The high-power devices of Don Smith

Edited by Brendan J. Darrer

December 4, 2022

This document was taken from Patrick J. Kelly's Practical Guide to 'Free-Energy' Devices: the introduction and Appendix (A-907 to A-975) on Don Smith's devices [1].

E-mail: brendan.darrer.12@ucl.ac.uk

Contents

1 Introduction **4**

2 Don Smith's free energy devices **9**

3 Transformer generator magnetic resonance into electricity **10**
- 3.1 Abstract 10
- 3.2 Description 11
- 3.3 Disclosure of the invention 11
- 3.4 Brief description of the drawings 11
- 3.5 Best method of carrying out the invention 12
- 3.6 Claims 12
- 3.7 Non-ionic electrons 22
- 3.8 Electron related energy 22
- 3.9 Useful circuits, suggestions for building an operational unit 23
- 3.10 Don Smith's suggestions 24

4 A practical implementation of one of Don Smith's designs **67**

5 Constructing high-quality coils **102**

6 A Russian implementation of Don Smith's design **106**
- 6.1 Part 1: Accessories and materials 106
- 6.2 Sergei's Dynatron circuitry 114

1 Introduction

The following is an expert from Patrick Kelly, 2008, on his introduction to Free-Energy Devices[2].

“I am just an ordinary person who became interested in “free-energy” as a result of a television programme entitled ‘It Runs on Water’ shown in the 1980s by a UK television company called ‘Channel 4’. From my point of view, the content of this documentary seemed to be rather unsatisfactory as it suggested quite a number of very interesting things but gave no real hard and fast specifics for the viewer to follow up on to investigate the subject further. However, it had the enormous benefit of making me aware that there was such a thing as “free-energy”.

“My attempts to find out more were not very successful. I bought paper copies of several of Stan Meyer’s HHO gas patents from the Patent Office in 1986 but while they were interesting, they did not provide much in the way of additional information. Searching on the internet at that time did not produce much more in the way of practical information. Things have changed dramatically since then and there has been an enormous increase in available information. But, even today, it is relatively difficult to find much in the way of direct, useful and practical information on free-energy systems and techniques. Much of the information consists of chatty, lightweight articles describing people, events and inventions in vague, broad outline terms which are almost completely lacking in specifics.

“These articles have the style of saying “There is a new invention called a ‘bus’ which is used to carry passengers from place to place. We saw one the other day, it was painted green and blue and looked most attractive. It is driven by Joe Bloggs who wears an engaging smile and a hand-knitted sweater. Joe says that even his children could drive a bus as it is so easy to do. Joe expects to retire in six months time as he is going to take up gold prospecting.” While I’m sure that an article like that is interesting, the sort of description which I would, want would be: “There is a new invention called a ‘bus’ which is used to carry passengers from place to place. We saw one the other day, and were very impressed as it has seats for some forty-five people. It has bodywork made of pressed aluminium, a wheel at each corner of its considerable 40’ × 10’ structure, a five litre diesel engine made by the Bosworth Engineering Company of Newtown, and has power-assisted steering, hydraulic brakes and ......”.[2]

“There are also many articles, scientific papers and books, some of which, quite frankly, I am not able to understand as the authors think mathematically and express themselves in equations (where they frequently do not define the terms which they use in their equations, making them effectively meaningless). I do not think in mathematical equations, so I do not share in this much higher level of thinking and analysis, though I do have some of these papers on my web site for the benefit of visitors who do have the ability to understand them easily.

"After a long period of searching and investigating I was beginning to gather enough information to be fairly confident of what was being done, what had already been achieved, and some of the possible background reasons for the effects which were being observed. Early in 2005 I decided that as I had encountered so much difficulty and had to put in so much effort to find out the basics of "free-energy" that it could be helpful to others if I shared what I had found out. So I wrote the first edition of this presentation and created a simple web site to make it available to others. Of course, this body of information is not static —on the contrary, it is very fast-moving. Consequently, this information digest is updated and refined typically many times each year. The present form of presentation is the third style of layout which has been used as the volume of material has increased."[2]

—Patrick Kelly, April 2008.

"This eBook contains most of what I have learned about this subject after researching it for a number of years. I am not trying to sell you anything, nor am I trying to convince you of anything. When I started looking into this subject, there was very little useful information and any that was around was buried deep in incomprehensible patents and documents. My purpose here is to make it easier for you to locate and understand some of the relevant material now available. What you believe is up to yourself and is none of my business. Let me stress that almost all of the devices discussed in the following pages, are devices which I have not personally built and tested. It would take several lifetimes to do that and it would not be in any way a practical option. Consequently, although I believe everything said is fully accurate and correct, you should treat everything as being "hearsay" or opinion."[2]

"Conventional science says that it can prove mathematically that it is quite impossible to [build and run over unity devices]. However, the calculation is massively flawed in that is not based on what is actually happening and worse still, it makes initial assumptions which are just plain wrong [The hypothesis of Subquantum kinetics by Dr. Paul LaViolette, could explain this over unity effect, by a violation of the laws of thermodynamics predicted by the model [5] [6] [7] [8]. See links @ Starburst Foundation]. Even if we were not aware of these calculations, the fact that it has been done is quite enough to show that the current engineering theory is out of date and needs to be upgraded."[2]

"The term "Free-Energy" generally means a method of drawing power from the local environment, without the need to burn a fuel. There are many different successful methods for doing this and these methods span many countries and many years.

"The amount of power which can be collected can be very high and the few kilowatts needed to power a household is most definitely within the reach of most of the devices mentioned.

"In this brief introduction, not much detail has been given about the devices mentioned and only a small selection of devices has been covered. Much more detail is available in the various chapters of this eBook.

"The 'bottom line' is that energy can definitely be drawn from the local environment in sufficient quantities to supply all of our needs. For whatever reason, conventional science appears determined not to accept this basic fact and denies it at every opportunity. It seems likely that vested financial interests are the root cause of this refusal to accept the facts. The true scientific method is to upgrade scientific theory in the light of observed fact and new discoveries, but the true scientific method is not being followed at the present time. To conclude this introduction, let us consider some of the many ways which can be used to gather energy from the zero-point energy field in readiness for use in our daily tasks. Here are some of those methods in Table 1 and 2."[4]

Method	**Examples**
1. Using an aerial	—Alexkor's aerial 100 watts, chapter 7 —Herman Plauson patent 1 kilowatt from each aerial, chapter 7 —Lawrence Rayburn's TREC aerial 10 kilowatts, chapter 7 —Thomas Henry Moray demonstrations up to 50 kilowatts, chapter 7
2. Gravity	—William Skinner – powered his workshop in 1939, chapter 4 —James Kwok 250 to 1000 kilowatts, chapter 4 —Mikhail Dmitriev's pushed weights, 100 watts, chapter 4
3. A spinning rotor	—Teruo Kawai self-powered electric motor cycle, chapter 2 —Lawrence Tseung's wheel 100 watts, chapter 2
4. Motionless circuit	—Carlos Benitez 2 kilowatts, chapter 5 —Lawrence Tseung's magnetic frame 10 watts, chapter 3 —Valeri Ivanov's magnetic frame 10 watts, chapter 3 —Rosemary Ainslie's heater 100 watts, chapter 5
5. Efficient magnetic transfer	—Thane Heins' 1 kilowatt, chapter 3 —Tewari Paramahamsa's 3 kilowatts, chapter 2 —Clemente Figuera's 20 kilowatt transformer, chapter 3
6. Efficient electrolysis for heating and powering generators	—Dave Lawton, chapter 10 —Dr Scott Cramton, chapter 10 —Bob Boyce, chapter 10 —Selwyn Harris, chapter 10 —David Quirey unmodified generator, chapter 10
7. Effective battery charging	—Motionless: Lawrence Tseung's FLEET, chapter 5 —Alexkor's many systems, chapter 6 —Moving: John Bedini / Ron Pugh, chapter 6

Table 1: Methods and examples of over unity devices as described in the different chapters of Patrick Kelly's Guide to Free Energy Devices, found at[1]. This table is continued in Table 2.

