WIN $5.00! 
Does your receiver use RCA tubes throughout?
If so, send us a photograph and a brief description of it. Photos of final amplifier stages are also suitable. We should like to publish one or more such photos in each issue of HAM TIPS. Those published win $5.00 each. "Commercial type" rigs are not given preference. What have you?
(This offer good in Western Hemisphere, Hawaii, and the Philippine Islands.)

RCA-806 GIVES 450 WATTS OUTPUT ON CW—400 ON 'PHONE

Has Real "Oomph!" on 10- and 20-meter Bands

For amateurs who wish to use a final-amplifier power input of 500 to 600 watts, a single RCA-806 is well suited—especially where operation in the 20- and 10-meter bands is desired. In cw service, a maximum power input of 600 watts can be used with a power output of about 450 watts. In plate-modulated telephony service, a maximum power input of 500 watts can be employed with a useful power output of about 300 watts.

A typical, single-ended r-f amplifier stage using one 806 is shown in circuit UC-21. For the driver stage, a single 806 operated at maximum rated input (75 watts) is recommended. The peak r-f grid voltage required by the 806 is in circuit UC-21 is 870 volts. Obviously, an r-f plate-voltage swing of this amplitude cannot be obtained from an 809 operating at a d-c plate voltage of only 750 volts. However, the required 870-volt swing can be obtained from the 809 by tapping the 809 plate lead a short distance down from the plate end of the driver-stage tank coil. The grid condenser (Cg) of the 806 is, of course, tied to the extreme top of the 809 plate tank. With this "auto-transformer" arrangement, the r-f driving

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PUSH-PULL RCA-806's TAKE FULL KILOWATT INPUT

OOMPH!

Big Tantalum Plate Triode FB for High Power Ham Rigs

Can Be Used at Maximum Input up to 30 Mc., and 50% of Full Input at 100 Mc.

"HAM TIPS" SEeks Amateurs' Help

Tube Prizes Awarded for Good "Tips"

Yessir! The editors of HAM TIPS want your co-operation in improving this amateur publication. The circuits and other tube information which have been published in past issues of HAM TIPS are intended to be of interest and of practical use to you. Moreover, there are unquestionably other subjects which you would like to see covered. If so, or if you have any other suggestions as to how this publication can be made more

(Continued on page 4, column 1)

"Breathes there a ham with a soul so dead—" that he has not, at one time or another, fervently wished for that last word in a ham rig—a one-kilowatt job? The RCA-806 is a logical choice for high-frequency transmitter in this power class; two 806's in push-pull will take a full kilowatt input in plate-modulated telephony service, and 800 watts in cw service.

The husky, 30-watt thurated-tungsten filament and tantalum-plate construction of the 806 insures ample electron-emitting capability, long gas-free operation, and outstanding ability to take severe punishment. The special, enclosed-anode design prevents stray electrons from bombarding the clear glass bulb and provides a considerable increase in efficiency and power output at the higher amateur frequencies. Grid and plate connections, brought out to side and top caps with short, heavy leads, provide low tube capacitances and simplify grid- and plate-circuit wiring. The 806 is especially well suited for high-frequency operation. It can be used with maximum rated input at frequencies up to 30 Mc., and at 75% of full input up to 50 Mc.

Plate-Modulated Push-pull Amplifier

Circuit UC-29 shows a typical push-pull 806 r-f amplifier designed for plate-modulated telephony service with a full kilowatt input. Under the operating conditions shown, the driving power dissipated by the 806's is 32 watts per tube (see 806 technical bulletin or TT-3 Manual), or 64 watts for two tubes. The actual power output of the driver stage must, of course, be considerably more than 64 watts in order to provide adequate regulation of the r-f grid voltage and to compensate for circuit losses. Experience indicates that by multiplying the driving power shown for a tube by a factor of 2, or slightly

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Ham Tips from RCA

Big Tantalum Plate Triode FB For High Power Ham Rigs
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more, we obtain a value which closely approximates the required power output of the driver stage. In this case, therefore, a driver-stage power output of 1 x 64, or 128 watts, is indicated.

A single RCA-810 is an excellent choice for the driver stage. Its ample net price is only $13.90 and it has a large surplus of power for this particular application. An 810 operating at only 125 volts and 200 ma (250 watts) should provide more than enough excitation for push-pull 806's, even at 10 meters. A surplus of driving power is nearly always desirable.

RCA-814 may be used for driver
The RCA-814 beam power tube is another possibility for the driver stage. It has the worthwhile advantages of not requiring neutralization and of being extremely easy to excite. However, because its nominal power output of 130 watts is just on the border line of the actual amount required, the 814 may not quite drive the 806's at 30 megacycles, where circuit and tube losses are considerably higher than at the lower amateur frequencies.

