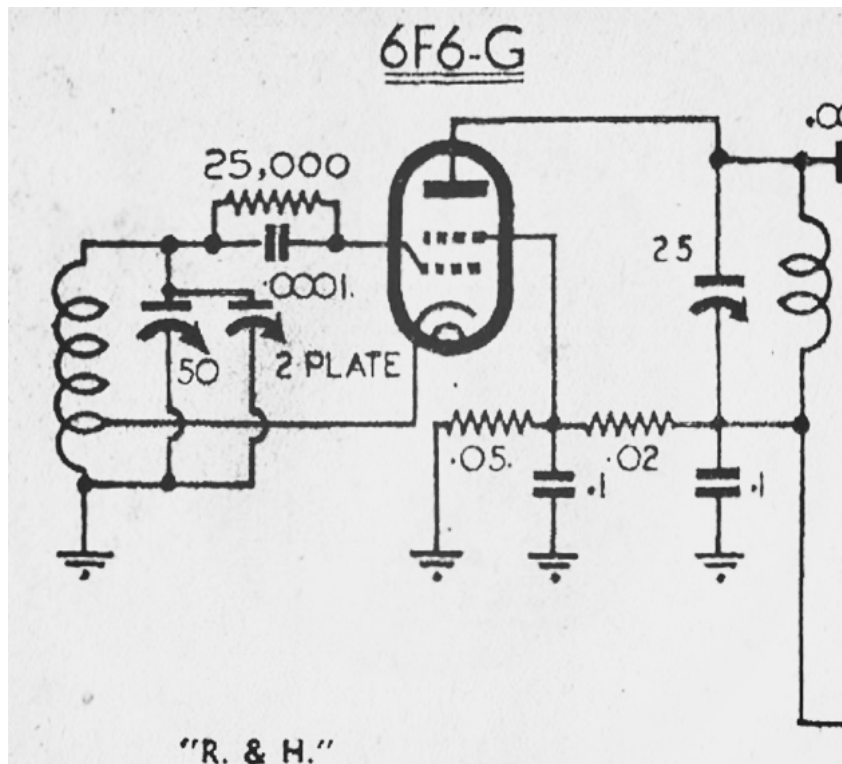


Hartley Oscillator derived from 1947 design

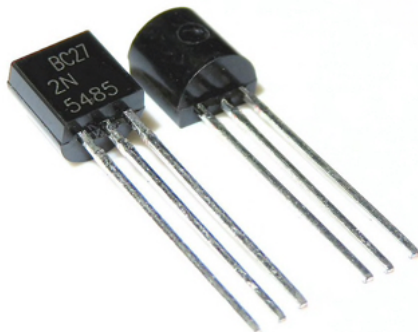


Here is our design for a Hartley oscillator which I have adapted to work with a FET in 2019.

As stated previously, there is very little difference between circuit designs of vacuum tubes and FET or Mosfet replacements.

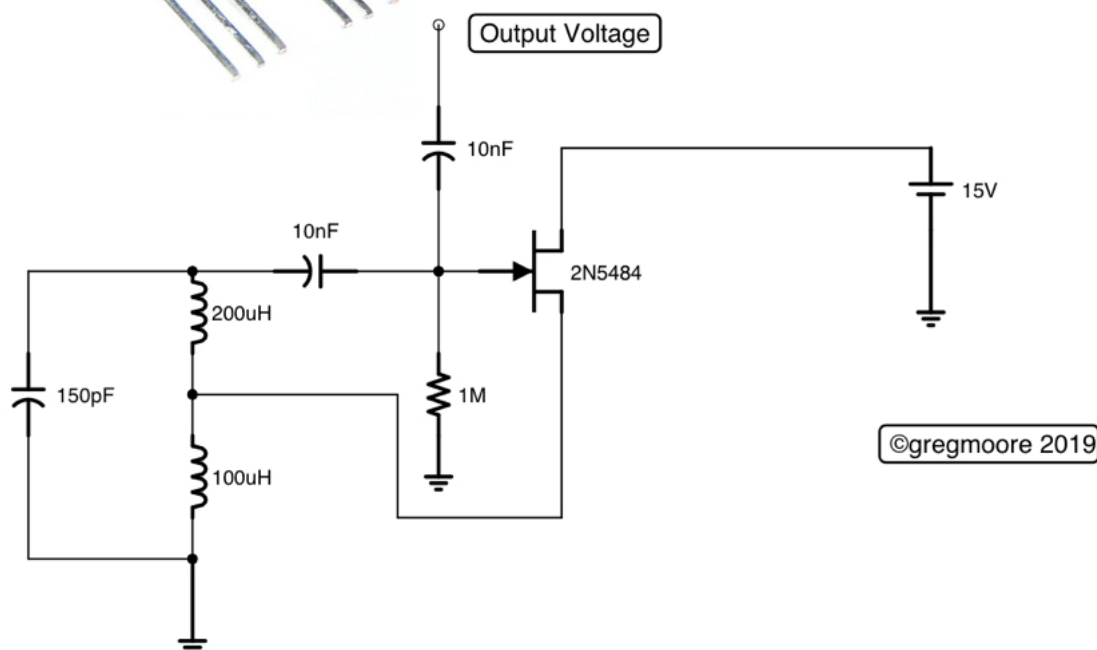
I have used a 2N5484 FET which is designed for RF purposes.

