The Center Loaded Antenna

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This is required reading for anyone that intends to try to tune a center loaded mobile antenna, or would you rather do it the hard way? —Editor.

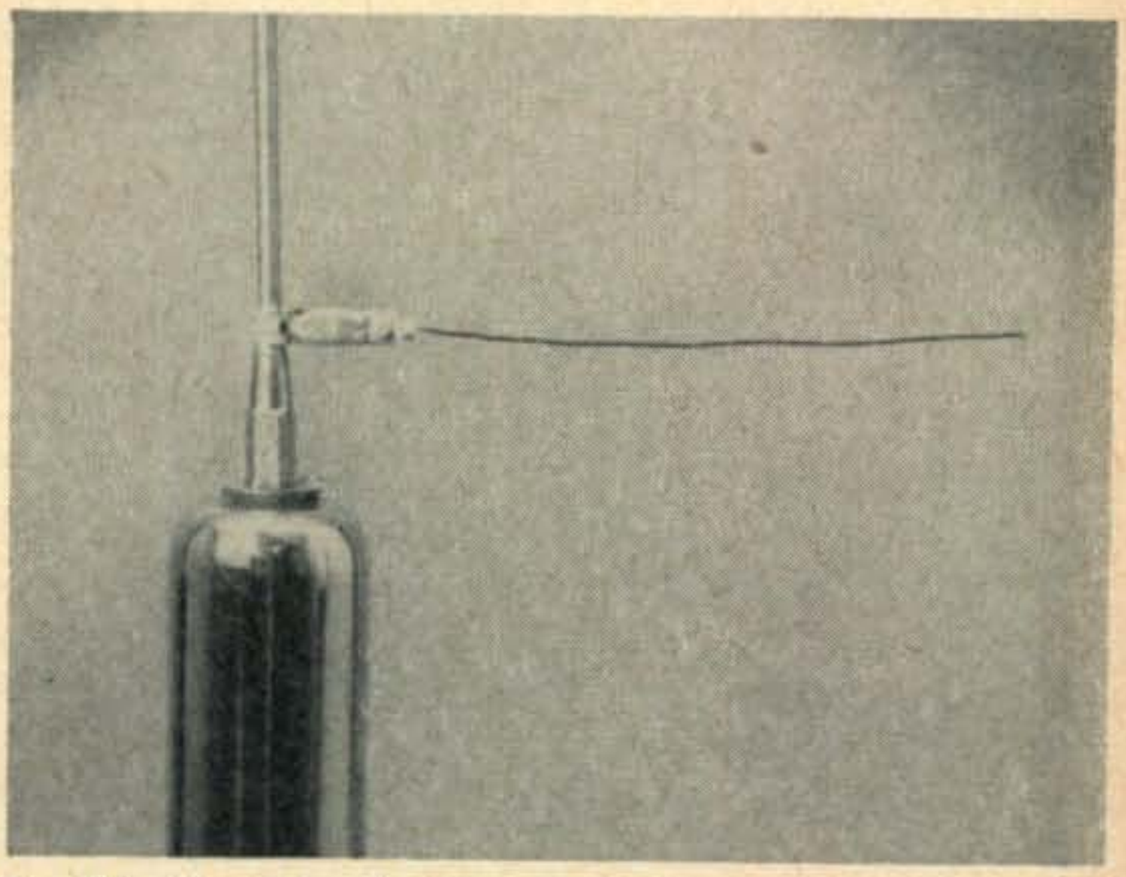
No doubt every owner of a mobile station has given his antenna a critical look and wondered to himself what would happen if he did this, or did that, or maybe took a turn off the loading coil, etc. Sure, we all have that feeling sometime. In even more vulnerable condition is the fellow who has yet to tune his whip. I have been through the mill and I hope that the results of my experience will be as helpful to you as they would have been to me When I started trying to tinker with the *Master Mount mobile* 75 meter center-loaded antenna.

The problem is that of tuning the antenna to a desired frequency of resonance. Just about any change that is made in the antenna results in a change in its resonant frequency. Worse than that, even the feedline and the proximity of other cars will change the resonant frequency (hereby abbreviated f_r).

The first approach to tuning the whip was to prune the loading coil to 3995 kilocycles (New York State Civil Defense frequency) while it was installed on W2QJN's car. Moving the antenna coil to my whip changed the f_r to 3950 kc. Since the antennas were mounted in roughly the same part of the two cars the variation was apparently due to the difference in feeder length: W2QJN, having his transmitter in the trunk of his car only had about 18 inches of feeder, my transmitter is under the dash and has about 21 feet of coaxial feeder.