Incidentally, those amateurs who happen to have already available an RCA-860 will find that this screen-grid tube makes a fine driver for a 1-kw final amplifier. The 860 has ample power output and has the advantage of not requiring neutralization. In addition, it can be operated at 2500 or 3000 volts from the same power supply that furnishes the push-pull 806's. A single 500- ma, 2500-volt supply will operate both the 860 driver stage and the 1-kw final amplifier. This tube combination is one of many high-power stations for this very reason.

In circuit UC-20 it should be noted that the direct wire connection between the +B lead and the rotor of plate-tank condenser C4 places the rotor frame and rotor shaft at the full dc and a-f plate potential. This arrangement, as explained in QST (Dec., 1938), enormously reduces the flash-over potential applied between the condenser plates on modulation peaks, inasmuch as it removes the 2500-volt d-c and 3000-volt a-f voltage components (parallel) across the condenser. Without this connection, a peak potential of 7000 to 10,000 volts is applied to the condenser plates. With the arrangement shown, only the peak r-f voltage of 3000 to 4000 volts remains. The air-gap of the plates in condenser C4 should be at least 0.394 inch if the rotor connection to +B is omitted, but can be reduced to about half this value if the circuit is used as shown. The saving thus made in both the size and cost of the plate-tank condenser is no minor item.

A spacing of 0.07 inch is adequate for the grid-tank condenser, C1. The neutralizing condensers, C1 and C2, should each have a spacing of at least 0.5 inch at the required capacitance setting of approximately 3.4 μuf.

Meter near ground potential
The plate-current meter of circuit UC-30 is operated at high potential, instead of being placed in the hot +B lead. Connected as shown, the plate meter reads plate current only, and not the sum of plate current and grid current, as it would if the grid meter were returned directly to ground.

To modulate this r-f amplifier 100%, an audio power of 500 watts is required. This power can conveniently and economically be obtained from two RCA-810’s in class B. A suitable circuit for the modulator is shown in circuit UC-12 in the November, 1938 issue of “Ham Tips.” To drive class B 810’s properly, four 8A9’s in push-pull-parallel are recommended. Each 8A9 should be operated at a plate voltage of 300 volts and at a fixed bias of -62 volts.

To protect the 806’s, the plate meter, and the rectifier equipment against accidental overloads, a d-c overload relay (La) should be included in the circuit. La can be placed in the -B lead, as shown, provided the final amplifier is the only stage operated from the 3000-volt supply. If the r-f driver stage or any other stage is operated from the same supply, La should be placed between the plate meter and ground. In the latter case, the holding coil of La should be suitably shunted by a large electrolytic condenser to bypass the a-f components of the plate current.

A kW power amplifier of the type described is capable of giving outstanding results, if it is coupled to a 2- or 3-element rotary beam, the fortunate ham at the mike can say with justifiable pride: “Look out, fellows, here I come. Under favorable conditions, R9/2+ voice signals in remote European countries is a reasonable expectancy of the 10- and 20-meter amateur bands.”

RCA-806 Gives 450 Watts Output On CW—400 On Phone
(Continued from page 1, column 1)

voltage can be suitably stepped up for the 806 grid. Phrased differently, the low-impedance plate circuit of the 806 is matched to the high-impedance grid circuit of the 806 by using the 806 plate tank as an impedance-matching network.

RCA-806 is suitable
A 1250-volt tube such as the 806 could be used for the driver in a conventional circuit, but it would have much more than the necessary driving power. If a tuned grid circuit were used in the driver stage, the r-f voltage across the grid coil could also be stepped up by a suitable choice of LC constants (high L and low C).

The method of measuring the grid and plate d-c currents in circuit UC-21 is worthy of mention. Connected as shown, the 100- ma. meter will measure the d-c current only, and the 500- ma. meter will measure the d-c plate current only. If the grid meter were returned directly to ground, the plate meter would measure the sum of the d-c grid current and the d-c plate current—an arrangement that is not desirable.

The advantage of the connections shown is that both meters are essentially at ground potential; thus, the hazard of having a “hot” plate meter in the +B lead is eliminated.

Particular attention should be given to the setting in which the keying relay and the filament by-pass condensers are connected. When the key is open, the filament, the filament-transformer winding, and the filament-by-pass condensers (C2 and C4) assume the full d-c plate potential with respect to ground. If, as shown in many circuits, the key is inserted next to the center tap of T1, and the mid-point of C2 and C4 is permanently grounded, the full plate voltage appears across C2 and C4 when the key is open. Thus, both C2 and C4 would have to be high-voltage condensers. The connections shown are preferable, because only one high-voltage filament by-pass condenser (C3) is required.