Method	Examples
8. Permanent magnets only	—Muammer Yildiz's motor, 300-watts, chapter 1 —Dietmar Hohl's motor, 20 watts, chapter 1 —ShenHe Wang's generators, 1 to 100 kilowatts, chapter 1 —Mini Romag / J L Naudin generator, 35 watts, chapter 13
9. Permanent magnets with electricity	—Robert Adams' generator, multi kilowatt, chapter 2 —Charles Flynn's motor, unlimited, chapter 1 —Steven Kundel's motor, 100 watts, chapter 1 —Donald Kelly's motor, 100 watts, chapter 1
10. Passive devices	—Dr Oleg Gritschevitch's Toroid 1500 kilowatts, chapter 5 —Bill Williams/Joe Nobel's Joe Cell, unlimited, chapter 9
11. Inertia	—John Bedini's pulsed flywheel, chapter 4 —James Hardy's water-jet generator, chapter 2 —Chas Campbell's self-powered flywheel, chapter 4
12. Ground energy	—Barbosa and Leal 169 kilowatts, COP=102.4, chapter 3 —Frank Prentice 3 kilowatts, COP=6, chapter 5 —Michael Emme's Earth Battery, 3 kilowatts, chapter 6
13. Radioactive	—Colman / Seddon-Gillespie's 1 kilowatt, 70-year battery, chapter 3 —Tesla's generator (spark gap alternative), unlimited, chapter 11
14. Isotope exchange	—Meyer and Mace using isotopes of iron, 1 kilowatt, chapter 3
15. Splitting the Positive	—Clemente Figuera's 5 kilowatt generator (avoids back-EMF), chapter 3
16. Magnetic Coupling	—Raoul Hatem's multi-generator system, unlimited, chapter 2
17. Inert-gas motors	—Josef Papp (Volvo 90 HP engine @300 HP 40 min. demo), chapter 8 —Robert Britt, unlimited, chapter 8
18. Optical amplification	—Pavel Imris' optical amplifier, multiplier of 9 times, unlimited, chapter 3
19. Friction	—Paul Baumann's Thestatika (Wimshurst machine), 3 kilowatts, chapter 13
20. Piezo electricity	—Michael Ognyanov's semiconductor battery, 10 watts, appendix

Table 2: Continuation of Table 1. Methods and examples of over unity devices as described in the different chapters of Patrick Kelly's Guide to Free Energy Devices, found at[1].

Figure 1: Don Smith.

---

2 Don Smith's free energy devices

One of most impressive developers of free-energy devices is Don Smith (figure 1) who has produced many spectacular devices, generally with major power output. These are a result of his in-depth knowledge and understanding of the way that the environment works. Don says that his understanding comes from the work of Nikola Tesla as recorded in Thomas C. Martin's book "The Inventions, Researches, and Writings of Nikola Tesla" ISBN 0-7873-0582-0 available from http://www.healthresearchbooks.com and various other book companies. This book can be downloaded from http://www.free-energy-info.tuks.nl as a pdf file, but a paper copy is much better quality and easier to work from. (Note: some of the hyperlinks in this document no longer work.)

Don states that he repeated each of the experiments found in the book and that gave him his understanding of what he prefers to describe as the 'ambient background energy' which is called the 'zero-point energy field' elsewhere in this eBook. Don remarks that he has now advanced further than Tesla in this field, partly because of the devices now available to him and which were not available when Tesla was alive.

Don stresses two key points. Firstly, a dipole can cause a disturbance in the magnetic component of the 'ambient background' and that imbalance allows you to collect large amounts of electrical power, using capacitors and inductors (coils). Secondly, you can pick up as many powerful electrical outputs as you want from that one magnetic disturbance, without depleting the magnetic disturbance in any way. This allows massively more power output than the small power needed to create the magnetic disturbance in the first place. This is what produces a COP[1] > 1 device and Don has created nearly fifty different devices based on that understanding.

Although they get removed quite frequently, there is one video which is definitely worth watching if it is still there. It is located at http://www.metacafe.com/watch/2820531/don_smith_free_energy/ and was recorded in 2006. It covers a good deal of what Don has done. In the video, reference is made to Don's website but you will find that it has been taken over by Big Oil who have filled it with innocuous similar-sounding things of no consequence, apparently intended to confuse newcomers. A website which is run by Conny Öström of Sweden is http://www.johnnyfg.110mb.com/ and it has brief details of his prototypes and theory. You will find the only document of his which I could locate, here http://www.free-energy-info.com/Smith.pdf in pdf format, and it contains the following patent on a most interesting device which appears to have no particular limit on the output power. This is a slightly re-worded copy of that patent as patents are generally worded in such a way as to make them difficult to understand.

3 Transformer generator magnetic resonance into electricity

Patent NL 02000035 A   20th May 2004   Inventor: Donald Lee Smith

3.1 Abstract

The present invention refers to an Electromagnetic Dipole Device and Method, where wasted radiated energy is transformed into useful energy. A Dipole as seen in Antenna Systems is adapted for use with capacitor plates in such a way that the Heaviside Current Component becomes a useful source of electrical energy.

[1] "The coefficient of performance or COP (sometimes CP or CoP) of a heat pump, refrigerator or air conditioning system is a ratio of useful heating or cooling provided to work (energy) required. Higher COPs equate to higher efficiency, lower energy (power) consumption and thus lower operating costs. The COP usually exceeds 1, especially in heat pumps, because, instead of just converting work to heat (which, if 100% efficient, would be a COP of 1), it pumps additional heat from a heat source to where the heat is required. Most air conditioners have a COP of 2.3 to 3.5."[9]

3.2 Description

Technical Field:

This invention relates to loaded Dipole Antenna Systems and their Electromagnetic radiation. When used as a transformer with an appropriate energy collector system, it becomes a transformer/generator. The invention collects and converts energy which is radiated and wasted by conventional devices.

Background Art:

A search of the International Patent Database for closely related methods did not reveal any prior art with an interest in conserving radiated and wasted magnetic waves as useful energy.

3.3 Disclosure of the invention

The invention is a new and useful departure from transformer generator construction, such that radiated and wasted magnetic energy changes into useful electrical energy. Gauss meters show that much energy from conventional electromagnetic devices is radiated into the ambient background and wasted. In the case of conventional transformer generators, a radical change in the physical construction allows better access to the energy available. It is found that creating a dipole and inserting capacitor plates at right angles to the current flow, allows magnetic waves to change back into useful electrical (coulombs) energy. Magnetic waves passing through the capacitor plates do not degrade and the full impact of the available energy is accessed. One, or as many sets of capacitor plates as is desired, may be used. Each set makes an exact copy of the full force and effect of the energy present in the magnetic waves. The originating source is not depleted or degraded as is common in conventional transformers.

3.4 Brief description of the drawings

The Dipole at right angles, allows the magnetic flux surrounding it to intercept the capacitor plate, or plates, at right angles. The electrons present are spun such that the electrical component of each electron is collected by the capacitor plates. Essential parts are the South and North component of an active Dipole. Examples presented here exist as fully functional prototypes and were engineer constructed and fully tested in use by the Inventor. In each of the three examples shown in the drawings, corresponding parts are used. See figures 2, 3, 4 and 5.

3.5 Best method of carrying out the invention

The invention is applicable to any and all electrical energy requirements. The small size and it's high efficiency make it an attractive option, especially for remote areas, homes, office buildings, factories, shopping centres, public places, transportation, water systems, electric trains, boats, ships and 'all things great and small'. The construction materials are commonly available and only moderate skill levels are needed to make the device.

3.6 Claims

1. Radiated magnetic flux from the Dipole, when intercepted by capacitor plates at right angles, changes into useful electrical energy.
2. A Device and Method for converting for use, normally wasted electromagnetic energy.
3. The Dipole of the Invention is any resonating substance such as Metal Rods, Coils and Plasma Tubes which have interacting Positive and Negative components.
4. The resulting Heaviside current component is changed to useful electrical energy.

This patent does not make it clear that the device needs to be tuned and that the tuning is related to its physical location. The tuning will be accomplished by applying a variable-frequency input signal to the neon transformer and adjusting that input frequency to give the maximum output. Don Smith has produced some forty eight different devices, and because he understands that the real power in the universe is magnetic and not electric, these devices have performances which appear staggering to people trained to think that electrical power is the only source of power. The device shown below is physically quite small and yet it has an output of 160 kilowatts (8000 volts at 20 amps) from an input of 12 volts 1 amp (COP[2] = 13,333), as shown in figure 6.

[2] COP is the coefficient of performance, it is energy efficiency as output over input. E.g. if COP = 2, it means the device produces twice as much energy output as is input.

