Improving the

Class B Driver

John W. Campbell, Jr., W2ZGU

Chain reactions causing trouble are not confined solely to atomic bombs. It can happen in the ham-shack, too, without being half so spectacular, or even destructive. It happened this way:—

It says right here in the books that a modulator for plate modulating an r-f load should have 50% of the power capability of the r-f stage, but that since the human voice doesn't make with the sine waves, a modulator having 25% of the r-f power stage capability can handle the job.

It can, too . . . provided you stick to the rather "thin" characteristics of a normal human voice. But that means you're not getting all the signal that you're entitled to; your modulation is 100% so far as peaks go, but it isn't a "full" modulation envelope.

So, having set up a pair of 813's, modulated by a pair of 811's, I wanted to see if a full modulation envelope made a real difference.

It did. By building a speech compressor-limiter, I cut down the sharp peaks of the voice signal, produced a slight alteration in voice quality—and almost doubled the average energy content! Yoicks! I could, with 500 watts to the 813's, lay in a more readable signal than some of the full-gallon stations that were not using compression.

But . . . the 811's were getting very red in the face doing it. The plate current to the modulators was running nice and steady, with that compressor in action—steadily more than the 811's could handle, too.

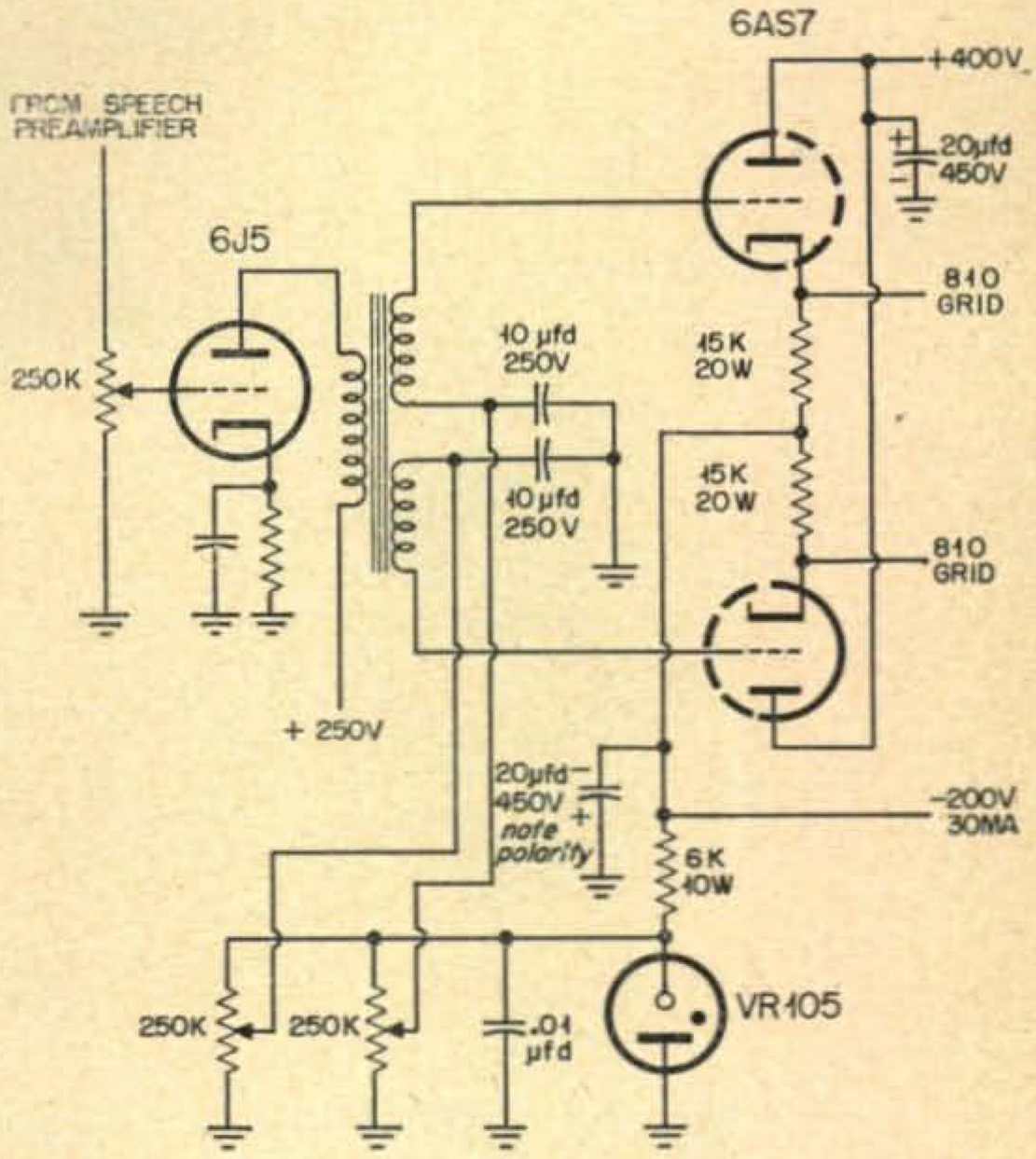
The answer to that was easy, though. A pair of those 810's I brought back in the dear old surplus days at $2 a copy would come in handy. Same power supply, and they'd yield all the audio I wanted! Fifty percent of r-f—stage power? Heck—they could give about 70% of the r-f power stage output!