Overload Relay Recommended
The use of a d-c overload relay (La) is recommended to protect the 806 and its auxiliary apparatus in case the r-f grid excitation should fail, or the plate-tank circuit should accidentally be detuned from resonance. In either case, the d-c plate current will "soar" to an excessive value which may cause serious damage to the equipment. The protective relay (Continued on page 4, column 4)

High-Voltage Power Supply for Push-Pull 806's
(D-C Power Output 1200 Watts)

C: = 1 μf. 4000 V.
C1: = 4 μf. 6000 V.
L: = Antenna change-over relay coil
S: = S.P.S.T. line switch.
R: = 30 kohms.
T1: = Power transformer, 500 ma.
T2: = Power transformer, 5000-volt insulation.
T3: = Power transformer, 100 ma.
V: = Transformer, 4000-volt insulation.
HOLD EVERYTHING!

- The October issue of HAM TIPS
- and the November issues of QST
- and RADIO will contain announce-
- ments of far-reaching impor-
- tance to every radio amateur.

HAM TIPS HAS FIRST BIRTHDAY

Copies of All Back Issues Available

With the September, 1939 issue, HAM TIPS celebrates its first birthday.

Judging by the large number of inquiries received by both RCA Power Tube Distributors and the headquarters staff at the Camden and Harrison offices, the first year of HAM TIPS has been a very successful one. Not to be satisfied, the editors promise an even more interesting group of issues for the second year. Complete information on new tube types as they are introduced as well as more detailed application information on older types is the goal of your editor.

For those amateurs and experimenters who have not kept a complete file of HAM TIPS, there is still time to round out your file of copies. You may request back issues from any RCA Parts Distributor, or if they do not have them, then an inquiry to the Commercial Engineering Section, RCA Mfg. Co., Harrison, New Jersey, will bring you the back copies you need to bring your file up to date.

During 1939 and 1938 the various issues of HAM TIPS covered a wide variety of subjects. These were:

Vol. 1 No. 1—September, 1939—Circuit Information on RCA 809.
Vol. 1 No. 2—October, 1939—Circuit Information on RCA 814.
Vol. 1 No. 3—November, 1939—Circuit Information on RCA 810.
Vol. 1 No. 4—December, 1939—High-Power Crystal Rig Using RCA 813.
Vol. 2 No. 1—January-February, 1939—Additional Information on RCA 813, RCA 802 and RCA 921.
Vol. 2 No. 2—March-April, 1939—Circuit Information on RCA 807 with Special Tube and Impedance Charts.
Vol. 2 No. 3—May-June, 1939—Circuit Information on RCA 808.

The information given in the foregoing issues is of a very practical character. The actual operating information for the circuits shown is given—values and wattage of resistors, details of capacitors, etc.

RESISTORS, R2 and R3, can be switched into the B circuit whenever the amplifier is being adjusted or tuned. In this way, the plate power input can be limited to a reasonably safe value if the circuit adjustments are incorrect. Overload relay L3 should be set to open at 300 ma. (maximum), this value being 50% in excess of the d-c plate current rating of the 806. Although circuit UC-21 shows the popular "center-tap" method of keying the final amplifier, this method does not lend itself to "break-in" operation, and I prefer to use break-in, by keying the crystal or c-c oscillator directly and by operating all stages following the oscillator in parallel or near-parallel to change circuit UC-36 for this type of operation, the grid bias should be obtained partially from a fixed source, such as a battery or bias rectifier of good regulation, and partially from a grid leak. About 250 volts of fixed bias is required in conjunction with a grid leak (R2) of 14,000 ohms (25-watt size) in order to maintain the amplifier plate current near cut-off when the key in the oscillator stage is up.

NEW RCA 2051 GAS TRIODE IS EXCELLENT FOR RELAY CIRCUIT

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TT-3 MANUAL

Of all the information on transmitting tubes in the amateur's library, perhaps none is more valuable than that contained in the TT-3 Tube Manual. This interesting book may be obtained from all RCA Power Tube Distributors or direct from the RCA Commercial Engineering Section, Harrison, New Jersey, by enclosing a remittance of 25c.

Supplementing the complete information on all RCA air-cooled transmitting tubes are chapters on the construction of tubes, the various advantages of different metals used in tubes, together with information on properly installing them. Also, a section on transmitting tube application explains the operation of the various circuits.

Many diagrams with complete details of the components are included with practically every type of circuit. This book has 192 pages and is an unusually handy reference book.

Peak Anode Current (Max.) 375 Ma.
Average Anode Current (Max.) 225 Ma.
Grid Resistor (Max.) 10 Megohms

This tube may be obtained through any RCA Power Tube Distributor. Further engineering information may be obtained from Commercial Engineering Section, Harrison, New Jersey.