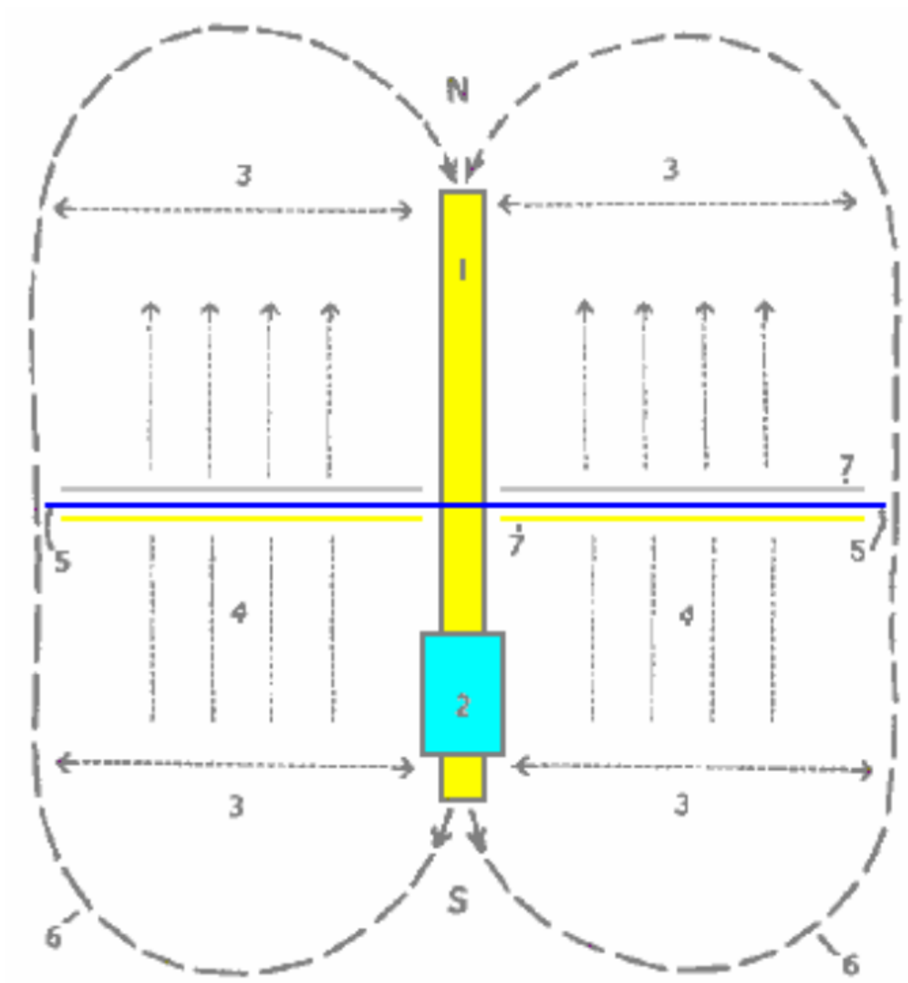


Figure 2: Above is shown a View of the Method, where **N** is the North and **S** is the South component of the Dipole. Here, **1** marks the Dipole with its North and South components. **2** is a resonant high-voltage induction coil. **3** indicates the position of the electromagnetic wave emission from the Dipole. **4** indicates the position and flow direction of the corresponding Heaviside current component of the energy flow caused by the induction coil **2**. **5** is the dielectric separator for the capacitor plates **7**. **6** for the purposes of this drawing, indicates a virtual limit for the scope of the electromagnetic wave energy.

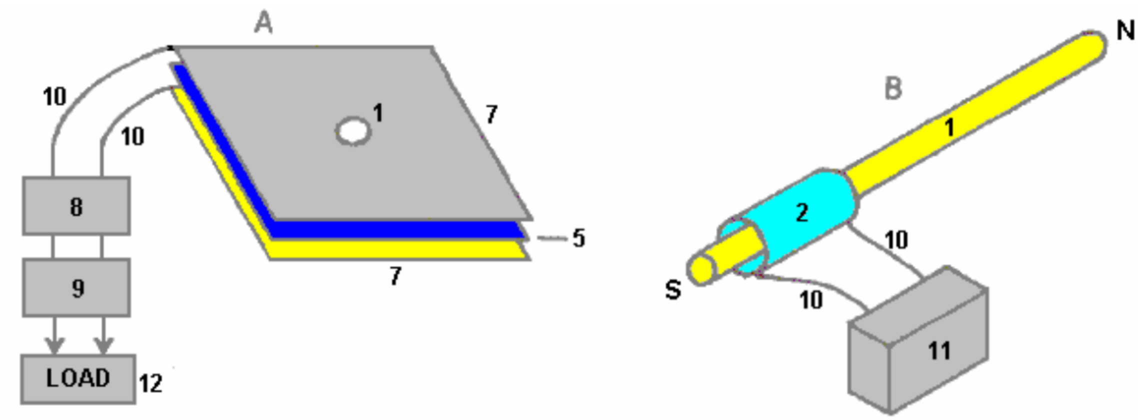


Figure 3: This diagram has two parts A and B. In A **1** is the hole in the capacitor plates through which the Dipole is inserted and in B it is the Dipole with its North (N) and South (S) poles shown. **2** is the resonant high-voltage induction coil surrounding part of the Dipole **1**. The dielectric separator **5**, is a thin sheet of plastic placed between the two capacitor plates **7**, the upper plate being made of aluminium and the lower plate made of copper. Unit **8** is a deep-cycle battery system powering a DC inverter **9** which produces 120 volts at 60 Hz (the US mains supply voltage and frequency, obviously, a 240 volt 50 Hz inverter could be used here just as easily) which is used to power whatever equipment is to be driven by the device. The reference number **10** just indicates connecting wires. Unit **11** is a high-voltage generating device such as a neon transformer with its oscillating power supply.

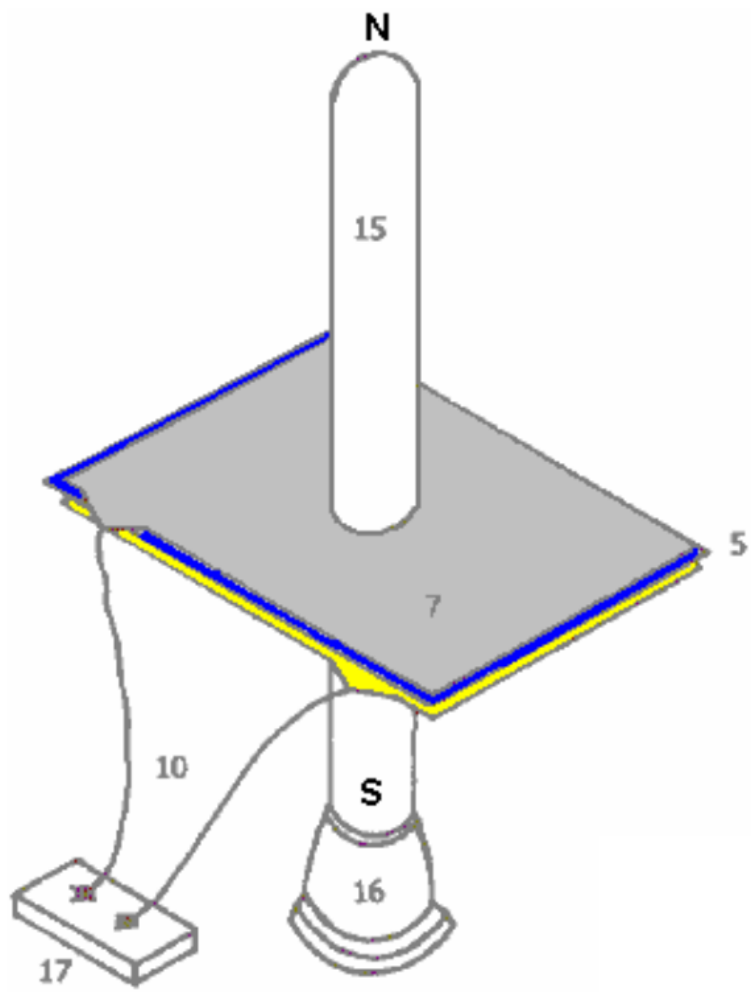


Figure 4: Here is a Proof Of Principal Device using a Plasma Tube as an active Dipole. In this drawing, **5** is the plastic sheet dielectric separator of the two plates **7** of the capacitor, the upper plate being aluminium and the lower plate copper. The connecting wires are marked **10** and the plasma tube is designated **15**. The plasma tube is four feet long (1.22 m) and six inches (150 mm) in diameter. The high-voltage energy source for the active plasma dipole is marked **16** and there is a connector box **17** shown as that is a convenient method of connecting to the capacitor plates when running tests on the device.