I've drawn the circuit and you can see it at the bottom of this page.



The coil was wound to give me a design frequency of 1MHz when used with a capacitor of 100pF. That proved to be an inductance of approximately 300μH. I tapped the coil at about 30% of the coil length to provide a feedback

www.learn.org.au



voltage to the source of the FET. The FET uses $1\text{M}\Omega$ gate return to ground and capacitance coupling to the tank circuit.

The basic equation for resonant frequency you will need to transpose and make L or C the subject in order to design circuits like this one.

$$\begin{array}{lcl}
 1 & f = \frac{1}{2\pi\sqrt{LC}} & L = \left(\frac{1}{2\pi f}\right)^2 \\
 2 & 2\pi f\sqrt{LC} = 1 & \\
 3 & \sqrt{LC} = \frac{1}{2\pi f} & \text{Therefore...} \\
 4 & LC = \left(\frac{1}{2\pi f}\right)^2 & C = \frac{\left(\frac{1}{2\pi f}\right)^2}{L}
 \end{array}$$

www.learn.org.au

I was able to plug in 100pF and 1MHz to this equation to come up with 253μH

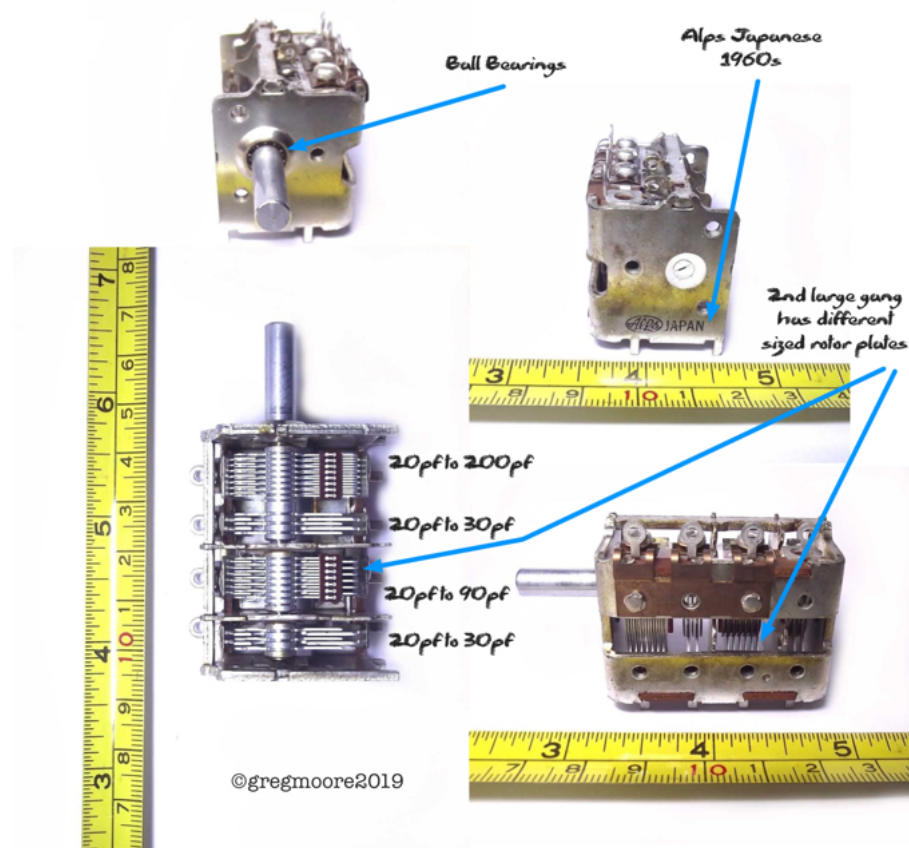
I wanted a bit of range in the tuning of the circuit so I increased the inductance to 300μH for the final coil winding.

