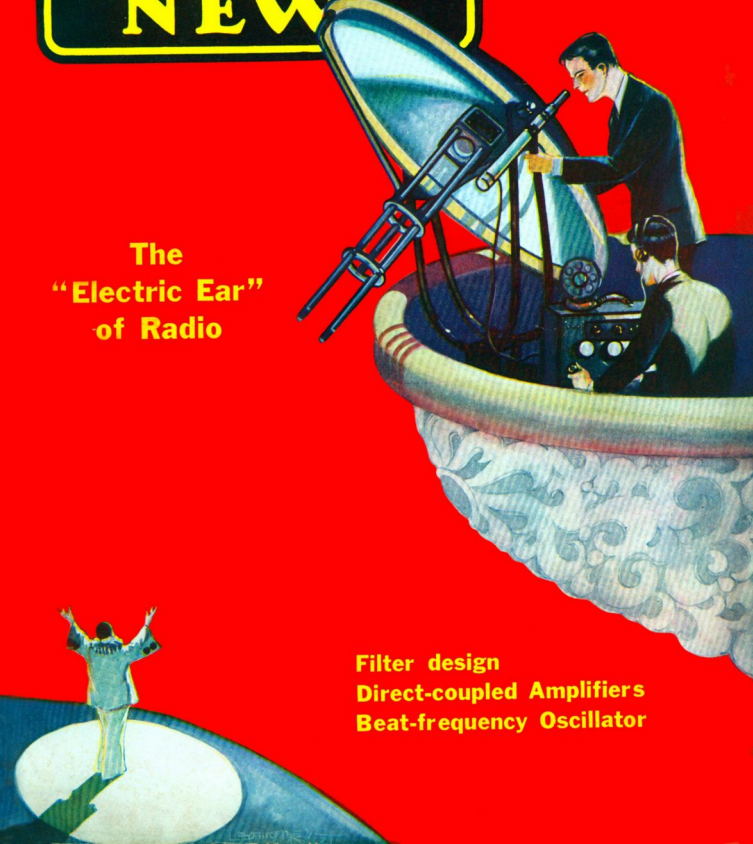
ELIMINATING INTERFERENCE

RADIO NEWS

January
25 cents



The
"Electric Ear"
of Radio

Filter design
Direct-coupled Amplifiers
Beat-frequency Oscillator

Power Supply for the *Radio News* Transmitter

The power supply, for the one-tube transmitter described last month, is covered in detail in this article. The advantages of the type 566 mercury vapor rectifier are discussed. Some transmitter operating hints are also included

By Nat Pomeranz*

Part Two

WITH our self-excited oscillator using the –52 type tube constructed as described in last month's issue of RADIO NEWS, we are now ready for the construction of the power supply unit to be built on the bottom shelf of the frame.

There is nothing complicated or out of the ordinary in the power supply. Full-wave rectification is employed. The output from the rectifier tubes is fed into a brute-force filter which provides the pure direct current necessary for the satisfactory operation of a really good code or 'phone transmitter.

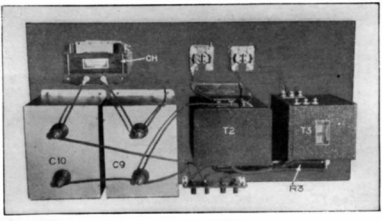
This constructional article specifies the use of the type –66 mercury vapor half-wave rectifier, although this type of tube is not used in the power supply of the transmitter in the RADIO NEWS Laboratories for reasons which will be explained further.

The type –66 rectifier is the ideal tube for use in amateur transmitters under most conditions. It requires a filament voltage of 2.5 at 5 amperes. It will stand a peak voltage of 7500 volts. This means that the tube will safely handle an a.c. input of 5250 volts as measured on a regular a.c. voltmeter. (The ordinary a.c. high-voltage meter will show approximately seven-tenths of the peak voltage.)

The tube is of the slow heater type and takes about 30 seconds to heat up. Because of this it is necessary to keep the filaments of the two rectifier tubes in operation throughout the operating time. Otherwise a delay of 30 seconds in answering a fellow amateur during a two-way chat will often make it difficult to maintain contact unless the fellow at the other end has an unusual amount of patience.

A filament transformer to light the two –66 tubes must deliver a total of 10 amperes for the two tubes and must have high-voltage insulation. A voltage insulation of 10,000 (as our transformer manufacturers rate them) is essential, according to the manufacturers of these tubes.

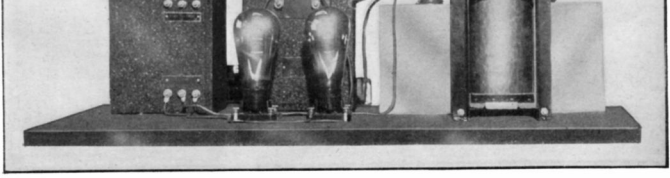
Once placed in operation, the type –66 rectifier offers an outstanding feature in its almost unlimited life, if it is not mistreated. One of our larger transmitting tube manufacturers, in an effort to determine the life of the tube, placed a number of them in operation many months ago, when the tube was first introduced to the public. They have been in continuous operation ever since and show very little sign of wear.