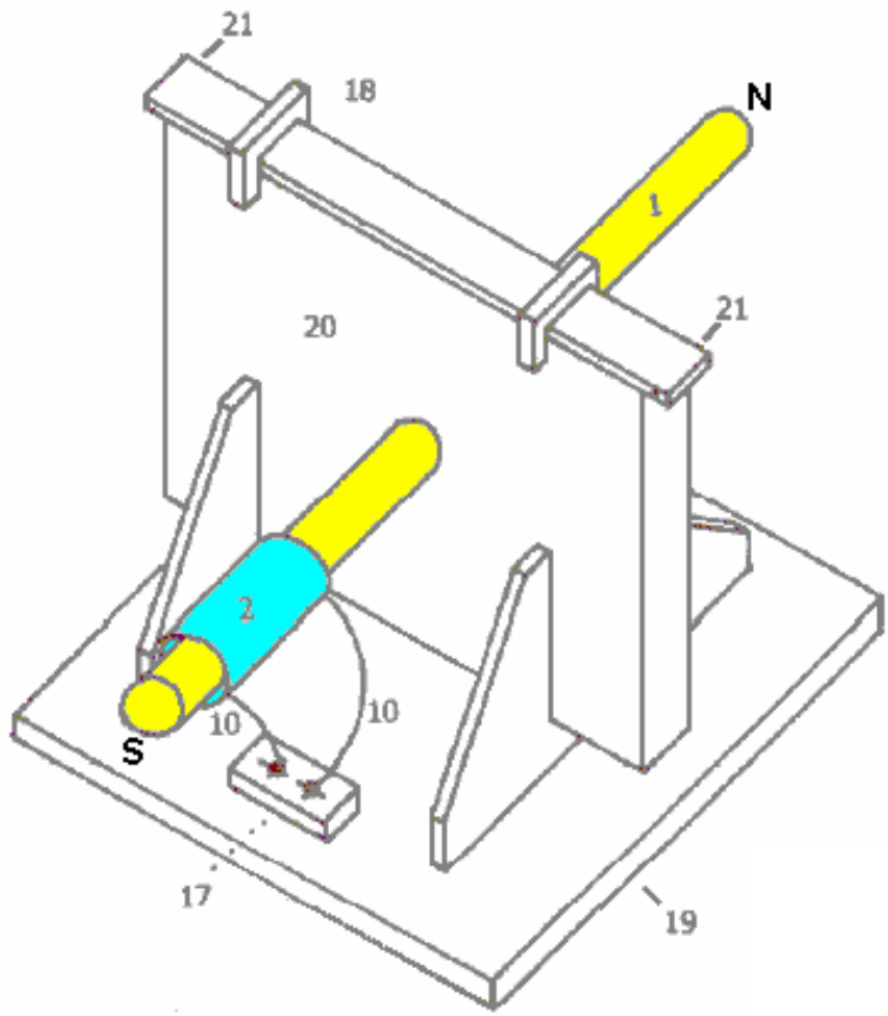


Figure 5: This diagram shows a Manufacturer's Prototype, constructed and fully tested. **1** is a metal Dipole rod and **2** the resonant high-voltage induction coil, connected through wires **10** to connector block **17** which facilitates the connection of it's high-voltage power supply. Clamps **18** hold the upper edge of the capacitor packet in place and **19** is the base plate with it's supporting brackets which hold the whole device in place. **20** is a housing which contains the capacitor plates and **21** is the point at which the power output from the capacitor plates is drawn off and fed to the DC inverter.

Figure 6: The device shown here is physically quite small and yet it has an output of 160 kilowatts (8000 volts at 20 amps) from an input of 12 volts 1 amp (COP = 13,333).

This is a device which can be placed on top of a table and is not a complicated form of construction, having a very open and simplistic layout. However, some components are not mounted on this board. The twelve volt battery and connecting leads are not shown, nor are the ground connections, the step-down isolation transformer and the varistor used to protect the load from over-voltage by absorbing any random induced voltage spikes which might occur.

The device shown above has various subtle points glossed over in spite of this being one device which Don says that we should be able to reproduce ourselves. Let me state here that reproducing this seemingly simple design of Don's is not an easy thing to do and it is not something which can be thrown together by a beginner using whatever components happen to be at hand at the time. Having said that, with careful study and common sense application of some obvious facts, it should be possible to make one of these devices, but more of these things later on when a much more detailed description of this device is given.

Another of Don's devices, somewhat similar to the one described in his patent, is shown in figure 7.

This is a larger device which uses a plasma tube four feet (1.22 m) long and 6 inches (150 mm) in diameter. The output is a massive 100 kilowatts. This is the design shown as one of the options in Don's patent. Being an Electrical Engineer, none of Don's prototypes are in the "toy" category. If nothing else is taken from Don's work, we should realise that high power outputs can be had from very simple devices.

There is one other brief document "Resonate Electrical Power System" from Don Smith which says:

Potential Energy is everywhere at all times, becoming useful when converted into a more practical form. There is no energy shortage, only grey matter. This energy potential is observed indirectly through the manifestation of electromagnetic phenomenon, when intercepted and converted, becomes useful. In nonlinear systems, interaction of magnetic waves amplify (conjugate) energy, providing greater output than input. In simple form, in the piano where three strings are struck by the hammer, the centre one is impacted and resonance activates the side strings. Resonance between the three strings provides a sound level greater than the input energy. Sound is part of the electromagnetic spectrum and is subject to all that is applicable to it.

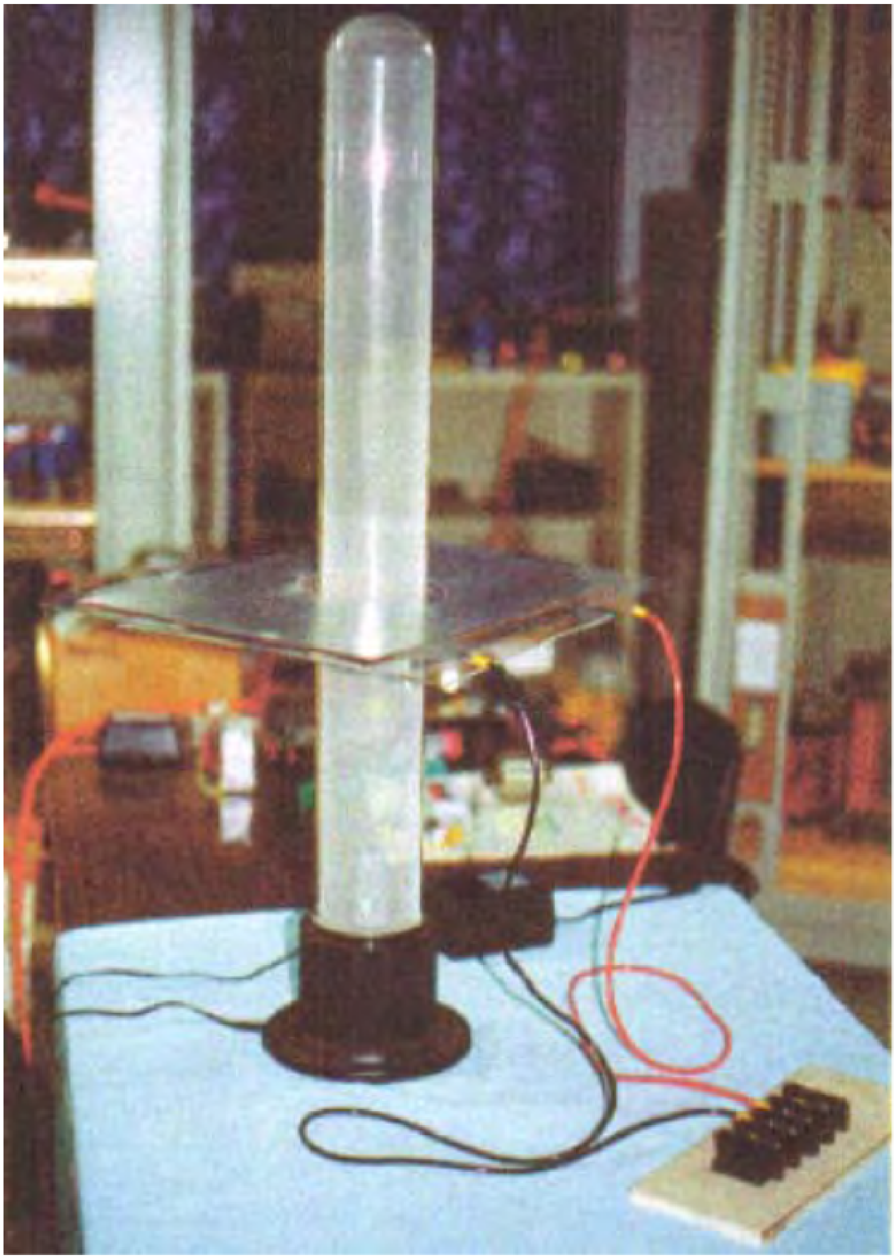


Figure 7: Another of Don's devices, somewhat similar to the one described in his patent, is shown here. This is a larger device which uses a plasma tube four feet (1.22 m) long and 6 inches (150 mm) in diameter. The output is a massive 100 kilowatts. This is the design shown as one of the options in Don's patent.

"Useful Energy" is defined as "that which is other than Ambient". "Electric Potential" relates to mass and it's acceleration. Therefore, the Earth's Mass and Speed through space, gives it an enormous electrical potential. Humans are like the bird sitting unaware on a high voltage line. in nature, turbulence upsets ambient and we see electrical displays. Tampering with ambient, allows humans to convert magnetic waves into useful electricity.