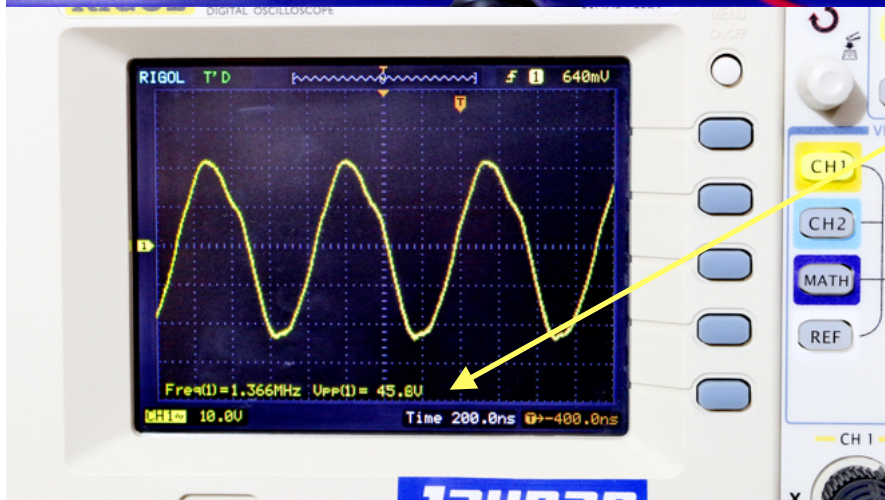
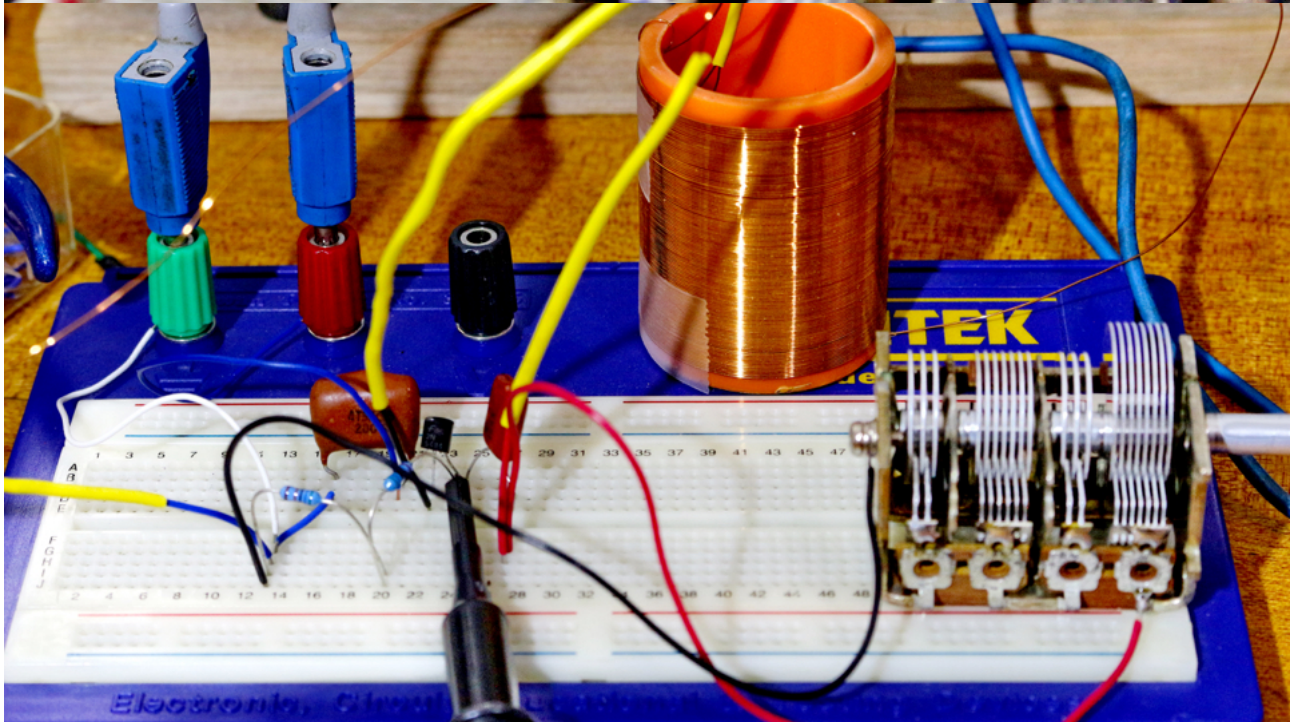