The center-loading coil will change the f_r if it is turned upside down. The coil should be pruned from the top for the highest frequency desired (3995 kc in my case), then, when it is inverted, the frequency drops 70 to 75 kc. (3920 kc in my case). A second coil, pruned to 3880 kc, resonates at about 3810 kc. when inverted, giving me a wide choice of basic operating frequencies. K2BS happened to be passing through town one day so I pruned his coil to 3958 kc with the alternate falling on 3890 kc, 68 kc lower. The fr of the coil goes up from 15 to 20 kc for each turn removed and seems to be quite linear. When the coil is through being pruned it is wise to use some #33 Scotch tape to hold the turns in place. The tape will stretch so be careful to draw it tight. It is not necessary to tape the entire coil, only the top end few turns where wire has been removed in the pruning process, leaving room for the remainder of the coil to spread out if the end is not taped. This spreading out results in a change of loading from day to day. If you want to hit a specific frequency (by reason of crystal control, net operation, friends, or perversity) all you have to do is prune the coil until you are close to the channel, then spread out the last few turns for fine tuning on the last five or ten kc.

Next a series of tests were made to determine what effect the changing of the length of the whip had on the f_r. The lower half o fthe antenna was



Possibly the "simplest" expedient to tune your mobile antenna—clip on a "pig-tail."

made two feet longer by means of a piece of brass pipe; this increased the f_r 20 kc. The two foot section was then changed to the top half of the antenna, resulting in a drop of 305 kc in the f_r. When both the top and bottom sections were extended two feet the resultant f_r was the sum of the two individual changes: plus 20 kc and minus 305 kc, or 285 kc lower. The total extension of four feet did not seem to make much difference in the signal strength at a distance of four miles although W2FJN reported a possible one "S" unit improvement.

Just how does that attractive metal coil shield affect things? It was removed and the frequency shot up 160 kc, that is how it reacts. W2TPM, 200 miles away, reported no change in signal strength when the coil shield was removed. Even the polystyrene disc at the bottom of the coil will raise the fr of the antenna if it is made thicker.

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Tests with W2UJR, about 250 miles away, indicated that the antenna is quite sharp in frequency response, and should be retuned if the transmitter frequency is changed much over ten kc.

Bridges and tunnels seem to affect the transmitted signal just the same as they do broadcast signals, save your breath when going through them. I don't know what happens to the resonant frequency of the antenna, guess it just goes away. Even a truck near the antenna will upset the tuning.

Pig Tails

So far the tuning of the antenna is all well and good, but not flexible enough. Some simple means of tuning the antenna to other frequencies is desirable. After all, you don't want to have to take the coil apart and change it every time you change crystals. A simple solution to this problem is the clip-on piece of wire, a short piece of #20 enamel wire on a *Mueller #45* clip which is clipped just above the coil on the antenna itself, not on the threaded coupling between the coil and the antenna. Several lengths of wire were tried so that a rough idea of the change in f_r could be correlated with the change in the wire.

Length of Pig-tail	Resonant Frequency	Drop in Frequency
—	3910 kc	—
5"	3895 kc	15 kc
7"	3880 kc	30 kc
8"	3870 kc	40 kc
9"	3860 kc	50 kc
11"	3840 kc	70 kc

Thus you can see that the antenna can be matched to almost any frequency just by using a pair of wire cutters and a grid-dip meter.

While playing with the pig-tail clip several other positions were tested. The five inch pig-tail was clipped in a horizontal plane just above the coil, lowering the f_r from 3910 to 3895 kc. The same clip was then moved to the top of the whip, still in the same plane, lowering the frequency to 3860 kc. When the pig-tail was turned to the vertical plane (extending the height of the antenna five inches) the resonant frequency went still lower, to 3853 kc. Reports from W2FJN, eight miles away, indicated that the pig-tail did not affect the signal strength.

A *Mueller #24A* clip was clipped under the bottom of the coil cover, resulting in a lowering of the f_r of 20 kc. The length of the pig-tail wire on the clip seemed to make very little difference in the frequency. This surprised me for I thought that the frequency would go up when the tail was clipped just as it did when attached above the coil.