Putting this in focus, requires a look at the Earth in general. During each of the 1,440 minutes of each day, more than 4,000 displays of lightning occur. Each display yields more than 10,000,000 volts at more than 200,000 amperes in equivalent electromagnetic flux. This is more than 57,600,000,000,000 volts and 1,152,000,000,000 amperes of electromagnetic flux during each 24 hour period. This has been going on for more than 4 billion years. The USPTO[3] insist that the Earth's electrical field is insignificant and useless, and that converting this energy violates the laws of nature. At the same time, they issue patents in which, electromagnetic flux coming in from the Sun is converted by solar cells into DC energy. Aeromagnetic flux (in gammas) Maps World-Wide, includes those provided by the US Department of Interior-Geological Survey, and these show clearly that there is present, a spread of 1,900 gamma above Ambient, from reading instruments flown 1,000 feet above the (surface) source. Coulomb's Law requires the squaring of the distance of the remote reading, multiplied by the recorded reading. Therefore, that reading of 1,900 gamma has a corrected value of $1{,}900 \times 1{,}000 \times 1{,}000 = 1{,}900{,}000{,}000$ gamma.

There is a tendency to confuse "gamma ray" with "gamma". "Gamma" is ordinary, everyday magnetic flux, while "gamma ray" is high-impact energy and not flux. One gamma of magnetic flux is equal to that of 100 volts RMS. To see this, take a Plasma Globe emitting 40,000 volts. When properly used, a gamma meter placed nearby, will read 400 gammas. The 1,900,000,000 gamma just mentioned, is the magnetic ambient equivalent of 190,000,000 volts of electricity. This is on a "Solar Quiet" day. On "Solar Active" days it may exceed five times that amount. The Establishment's idea that the Earth's electrical field is insignificant, goes the way of their other great ideas.

There are two kinds of electricity: "potential" and "useful". All electricity is "potential" until it is converted. The resonant-fluxing of electrons, activates the electrical potential which is present everywhere. The Intensity/CPS of the resonant-frequency-flux rate, sets the available energy. This must then be converted into the required physical dimensions of the equipment being used. For example, energy arriving from

[3] United States Patent and Trademark Office

the Sun is magnetic flux, which solar cells convert to DC electricity, which is then converted further to suit the equipment being powered by it. Only the magnetic flux moves from point "A" (the Sun) to point "B" (the Earth). All electrical power systems work in exactly the same way. Movement of Coils and Magnets at point "A" (the generator) fluxes electrons, which in turn, excite electrons at point "B" (your house). **None of the electrons at point "A" are ever transmitted to point "B"**. In both cases, the electrons remain forever intact and available for further fluxing. This is not allowed by Newtonian Physics (electrodynamics and the laws of conservation). Clearly, these laws are all screwed up and inadequate.

In modern physics, USPTO style, all of the above cannot exist because it opens a door to overunity. The good news is that the PTO[4] has already issued hundreds of Patents related to Light Amplification, all of which are overunity. The Dynode used to adjust the self-powered shutter in your camera, receives magnetic flux from light which dislodges electrons from the cathode, reflecting electrons through the dynode bridge to the anode, resulting in billions of more electrons out than in. There are currently, 297 direct patents issued for this system, and thousands of peripheral patents, all of which support overunity. More than a thousand other Patents which have been issued, can be seen by the discerning eye to be overunity devices. What does this indicate about Intellectual Honesty?

Any coil system, when fluxed, causes electrons to spin and produce useful energy, once it is converted to the style required by its use. Now that we have described the method which is required, let us now see how this concerns us.

The entire System already exists and all that we need to do is to hook it up in a way which is useful to our required manner of use. Let us examine this backwards and start with a conventional output transformer. Consider one which has the required voltage and current handling characteristics and which acts as an isolation transformer. Only the magnetic flux passes from the input winding to the output winding. No electrons pass through from the input side to the output side. Therefore, we only need to flux the output side of the transformer to have an electrical output. Bad design by the establishment, allowing hysteresis of the metal plates, limits the load which can be driven. Up to this point, only potential is a consideration. Heat (which is energy loss) limits the output amperage. Correctly designed composite cores run cool, not hot.

[4] Patent & Trademark Office

A power correction factor system, being a capacitor bank, maintains an even flow of flux. These same capacitors, when used with a coil system (a transformer) become a frequency-timing system. Therefore, the inductance of the input side of the transformer, when combined with the capacitor bank, provides the required fluxing to produce the required electrical energy (cycles per second).

With the downstream system in place, all that is needed now is a potential system. Any flux system will be suitable. Any amplification over-unity output type is desirable. The input system is point “A” and the output system is point “B”. Any input system where a lesser amount of electrons disturbs a greater amount of electrons —producing an output which is greater than the input —is desirable.

At this point, it is necessary to present updated information about electrons and the laws of physics. A large part of this, originates from me (Don Smith) and so is likely to upset people who are rigidly set in the thought patterns of conventional science.

3.7 Non-ionic electrons

As a source of electrical energy, non-ionic electrons doublets exist in immense quantities throughout the universe. Their origin is from the emanation of Solar Plasma. When ambient electrons are disturbed by being spun or pushed apart, they yield both magnetic and electrical energy. The rate of disturbance (cycling) determines the energy level achieved. Practical methods of disturbing them include, moving coils past magnets or vice versa. A better way is the pulsing (resonant induction) with magnetic fields and waves near coils.

In coil systems, magnetic and amperage are one package. This suggests that electrons in their natural non-ionic state, exist as doublets. When pushed apart by agitation, one spins right (yielding Volts-potential electricity) and the other spins left (yielding Amperage-magnetic energy), one being more negative than the other. This further suggests that when they reunite, we have (Volts × Amps = Watts) useful electrical energy. Until now, this idea has been totally absent from the knowledge base. The previous definition of Amperage is therefore flawed.

3.8 Electron related energy

Left hand spin of electrons results in Electrical Energy and right hand spin results in Magnetic Energy. Impacted electrons emit visible Light and heat.

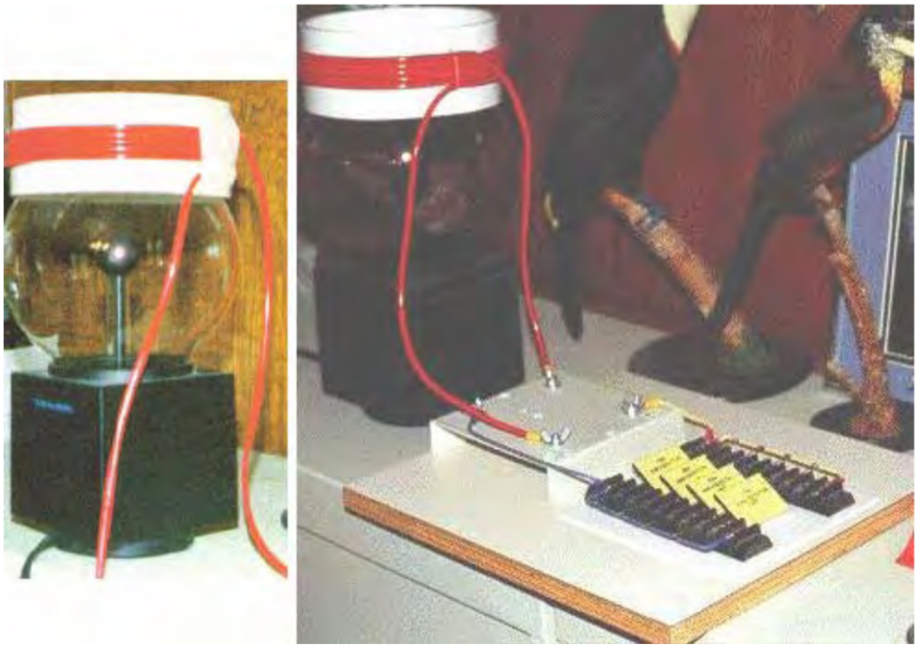


Figure 8: Plasma Globe and circuitry.

3.9 Useful circuits, suggestions for building an operational unit

1. Substitute a Plasma Globe (figure 8) such as Radio Shack's "Illumna-Storm" for the source-resonant induction system. It will have about 400 milligauss of magnetic induction. One milligauss is equal to 100 volts worth of magnetic induction.

2. Construct a coil using a 5-inch to 7-inch (125 to 180 mm) diameter piece of PVC for the coil former.

3. Get about 30 feet (10 m) of Jumbo-Speaker Cable and separate the two strands. This can be done by sticking a carpet knife into a piece of cardboard or wood, and then pulling the cable carefully past the blade to separate the two insulated cores from each other. (PJK Note: "Jumbo-Speaker Cable" is a vague term as that cable comes in many varieties, with anything from a few, to over 500 strands in each core).

4. Wind the coil with 10 to 15 turns of wire and leave about 3 feet (1 m) of cable spare at each end of the coil. Use a glue gun to hold the start and finish of the

coil.

5. This will become the “L-2” coil shown in the Circuits page (figure 9).

6. When sitting on top of the Plasma Globe (like a crown) you have a first-class resonant air-core coil system.

7. Now, substitute two or more capacitors (rated at 5,000 volts or more) for the capacitor bank shown on the Circuits page (figure 9). I use more than two 34 microfarad capacitors.