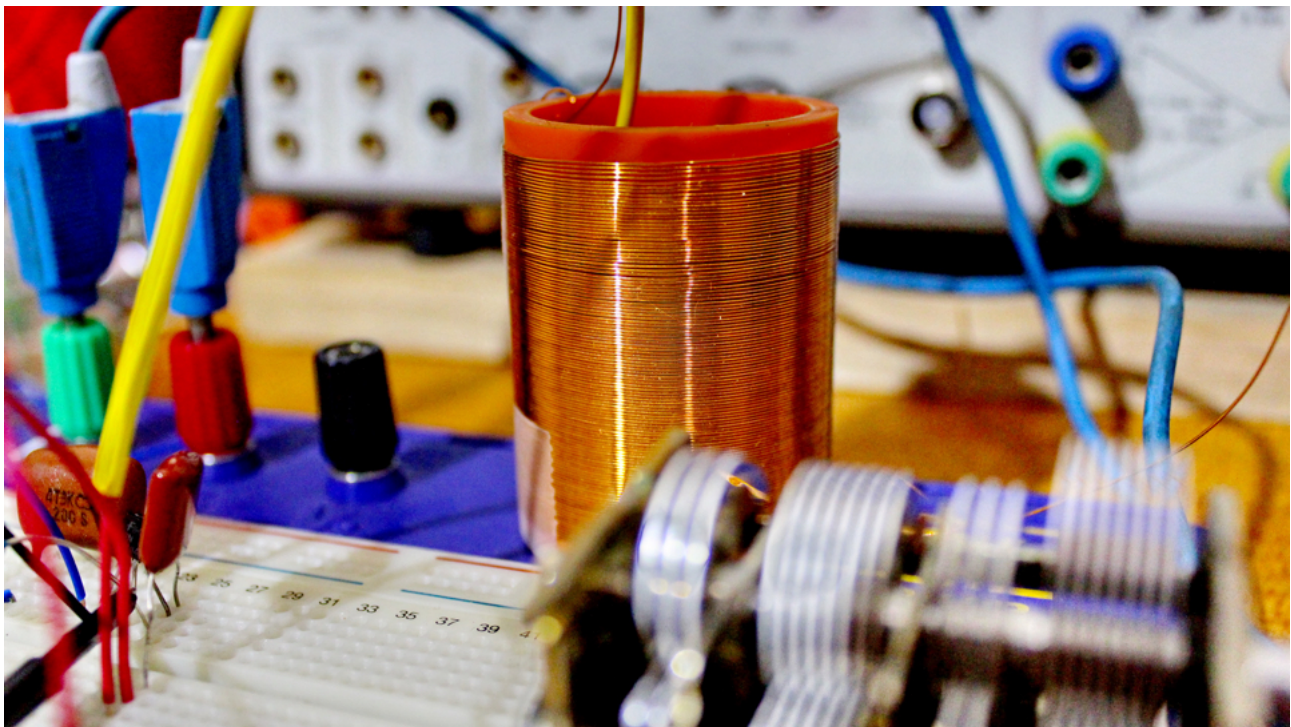
I bought some of these variable capacitors online from Thailand and had the

