

Extract of notebook of W. Hanscomb, noting results of testing approximately 40 Moorhead (Huppert) "solenoids", May, June and July 1923.

FIRST TESTS, CONCLUDED

JULY 1923

REMARKS:

(PAGE 51) More sensitiveness of Huppert tubes on local signals about 80% to 90% of standard M.1 tube, regeneration as fixed factor, with but few exceptions does not help and then improvement in signals only very slight. They are very clear as a rule and bring in music and voice, particularly from Hales, Telegraph Hill, Oakland very clearly without fringe. They do not oscillate except with special effort and then only feebly (see 57) as straight detector tubes and compared against standard detector tube and in same circuit the best nearly equal the standard on fair and strong signals. The standard tube will bring in distance better, probably due to inherent oscillating quality when no regeneration is used, and when regeneration is used the signals are stronger for equal clarity and much stronger (PAGE 52) to pick up distant cw by the carrier wave and the usual way is to tune the set with a standard tube, change to the Huppert tube and retune to suit, usually reducing regeneration to zero. It is also necessary to use closer coupling to get nearly the same signal strength on the same station, the standard tube taking the 2nd mark on coupler dial and the Huppert tube the 5th.

Owing to its detector action which is quite stable many of the minor QRM's which are audible with the standard tube are not audible with the Huppert tube, with the result that voice and music are very clear.

The tube will not work as an amplifier. This was tried both as a solenoid and as a grid and for audio and radio frequencies. It is practically dead (PAGE 53) under these conditions. The later tubes and a few of the earlier ones are very stable and do not require a critical adjustment of either the A or B batteries, but operate satisfactorily over a wide range of both.

The tube can be used either as a plain grid or a solenoid and in the latter case, when solenoid is connected to filament the results are practically the same. If the filament connection is omitted the signals are considerably reduced, in some cases 50%. The earlier tubes, not as good as the later ones, at first have gradually improved with age either remaining idle or under use at various times when being tested. For local work on radio fone broadcast reception they should give excellent satisfaction (PAGE 54) on account of their ease in adjustment and on account of their clarity of reproduction, when used in the standard or Huppert circuits. Visitors have invariably remarked on the clarity of reproduction of the tube, particularly when used in connection with a Western Electric amplifier and loud speaker, and also in connection with an ordinary 2 step amplifier. In the latter case the changing of the standard tube for one of the Hupperts resulted in considerable improvement in the music and voice being reproduced. Just what the action of the tube is, I am unable at present to say. It works, but I can not say why. This statement is based on the observations made during a number of static tests of some of the tubes both (PAGE 55) as a grid device and as a solenoid. Owing to the fact that connecting the grid circuit to the filament makes a decided improvement in the signal strength, when hooked up as a solenoid tube, it would appear as though there is a decided grid action and that the grid or solenoid attracts and by passes some of the electrons ordinarily flowing to the plate. A peculiar feature, however, is the results obtained when making a static test of the grid plate characteristics when a potential is applied to the grid in steps of increasing value the effect on the plate circuit is only temporary. The plate current dropping a certain value, depending on the potential, and then quickly returning to its original value even though the grid potential is kept applied. (PAGE 56) This effect maintains with gradually increasing grid potential until a certain critical value is reached when the current in the plate circuit will fall to zero, remain there for a fraction of a second and then suddenly return to its original value. Upon further increase in grid potential the heater current will stay at zero and not return.

It makes no difference whether the A battery terminals are reversed or not. The signal strength is the same for a given adjustment.

If in place of the direct current potential applied to the grid, an alternating one of 1000 cycles frequency is applied, the plate circuit current will drop to and remain at zero

(PAGE 57) A peculiar effect was noted when applying potential to the grid in some tests if the potential applied was of the correct value, and if the connection was made and broken at proper intervals, it was possible to jog the plate circuit current down to zero, but it immediately returned to normal when the jogging stopped whether the potential was suddenly applied or removed.

But two of the tubes could be made to oscillate and these required $0.65+If$, 36 Volts E_p with full grid condenser of .0004 Mf and blocking or by-pass condenser of .0001 Mf. With these the Atlantic Coast and Honolulu (N.P.M.) could be brought in with good signals.

Compared with C301A the best tubes show approximately 55% of the signal strength on KPO.

The relative efficiencies of a group of tubes seem to change from time to time, the best one time ranking (PAGE 58) lower in the series at another. Occassionally a tube will prove dead on the same adjustment at which it was a good sensitivity on a previous test.

OCTOBER 22, 1923 HUPPERT TUBES

Brought in several new tubes made by him having thoriated filament and checmical exhaust with sodium mercury amalgam.

#1 had two concentric 3 element structures mounted in parallel with one filament central thru both. Worked very well, equal to 201-A on 6 volts with 0.12 amps, "B" 35 volts. Good oscillator, sensitive and microphonic.

-- In all the above the elements were mounted vertically in std Moorhead tubes (Note: This describes A-P Two-in-One).

W. W. Hanscom Test Program Report Summary

In summing up the results of the tests so far made, no final conclusion as to the actual operation of the tubes has been reached. Two receiving sets were connected so as to permit the use of the standard regenerative circuit in one and the Huppert circuit in the other, and a double pole, double throw switch permitted connecting either to the head receivers. In this way it was possible to tune both sets to the same station and make a direct comparison between two tubes when both were adjusted to their maximum sensitiveness, and when working as an external grid tube or as a solenoid tube.

The conclusion has been reached that the new tubes work as detectors, it being practically impossible to make them oscillate, with the exception of two tubes previously mentioned (#16 and #18). Regeneration has no effect of any magnitude, sometimes increasing strength of signals and sometimes decreasing it. I have been unable to use any of the tubes as amplifiers, and no appreciable difference has been noted in the operation of the tubes when used in either the standard or Huppert circuits.

When compared with any of the other tubes as a simple detector without oscillation, the best of the new tubes is practically as good, but when regeneration is used in connection with the tubes now on the market, the new tube is from 50% to 85% as good in signal strength. Owing to its being a detector only, it does not reproduce any of the fringe from the transmitting station but makes the

voice and music very clear and in one case, working with a two step amplifier, the signals from the loud speaker were considerably clearer and better when the standard tube was replaced by one of the new ones.

The new tube cannot be used to pick up distant stations. It is not good for long distance work on weak signals as it requires an appreciable amount of original signal strength for its operation and also requires closer coupling and more capacity in the grid condenser when used in a standard set. It is a good tube for use with single circuit receiving sets and has a very wide range of both A and B battery adjustments, which are not at all critical.

Local stations, those around the Bay of San Francisco, come in very good; Los Angeles has been heard with about 50% of the strength of a standard tube, as have San Jose and Portland, but in the case of the more distant stations it has not been possible to pick them up without first getting the proper tune with a standard tube and then changing to the new tube and making the final adjustments.

It has been stated that the new tubes are not as sensitive to weak signals as are the standard tubes; it has also been noted during tests that stronger signals give a proportionately greater response in the receivers. Owing to this feature, much of the weaker interference that would otherwise be audible is eliminated and the desired signals are retained without the necessity for loose coupling.