8. Finish out the circuit as shown. You are now in business!

9. Voltage - Amperage limiting resistors are required across the output side of the Load transformer. These are used to adjust the output level and the desired cycles per second.

3.10 Don Smith’s suggestions

Get a copy of the “Handbook of Electronic Tables and Formulas”, published by Sams, ISBN 0-672-22469-0, also an Inductance/Capacitance/Resistance meter is required. Chapter 1 of Don’s pdf document has important time-constant (frequency) information and a set of reactance charts in nomograph style (“nomograph”: a graph, usually containing three parallel scales graduated for different variables so that when a straight line connects values of any two, the related value may be read directly from the third at the point intersected by the line) which makes working, and approximating of the three variables (capacitance, inductance and resistance) much easier. If two of the variables are known, then the third one can be read from the nomograph. (There is a nomograph chart shown later on in this document, see figure 38.)

For example, if the input side of the isolation transformer needs to operate at 60 Hz, that is 60 positive cycles and 60 negative cycles, being a total of 120 cycles. Read off the inductance in Henries by using an Inductance meter attached to the input side of the isolation transformer. Plot this value on the (nomographic) reactance chart (see figure 38). Plot the needed 120 Hz on the chart and connect these two points with a straight line. Where this line crosses the Farads line and the Ohms line, gives us two values. Choose one (resistor) and insert it between the two leads of the transformer input winding.

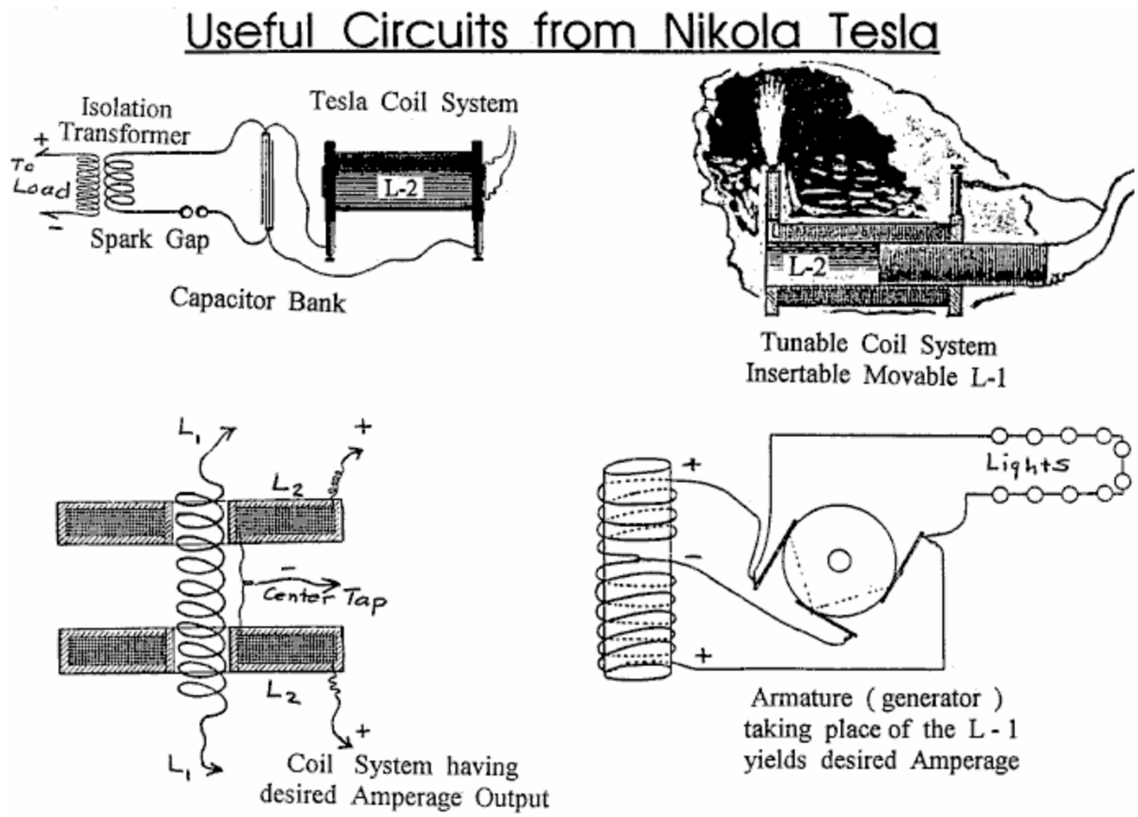


Figure 9: Useful circuits from Nikola Tesla.

The Power Correction Factor Capacitor (or bank of more than one capacitor) now needs adjusting. The following formula is helpful in finding this missing information. The capacitance is known, as is the desired potential to pulse the output transformer. One Farad of capacitance is one volt for one second (one Coulomb). Therefore, if we want to keep the bucket full with a certain amount, how many dippers full are needed? If the bucket needs 120 volts, then how many coulombs are required?

$$\frac{Desired\ Voltage}{Capacitance\ in\ Microfarads} = Required\ frequancy\ in\ Hz$$

Now, go to the nomograph (see figure 38) mentioned above, and find the required resistor jumper to place between the poles of the Correction Factor Capacitor.

An earth grounding is desirable, acting as both a voltage-limiter and a transient spike control. Two separate earths are necessary, one at the Power Factor Capacitor and one at the input side of the isolation transformer. Off-the-shelf surge arrestors / spark gaps and varistors having the desired voltage/potential and amperage control are commonly available. Siemens, Citel America and others, make a full range of surge arrestors, etc. Varistors look like coin-sized flat capacitors. Any of these voltage limiters are marked as “V-1” in the following text.

It should be obvious that several separate closed circuits are present in the suggested configuration: The power input source, the high-voltage module, a power factor capacitor bank combined with the input side of the isolation transformer. Lastly, the output side of the isolation transformer and its load. None of the electrons active at the power source (battery) are passed through the system for use downstream. At any point, if the magnetic flux rate should happen to vary, then the number of active electrons also varies. Therefore, controlling the flux rate controls the electron (potential) activity. Electrons active at point “A” are not the same electrons which are active at point “B”, or those at point “C”, and so on. If the magnetic flux rate (frequency Hz) varies, then a different number of electrons will be disturbed. This does not violate any Natural Law and it does produce more output energy than the input energy, should that be desirable.

A convenient high-voltage module is a 12 volt DC neon tube transformer. The Power Factor Correction Capacitors should be as many microfarads as possible as this allows a lower operating frequency. The 12-volt neon tube transformer oscillates at about 30,000 Hz. At the Power Correction Factor Capacitor bank we lower the frequency to match the input side of the isolation transformer.

Other convenient high-voltage sources are car ignition coils, television flyback transformers, laser printer modules, and various other devices. Always lower the frequency at the Power Factor Correction Capacitor and correct, if needed, at the input side of the isolation transformer. The isolation transformer comes alive when pulsed. Amperage becomes a part of the consideration only at the isolation transformer. Faulty design, resulting in hysteresis, creates heat which self-destructs the transformer if it is overloaded. Transformers which have a composite core instead of the more common cores made from many layers of thin sheets of soft iron, run cool and can tolerate much higher amperage.

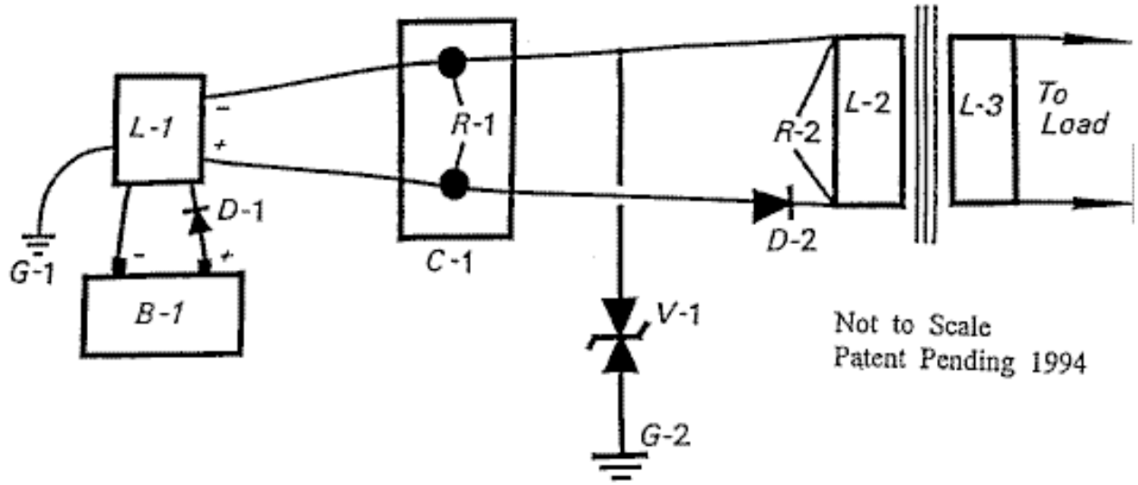
The information shown in figures 10 and 11, relates to the small Suitcase Model demonstrated at the 1996 Tesla Convention, presented as Don Smiths' Workshop. This unit was a very primitive version and newer versions have atomic batteries and power output ranges of Gigawatts. The battery requirement is low level and is no more harmful than the radium on the dial of a clock. Commercial units of Boulder Dam size are currently being installed at several major locations throughout the world. For reasons of Don's personal security and contract obligations, the information which he has shared here, is incomplete. Also see a list of references in figure 12.