Extra Hints

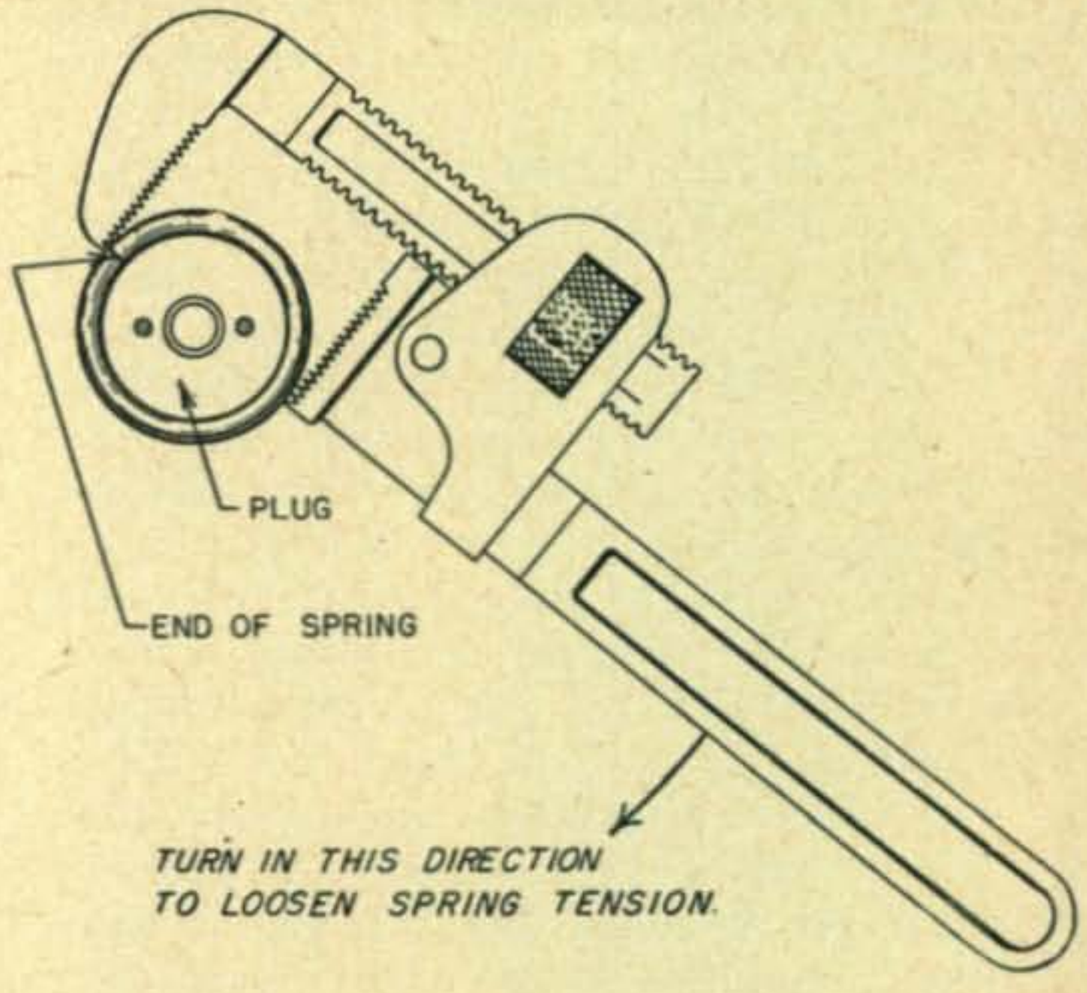
The easiest method of tuning the antenna is to use a grid-dip meter, however, a VFO will usually do the job satisfactorily, providing you don't have an antenna tuning network between it and the antenna. For tuning procedure it is best to couple the antenna directly to the transmitter so that the impedance of the antenna will vary the loading of the rig. In this way the VFO can be swung up and down the band to find the frequency of maximum loading.

The receiver here is a *Gonset Tri-Band* mounted just to the right of the drivers' knee. The rig is a homemade affair using a 6AK6 VFO, a 2E26 final, and a 1635 modulator. The power runs from 20-25 watts input and is supplied by a dual Vibrapack mounted in the engine compartment. The 75 meter *Master Mount* mobile antenna has given me good reports from almost half of the states, and even from Canada.

Spare Parts

Dis-Assembling The Mobile Antenna

Many spring-supported mobile antennas are secured to the mounting bracket by means of a threaded metal plug screwed into the lower end of the spring. Sometimes it becomes necessary to remove the spring from the mount, as when the braid inside the spring breaks. Usually the plug is provided with a couple of holes for a spanner wrench, but these are not of much help unless the spring is loosened in some way. Since the spring itself forms the "threads" into which the plug screws, turning the plug merely wraps the spring more tightly around the plug. If the spring tension can be relieved, the plug can be removed easily by hand.



A simple method of relieving this spring tension employs an ordinary pipe wrench which is usually available in the average household. With the antenna end of the mount secured in a vise, the jaws of the wrench are opened to fit over the spring and the wrench is held in the position which would be used if the plug were to be screwed *into* the spring. The end of the spring is caught with the tip of the fixed jaw on the wrench, while the movable jaw bears on the spring one half turn from its end. Pressure applied to the wrench will now tend to "unwind" the spring and will relieve the tension which normally holds the plug. The plug can then be removed easily, usually without a wrench. A similar procedure can be used to start the plug into the spring, if necessary, when the mount is reassembled.

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