THE PLAN VIEW

The location of parts is clearly shown. At the extreme right is the Type 210 Power Compact, which is being used temporarily to light the filaments of the –81's

*U. S. N. R., W2WK-W2APD.

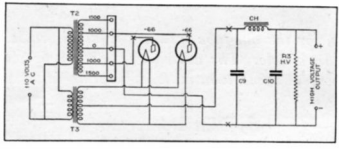


THE POWER SUPPLY SHELF

The complete power supply as it looks from the front. While mercury vapor rectifier tubes are recommended, the type –81's shown here are being used temporarily, for reasons explained in the text

Due to the fact that at the present time 110-volt alternating current service is not available in the RADIO NEWS Laboratory, an alternating-current generator is used and the –81 type rectifier is temporarily substituted for the –66. The generator, while running, creates interference in the short-wave receiver and it is, therefore, essential to stop the generator while receiving. The –81, which passes current as soon as the filament is lighted, makes a very good substitute. However, we are not able to use more than 1000 volts on the plates without the danger of breakdown. At 1000 volts the tubes run quite cool, since no more than 90 milliamperes is ever drawn through them. They are rated to deliver 110 milliamperes each.

In the constructional model we used a Thordarson 210 Power Compact which delivers, among other voltages, 7.5 volts for two –81 tubes. Only this winding is used on the transformer. It is not a practical method of use, but since a 210 Compact will later be used for plate and filament supply for our crystal-controlled stages, we have placed this transformer in temporary use.



THE POWER SUPPLY CIRCUIT

There is nothing unusual in the circuit employed. In fact, simplicity is one of its features

If, in place of the –66 type rectifier tube, readers who construct this outfit prefer to use –81 rectifiers, the only change necessary is from the 2.5-volt filament transformer specified in the parts list to one delivering 7.5 volts. With the –81 tubes, the filament transformer need not have high-voltage insulation but can be of the ordinary type such as is used in receiver power-pack construction.

Selection of Parts

Still another type of rectifier tube can be used. Some companies are manufacturing a half-wave mercury vapor tube which somewhat resembles the –66 but requires a filament voltage of 7.5 volts. This tube is therefore interchangeable with the –81.

The plate power transformer is a Thordarson Type T-2387, which delivers a total of 3000 volts. On either side of the center-tap it is tapped at 1500 volts and 1000 volts. These taps are brought to a terminal strip on the transformer. In wiring to this transformer, the connections are made to large soldering lugs which are provided with the transformer.

The brute-force filter consists of eight microfarads of filter condensers and a Thordarson Type T-2027 filter choke. The latter is a 30-henry choke and is rated at 300 milliamperes, maximum.

In selecting the filter condensers, ones having a rating of 2000 volts d.c. were adopted. These condensers are also rated at 1600 volts rectified a.c. An error is often made by the building amateur in the proper choice of condensers so far as ratings go. Most condensers manufactured have just one rating placed upon them, which is the d.c. working voltage. If we would have d.c. to feed into these condensers, they would not be necessary for filtering. Our voltage rating must therefore be figured on rectified a.c. and not on d.c.

The common error in a case of this kind is to use condensers having a voltage rating of 1500 volts (d.c.). This rating is the equivalent to a rating of around 1300 volts rectified a.c. and would be too low for safe use. Our supply utilizes two Flechtheim Type TH-400, each having a capacity of 4 microfarads.

An Electrad 100,000-ohm, 100-watt "bleeder" resistor is used to provide a slight load on the rectifier tubes when the transmitting key is up and no current is being drawn from the power supply and also to discharge the filter condensers when the power is shut off. A charged filter condenser will produce some queer reactions upon the human body when applied properly.

The "bleeder" resistor is an absolute necessity when –66 tubes are used unless two tubes can be perfectly matched to each other. The total drain upon these tubes is so small to what the tubes can really handle when the voltage is applied to the oscillator tube, that, often, just one of the two rectifier tubes goes into operation, leaving the other in the circuit but not passing any current. The result is a plate voltage which is only half-wave rectified and therefore not as pure d.c. as wanted. One can tell when the rectifier tube is operating by a bluish glow near the inside top of the tube when the key is pressed. The "bleeder" resistor keeps both tubes passing some current continuously after the key is pressed for the first time and they are therefore more stable in operation.

Optional Use of R.F. Chokes

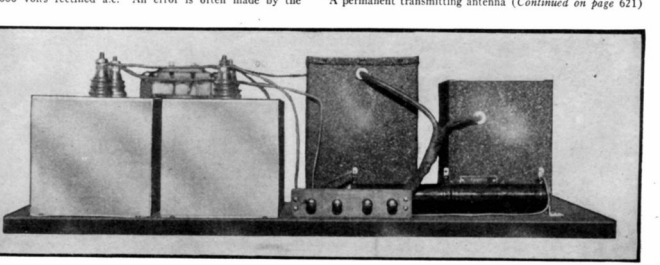
For wiring the power supply unit, a Number 14 rubber-covered wire is used. This insures adequate insulation in the wiring as well as flexibility while working.