PJK: I am most definitely not an expert in this area. However, it is probably worth mentioning some of the main points which Don Smith appears to be making. There are some very important points being made here, and grasping these may make a considerable difference to our ability to tap into the excess energy available in our local environment. There are four points worth mentioning:

1. Voltage
2. Frequency
3. Magnetic / Electric relationship
4. Resonance

1. Voltage. We tend to view things with an 'intuitive' view, generally based on fairly simple concepts. For example, we automatically think that it is more difficult to pick up a heavy object than to pick up a light one. How much more difficult? Well, if it is twice as heavy, it would probably be about twice as much effort to pick

RESONATE ELECTROMAGNETIC POWER SYSTEM



Power Source: B - 1 Gelcell, 12 Volt, 7 Amp Hour
D - 1 Kick back protection for L - 1
L - 1 Bertonee, NPS - 12D8, constant burn Neon Tube transformer, Bertonee, Boston, MS

Power Conditioner: C - 1, Capacitor or Capacitor Bank, 8,000 microfarads for 480 volts DC. R - 1, Resistor used to set electron pump rate, frequency of the capacitor. Maintains the desired voltage level required to operate the system.

Voltage Control: V-1, Varistor, limits the voltage as required for the Output Transformer L -2. (480 V @ 60 Amps)

Output Transformer: Isolation Type, (L - 2 / L-3) with R - 2 (resistor) correcting the output frequency to 60 CPS, being 60 UP and 60 DN (120 total). (28.8 KVA)

Useful Timing Formulas:

T = frequency in cycles per second
C = capacitance in microfarads
L = Inductance in milliheneries
R = resistance in ohms

Therefore: $T = RC$ and $T = \frac{L}{R}$

Figure 10: Resonant electromagnetic power system.

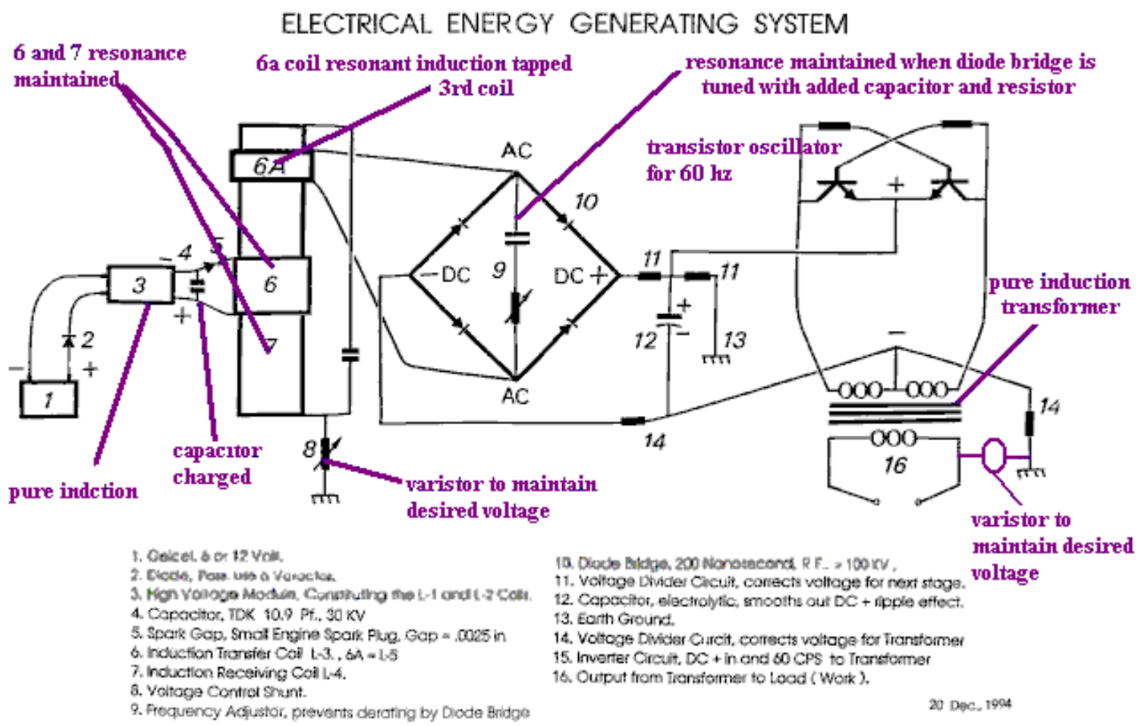


Figure 11: Electrical energy generating system.

Booker, H.G., " Energy in Electromagnetism ", Institute of Electrical Engineers, Peter Peregrinus, Ltd., 1982, I.S.B.N. 0-906048-59-1

Bleany and Bleany, " Electricity and Magnetism ", Oxford University Press, 1991, I.S.B.N. 0-19-851172-8

Chapman and Bartels, " Geomagnetism ", 3 vol., Oxford University Press, 1940

Hammond, P., " Energy Methods in Electromagnetism ", Oxford University Press, 1986, I.S.B.N. 0-19-859368-6

Matsushita and Campbell, " Physics of Geomagneic Phenomena ", several vols., National Center for Atmospheric Research, Boulder, Colorado, Academic press, 1967

Nashida, A., " Geomagnetic Diagnosis of the Magnetosphere ", University of Tokyo, Springer-Verlag, 1978, I.S.B.N. 0-387-08297-2

Rieger, Von Heinz., " Der Magnetisch Kreis ", Siemens A.G., Berlin and Munchen, Germany, I.S.B.N. 3-8009-4719-6

Rokityansky, I.I., " Geoelectrical investigation of the Earth's Crust and Mantel ", Institute of Geophysics, Kiev, U.S.S.R., Springer-Verlag, 1982, I.S.B.N. 3-540-10630-8

Vigoureux, P., " Units and Standards for Electromagnetics ", National Physical Laboratory, 1971, Springer-Verlag, I.S.B.N. 0-387-91077-8

Finnell, Woosley, " Solar Power Satellite Microwave Transmission and Receiver System. Energy Conversion Conference, Sept. 1981 pp 266-271

Glaser, " Satellite Solar Power Station " The Journal of Solar Energy and Technology, Vol. 12, No. 3., p. 353 .

Denmum et al, "A Microwave Power Transmission System for Space Satellite Power", Energy Conversion Conference Conference, Sept. 1977, pp 162-168

Nalos et al, "Microwave Power Beaming for long range energy transfer" "Proceedings of the 8 th European Microwave Conference" pp 573-578, 4 through 8 th. Sept., 1978

Angrist, S.W., " Direct Energy Conversion ", forth edition, Carnegie-Mellon University, Pub. Allyn and Bacon, Boston, London, Sidney and Toronto, ISBN 0-205-07758-7

Smith, D.L., " An Answer to Americas Energy Defict " , fifth edition, Pub. International Tesla Society, Colorado Springs, Co., 1996

Aspden, H. " The Law of Electrodynamics ", J. Franklin Inst., 287:179, 1969.

Sethian, J.D., " Anomalous Electron-Ion Energy Transfer ", Phys. Rev. Letters, vol. 40, No. 7, pp. 451-454 , 1978.

Westinghouse R. & D., "Electromagnetic Spectrum Chart"., Pub. The Exploratorium, San Francisco, CA 94123, Distributed by Edmond Scientific, Barrington, N.J. 06007 Order # 609-573-6250

****

Figure 12: References —probably relating to above power system schematics, for the small Suitcase Model demonstrated at the 1996 Tesla Convention.

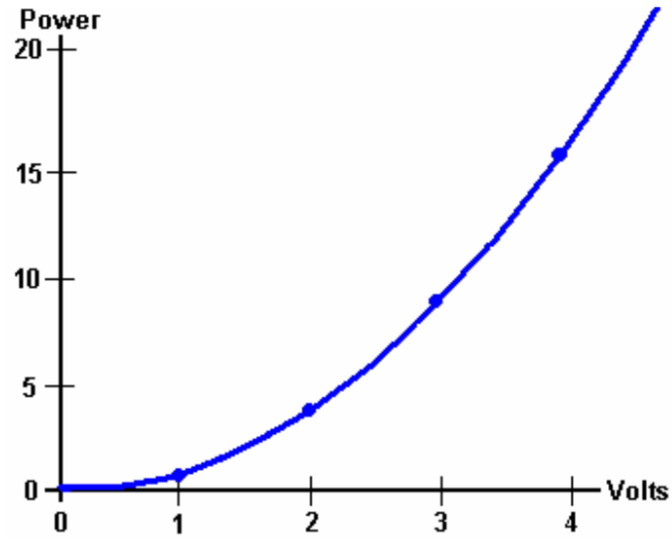


Figure 13: Don Smith points out that as capacitors and coils store energy, if they are involved in the circuit, then the output power is proportional to the square of the voltage used.

it up. This view has developed from our experience of things which we have done in the past, rather than on any mathematical calculation or formula.

