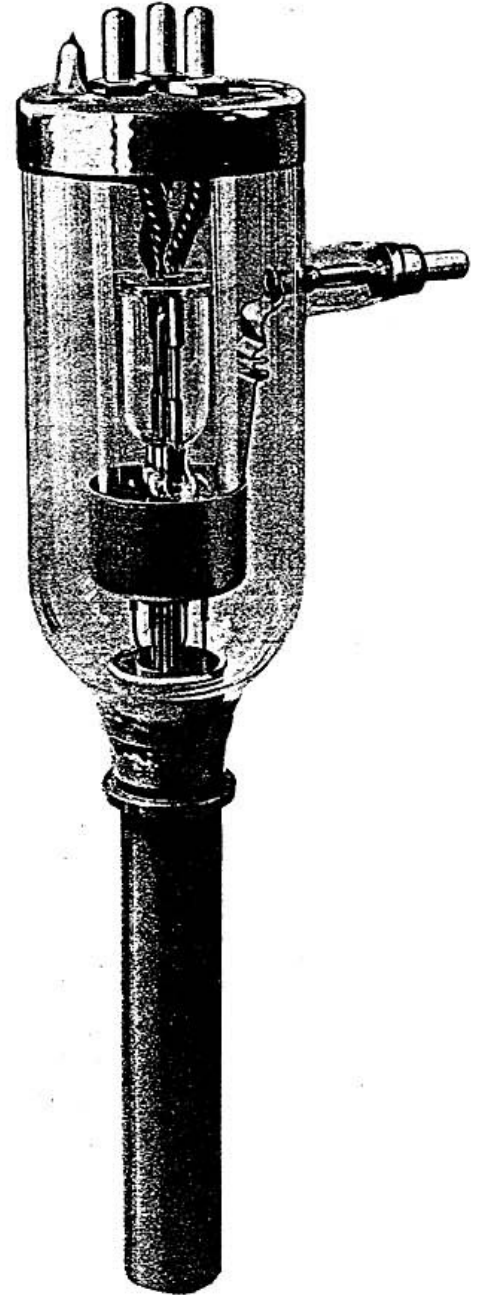
To provide adequate shielding between the plate output and grid input circuits, a screen grid has been included in the design of the WL-850, 860, 861 and 865 tubes. The



TYPE WL-460, WL-464
HIGH FREQUENCY 250 WATT
OSCILLATOR & AMPLIFIER.



TYPE WL-849 GENERAL
PURPOSE OSCILLATOR
AND AMPLIFIER



TYPE WL-891, WL-892
GENERAL PURPOSE
WATER-COOLED OSCILLATOR
& AMPLIFIER

RJ-571 tube has an additional electrode in the form of a space charge grid which gives the tube an extremely high amplification factor.

Two of the WESTINGHOUSE water-cooled tubes, types WL-891 and WL-892, have been designed with special two phase filaments

which facilitates operation of the tubes directly from a-c circuits.

WESTINGHOUSE amplifier and oscillator tubes have been designed with a wide variety of characteristics so that it is possible to select the proper tube for any industrial application from the accompanying list.

TYPICAL TECHNICAL DATA AND CLASS "C" OSCILLATOR RATINGS

CLASSIFICATION	TYPE NO.	TYPICAL OPERATING CONDITIONS					AMPLIFICATION FACTOR
		PLATE MILLIAMPERES	PLATE VOLTS	PLATE OUTPUT WATTS	FILAMENT AMPERES	FILAMENT VOLTS	
Water-Cooled Oscillator and R-F Power Amplifier	AW-200	2400	15000	25000	153.0	14.5	30
	WL-207	1800	12000	15000	52.0	22.0	20
	WL-848	1450	10000	10000	52.0	22.0	8
	WL-858	1800	18000	22400	52.0	22.0	42
	WL-863	1640	12000	14000	52.0	22.0	50
	WL-891	1450	10000	10000	60.0	22.0	8
	WL-892	1640	12000	14000	60.0	22.0	50
Large Air-Cooled Oscillator and R-F Amplifier	WL-831	300	3000	540	10.0	11.0	14.5
	WL-851	900	2000	1250	15.5	11.0	20.5
	WL-861	300	3000	540	10.0	11.0	300
Intermediate Air-Cooled Oscillator and R-F Amplifier	WL-204A	250	2000	350	3.85	11.0	23
	WL-803	160	1500	160	5.0	10.0	
	WL-849	300	2000	425	5.0	11.0	19
Small Air-Cooled Oscillator and R-F Power Amplifier	WL-203A	150	1000	100	3.25	10.0	25
	WL-675	150	1000	100	3.25	10.0	25
	WL-680	150	1000	100	3.25	10.0	12
	WL-845	150	1000	100	3.25	10.0	5
	WL-850	160	1000	100	3.25	10.0	550
	WL-852	90	2500	135	3.25	10.0	12
	WL-860	90	2500	135	3.25	10.0	200
WL-865	50	500	10	2.0	7.5	150	
High Frequency Oscillator and Amplifier	WL-195	132	2500	220	3.25	10.0	12
	WL-196	132	2500	220	3.25	10.0	35
	WL-211	200	1250	180	3.25	10.0	12
	WL-460	200	2000	250	3.85	10.0	18
	WL-463	250	2500	450	5.0	10.0	22
	WL-464	200	2000	250	3.85	10.0	65
Current Amplifier	RJ-551	38	450	-	1.25	7.5	8
	RJ-563	200	250	-	3.0	2.5	4
Voltage Amplifier	RJ-571	2	250	-	1.0	2.5	1500
Low Grid Current Amplifier	RJ-507	0.3	6	-	0.06	2.0	0.8
	RJ-550	6.0	95	-	0.92	2.5	8.5
	RJ-553	8.5	95	-	1.05	6.0	3.8
	RJ-557	7.0	95	-	0.92	2.5	10.7
Non-Microphonic Amplifier	RJ-524	2.5	90	-	0.25	1.1	7.8
	RJ-544	1.0	180	-	0.25	1.1	35.0
Interstage Amplifier	RJ-526	5.2	135	-	0.92	1.25	8.2

For prices and further information write to
Special Products Sales Department,
Westinghouse Lamp Company,
Bloomfield, New Jersey.