A binding post strip having four binding posts, two for a.c. input and two for d.c. output, completes the apparatus needed.

In some cases, radio-frequency currents flow back into the wiring of the power pack when the transmitter is in operation. This deficiency tends to introduce a ripple in the note produced by the oscillator. In this event, radio-frequency choke coils can be placed at the points marked X on the diagram.

With both the tuned-grid-tuned-plate oscillator and power pack completed, the transmitter is now ready to be placed in operation.

A permanent transmitting antenna (*Continued on page* 621)



THE REAR VIEW

The only external connections are for the a.c. line and the high-voltage output. These are made at the terminal strip in the foreground

(*Continued from page 572*)

has not as yet been erected for operation with the RADIO NEWS transmitter. Upon the completion of two iron pipe masts, experiments will be made to obtain a perfect "zeppelin" type antenna. Different lengths of antenna will be tried. The theory that feed wires but one-quarter of the length of the top stretch of the antenna reduces the efficiency of the system will be tested.

At present an antenna-ground system is being used with fair results. The total length of the antenna for operation in the middle of the 3.5 megacycle band is 175 feet, including the lead-in. The ground is made to a steam-pipe close by the transmitter. When using this system, one should be positive that a good ground is used. Cold-water pipes will be found to work best in most cases.

The antenna system finally adopted for use at W2RM will be described in a forthcoming issue of this magazine.

With the antenna disconnected from its circuit, the grid tank condenser should be set at approximately 65 percent of its total capacity with the 3.5 megacycle coils in the circuit. The back plate tank condenser should be placed at 50 percent of its capacity. With the keying circuit closed and with the plate supply transformer delivering 1000 volts on either side of the center-tap, the front plate tank condenser should be slowly rotated until a sudden dip is obtained on the plate milliammeter. The ma. reading should drop down to approximately 25 or 30. If the plate meter shows 100 or 110 ma. and does not respond to the turning of the plate tank condenser, it is a sign that the tube is not oscillating.

The plate condenser should be left at the point where approximately 40 mils. are drawn. Wiggle the key up and down to see if the circuit stays in oscillation.

The frequency should then be obtained by the use a good frequency meter. Amateurs should be very cautious that their operating frequencies are in the prescribed bands. The Federal Government recently suspended the license of an amateur, subjected him to a large monetary fine and is taking action to place the party behind the bars for violating the Federal laws on frequency.

The antenna coils should be loosely coupled to the plate tank coil and the antenna lead proper connected to the lead going to the variable antenna condenser. The auxiliary feed wire should be connected to the far side of the antenna coil. Rotating the antenna condenser, the plate meter will rise as well as the antenna radiation meter. If, by turning the antenna condenser past a certain point the tube goes out of oscillation, the coupling between the antenna and plate tank coils should be further loosened. The ideal setting is where the antenna condenser, when turned to a certain point, will show maximum radiation with the tube remaining in oscillation if the condenser is turned past that point.

The antenna radiation with the antenna mentioned in this article was between .8 to 1 ampere, with a plate current of 80 milliamperes.

(*Continued on page 622*)

Radio News Transmitter

(*Continued from page* 621)

The tone of the signal produced should next be checked, either by use of a monitor or by using the receiver tuned to twice the transmitter wavelength and with the receiving antenna disconnected.

If the signals have a tendency to swing, it may be due to the long length of the antenna. This can be overcome by using an insulated wire in the approximate center of the aerial, broken up every few feet by insulators and fastened down to some solid object. This system will stop the antenna from swinging and thereby steady the outgoing signals. . . .

A word of caution on results. Give the transmitter a fair trial. Do not be discouraged by immediate failure on its performance. The writer's best transmitter did not produce the desired results until after two weeks of experimenting. It then went on to "work" almost everything heard on the receiver. On the other hand, one of the writer's transmitters effected communication with Capetown in South Africa only five minutes after it was hooked up—but failed to do anything noteworthy thereafter. This freak work can only be attributed to favorable or unfavorable conditions, something we have to accustom ourselves to.

The Parts for the Power Supply

T2—Thordarson plate supply transformer, model T-2387

T3—Thordarson filament supply transformer, model T-4585 (for use with type –66 tubes. See text for data on transformer used with type –81 rectifier tubes.)

CH—Thordarson filter choke, model T-2027

C9, C10—Flechtheim filter condenser, type TH-400, 4 mfd., 2000 volts d.c.

R3 — Electrad 100,000-ohm, 100-watt "bleeder" resistor

2 Airgap sockets

2 De Forest type 566 half-wave rectifying tubes

1 binding post strip

The next step in the development of the transmitter equipment will be made the subject of next month's article. Just which phase of the development this may be has not as yet been determined, as this depends on the progress made along the lines of crystal control, antenna design and voice modulation, all of which are in the experimental stage now.—THE EDITORS.