parcel in Sydney in 4 days. I like this capacitor as it gives me a huge range of values for experimenting and it is still quite small but has ball bearing construction. Made in Japan in the 1960's.

The coil former is heavy duty electrical conduit and it was precision parted on the lathe to give me flat ends for the winding mechanism.

For small coils it's often easier to use a cordless drill with a mechanism in the chuck to support the former. Winding wire is 28 SWG and holes were pre-drilled to accept the enamelled copper wire. After winding, some tape is used to hold the windings tight while working with the external wires. If you have time on your side, some spray can of polyurethane is ideal too, but it will need overnight to dry.

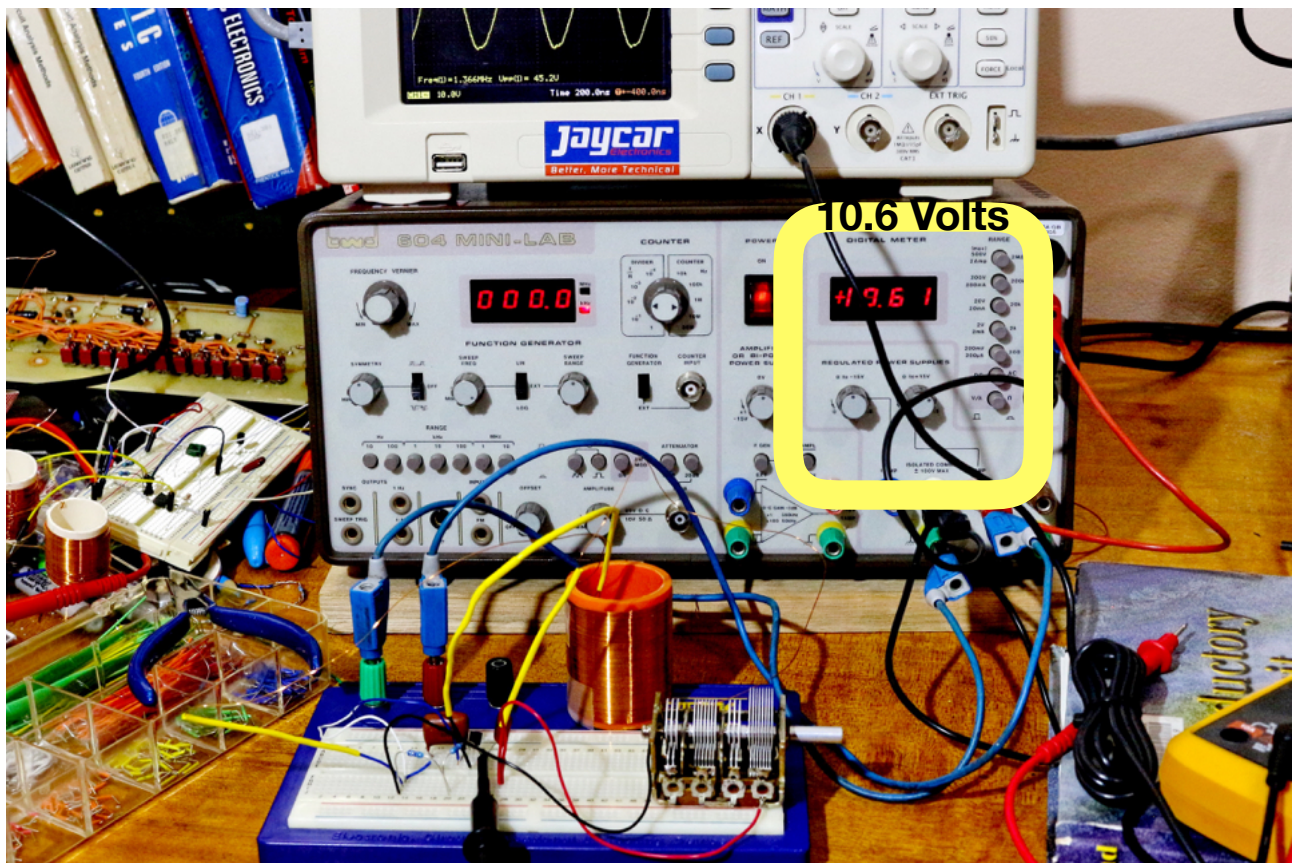




Note the voltage at the gate on the FET !
45Vpp, Frequency
1.366MHz with
capacitor plates
opened up.

Two 500k Ω resistors in
series to make up 1M Ω

Supply voltage 10.6V



This makes a very effective low power transmitter from 500kHz to 1.36MHz. The output is taken from the gate as the source voltage waveform is not as symmetrical looking. The output could be and probably should be taken from inductively coupling a takeoff coil over the main tank coil. Alternately a 1mH RF choke could be placed in the drain circuit with a bypass capacitor on the cold end (DC) and then the output sample taken from the drain.