So they were installed in place of the 811's, fired up, and put on the air.

The reports weren't so hot, though. The modulation was full, all right, but checking at the other end myself indicated that the XYL seemed to have turned the mike over to Gravel Gertie.

A slight investigation showed why. The 810 is a very nice triode; with —35 volts on the grid, it makes a very nice Class-B modulator. Only it calls for a peak grid-swing of 175 volts positive, and at that point the dear old grid is drawing *one quarter of an ampere,* solid. I had a pair of 807's in AB_1 driving the 810's, but they didn't have a chance with that load. Also, the driver transformer was incapable of pushing anything that stubborn around, even when the primary was excited by a really low-impedance source like a 60-cycle power line.

Now let's see . . . ¼ amp at 175 volts means a peak power demand of . . . call it 45 watts. To handle a Class-B grid-type load, we should have some swamping load on it, and negative feedback, so that means . . . hmmmm. Now look; let's not be silly! A hundred-watt transformer is a modulator transformer itself, not a *driver* transformer! No wonder we had Gravel Gertie at the mike!



But how in blazes do you get 175-volt grid drive that can take a 250-mil grid current without minding it? We're not trying for a hi-fidelity prize, and won't insist on less-than-½% distortion, but the neatly clipped wave-crests we've been getting won't do.

Investigation showed no satisfactory driver-transformer of the required characteristics anyway. But this chain-reaction had gone too darned far now to back all the way down to the 811's again.

Regulation was the problem—getting the 175 volts was easy. Regulation . . . hmmm. The current involved . . . and the voltage . . . yup! A voltage regulation circuit it shall be! With a 6AS7 voltage regulator!

The circuit that evolved is shown.

The two halves of the 6AS7 are acting purely as cathode followers; their input impedance is, in consequence, extremely high—and, I hasten to add thankfully, *stays* high throughout the audio cycle. The 810 grids are directly connected to the 6AS7 cathodes; the massive 810 grid current now appears as cathode current in the 6AS7, and the 6AS7 is completely competent to handle that slug

[Continued on page 56]

[from page 15]

of electrons. Don't be fooled by the 15,000 ohm cathode resistors; all they do is pull the 6AS7 cathodes back down on the down-swing of the audio wave. It's going uphill that's the tough job; the 6AS7 plate current does that job.

Since no two 6AS7 halves will exactly match, and the cathode potential is the grid potential on the 810's, a split secondary transformer was called for. Adjusting the two potentiometers allows you to adjust the 810 grid bias to exactly what you want it to be—in this case, –35 volts.

Incidentally, the 6AS7 isn't supposed to have 600 volts across it; that's perfectly satisfied by the fact that most of the negative 200 volts appears across those 15,000 ohm resistors.

The transformer I had allowed me to use a 6J5; a 6V6 triode connected would have done as well, or a 6SN7. Since the 6AS7 is acting as a cathode follower, it takes no driving power—it just calls for about 250 volts.

The circuit's essentially about as simple as a circuit can get, yet was designed to handle the toughest driver problem you're apt to meet, so long as you stay within the 1-kw. law. This modulator driver circuit will, because of the cathode-follower feature, drive any pair of modulator tubes, so long as they don't call for more than about 200 volts of grid drive—which is enough to drive 810's modulating a full kilowatt. The same circuit, with a 6SN7 plugged in the 6AS7 socket, will drive a pair of 807's. It comes as close to being the universal modulator-driver system as any, and supplies the bias required for the modulator tubes.

With that final link of the chain nailed down solid—Gravel Gertie moved out, and the reports started sounding sweet in the receiver again. And the full-modulation signal definitely gets through where the uncompressed signal won't. There's a switch on my pre-amp that cuts out the compressor circuit . . . naturally. How could you be sure the thing worked if you couldn't try it with and without on the same contact, under the same conditions?

NOVICE SHACK

[Continued from page 44]

When he stood by, I told him it was unnecessary to repeat everything, signed and called QRZ?

Another KN4 called. I gave him 579X, but the whole thing was repeated again. I finally signed with him at 0556, to leave for work. Two QSO's in 30 minutes, when a 1 X 1 call, Tnx, RST, QTH, and name sent singly would have done just as well, and I would have been able to give a half dozen more Novices a KV4 QSO.

"I do not mind slowing down to a couple words a minute for those who are obviously new and need the slow down and repeats to complete the contact, but I do get impatient with those who do not use their heads a little and consult an RST table. 73."

The RST method of giving signal reports is described in the front of the ARRL log book, in the *Call Book*, and in various handbooks.

Doug Brown, WN3BXM (12), 101 Primrose St., Chevy Chase, Md., writes, "In four weeks on the air I have worked 23 states and Canada. I use a *Johnson* Adventurer