The next stage is to be a buffer using another FET, so as not to load down the oscillator stage. Finally a tuned output amplifier running in class C using a Mosfet will deliver around 5W of RF output at the 1MHz frequency.

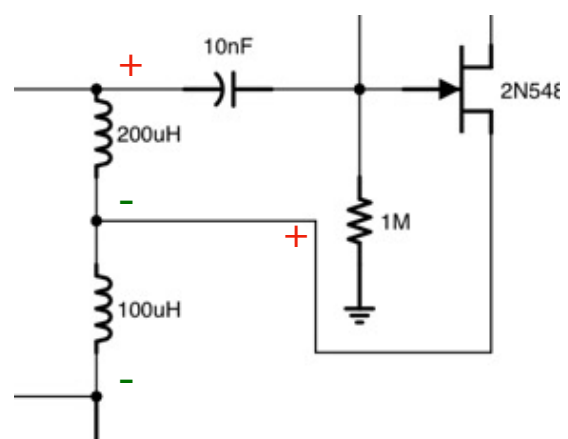
See my video in Youtube for this project when it's uploaded.

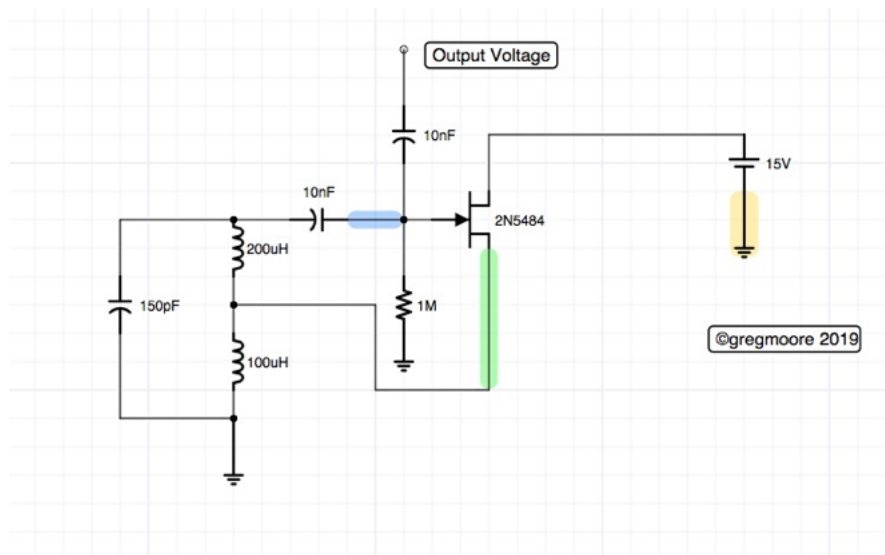
Basic Operation:

At turn on, current flows through the drain of the FET and into the bottom half of the inductor. Autotransformer action causes the same polarity pulse at the gate capacitor, the inductor being split + / - in the centre.

The positive pulse is coupled into the gate and turns the FET on harder... etc etc.

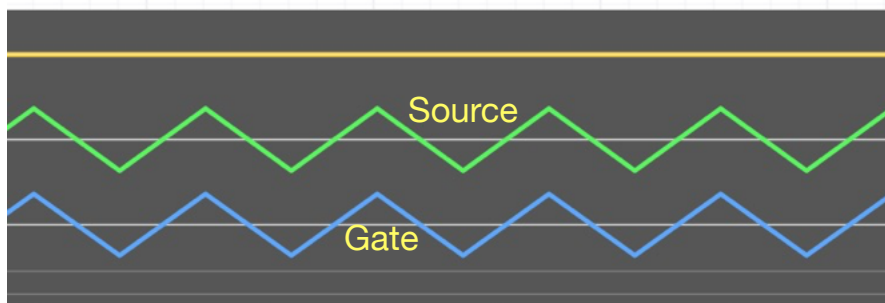
Overpage is a dodgy iCircuit running representation...





:) I say dodgy because the simulator won't give me sine waves at this frequency but note the polarity of the green source voltage and the blue gate voltage.

The autotransformer action here is causing the nice oscillation.



There is a video which may explain this in Youtube... it's fast but I think it's ok.

<https://youtu.be/u7MY8X1-U8Y?t=705>

Ucando 6/6 Electronics Oscillators

Old and real fast, but if you can stay awake, it's quite good. www.learn.org.au