Well, how about pulsing an electronic system with a voltage? How would the output power of a system be affected by increasing the voltage? Our initial 'off-the cuff' reaction might be that the power output might be increased a bit, but then hold on... we've just remembered that Watts = Volts × Amps, so if you double the voltage, then you would double the power in watts. So we might settle for the notion that if we doubled the voltage then we could double the output power. If we thought that, then we would be wrong.

Don Smith points out that as capacitors and coils store energy, if they are involved in the circuit, then the output power is proportional to the **square** of the voltage used (figure 13). Double the voltage, and the output power is four times greater. Use three times the voltage and the output power is nine times greater. Use ten times the voltage and the output power is one hundred times greater!

Don says that the energy stored, multiplied by the cycles per second, is the energy being pumped by the system. Capacitors and inductors (coils) temporarily store electrons, and their performance is given by:

Capacitor formula: $W = 0.5 \times C \times V^2 \times Hz$ where:

W is the energy in Joules (Joules = Volts × Amps × seconds)
C is the capacitance in Farads
V is the voltage
Hz is the cycles per second.

Inductor formula: $W = 0.5 \times L \times A^2 \times Hz$ where:

W is the energy in Joules
L is the inductance in henrys
A is the current in amps
Hz is the frequency in cycles per second.

You will notice that where inductors (coils) are involved, then the output power goes up with the square of the current. Double the voltage and double the current gives four times the power output due to the increased voltage and that increased output is increased by a further four times due to the increased current, giving sixteen times the output power.

2. Frequency. You will notice from the formulas above, that the output power is directly proportional to the frequency "Hz". The frequency is the number of cycles per second (or pulses per second) applied to the circuit. This is something which is not intuitive for most people. If you double the rate of pulsing, then you double the power output. When this sinks in, you suddenly see why Nikola Tesla tended to use millions of volts and millions of pulses per second. However, Don Smith states that when a circuit is at it's point of resonance, resistance in the circuit drops to zero and the circuit becomes effectively, a superconductor. The energy for such a system which is in resonance is:

Resonant circuit: $W = 0.5 \times C^2 \times V \times (Hz)^2$ where:

W is the energy in Joules
C is the capacitance in Farads
V is the voltage

Hz is the cycles per second.

If this is correct, then raising the frequency in a resonating circuit has a massive effect on the power output of the device. The question then arises: why is the mains power in Europe just fifty cycles per second and in America just sixty cycles per second? If power goes up with frequency, then why not feed households at a million cycles per second? One major reason is that it is not easy to make electric motors which can be driven with power delivered at that frequency, so a more suitable frequency is chosen in order to suit the motors in vacuum cleaners, washing machines and other household equipment.

However, if we want to extract energy from the environment, then we should go for high voltage and high frequency. Then, when high power has been extracted, if we want a low frequency suited to electric motors, we can pulse the already captured power at that low frequency. It might be speculated that if a device is being driven with sharp pulses which have a very sharply rising leading edge, that the effective frequency of the pulsing is actually determined by the speed of that rising edge, rather than the rate at which the pulses are actually generated. For example, if pulses are being generated at, say, 50 kHz but the pulses have a leading edge which would be suited to a 200 kHz pulse train, then the device might well see the signal as a 200 kHz signal with a 25% Mark/Space ratio, the very suddenness of the applied voltage having a magnetic shocking effect equivalent to a 200 kHz pulse train.

3. Magnetic / Electric relationship. Don states that the reason why our present power systems are so inefficient is because we concentrate on the electric component of electromagnetism. These systems are always COP < 1 as electricity is the 'losses' of electromagnetic power. Instead, if you concentrate on the magnetic component, then there is no limit on the electric power which can be extracted from that magnetic component. Contrary to what you might expect, if you install a pick-up system which extracts electrical energy from the magnetic component, you can install any number of other identical pick-ups, each of which extract the same amount of electrical energy from the magnetic input, without loading the magnetic wave in any way. Unlimited electrical output for the 'cost' of creating a single magnetic effect.

The magnetic effect which we want to create is a ripple in the zero-point energy field, and ideally, we want to create that effect while using very little power. Creating a dipole with a battery which has a Plus and a Minus terminal or a magnet which has North and South poles, is an easy way to do create an electromagnetic imbal-

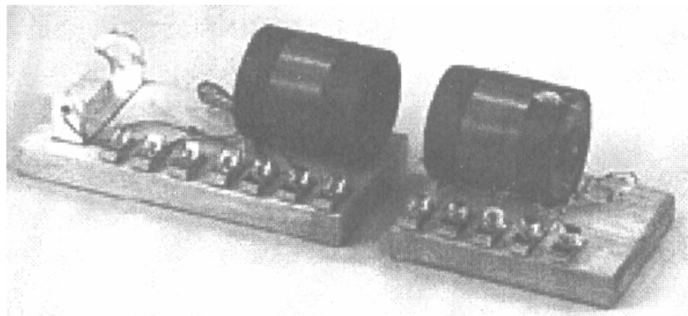


Figure 14: “Transmitter / Receiver” educational kit “Resonant Circuits #10-416” which was supplied by The Science Source, Maine.

ance in the local environment. Pulsing a coil is probably an even better way as the magnetic field reverses rapidly if it is an air-core coil, such as a Tesla Coil. Using a ferromagnetic core to the coil can create a problem as iron can’t reverse it’s magnetic alignment very rapidly, and ideally, you want pulsing which is at least a thousand times faster than iron can handle.

Don draws attention to the “Transmitter / Receiver” educational kit “Resonant Circuits #10-416” (figure 14) which was supplied by The Science Source, Maine. This kit demonstrated the generation of resonant energy and it’s collection with a receiver circuit. However, if several receiver circuits are used, then the energy collected is increased several times without any increase in the transmitted energy. This is similar to a radio transmitter where hundreds of thousands of radio receivers can receive the transmitted signal without loading the transmitter in any way. In Don’s day, this kit was driven by a 1.5 volt battery and lit a 60-watt bulb which was supplied. Not surprisingly, that kit has been discontinued and a trivial kit substituted.

If you get the Science Source educational kit, then there are some details which you need to watch out for. The unit has two very nice quality plastic bases and two very neatly wound coils each of 60 turns of 0.47 mm diameter enamelled copper wire on clear acrylic tubes 57 mm (2.25”) in diameter. The winding covers a 28 mm section of the tube. The layout of the transmitter and receiver modules does not match the accompanying instruction sheet and so considerable care needs to be taken when wiring up any of their circuits. The circuit diagrams are not shown, just a wiring diagram, which is not great from an educational point of view. The one relevant circuit is shown in figure 15.

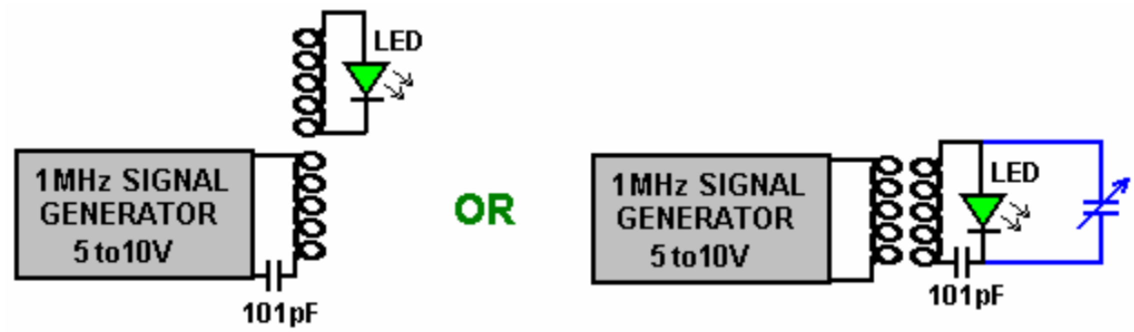


Figure 15: For the Science Source educational kit, the circuit diagrams are not shown, just a wiring diagram, which is not great from an educational point of view. The one relevant circuit is shown above.

Before you buy the kit, it is not mentioned that in order to use it, you now need a signal generator capable of producing a 10-volt signal at 1 MHz. The coil has a DC resistance of just 1.9 ohms but at a 1 MHz resonant frequency, the necessary drive power is quite low.

A variable capacitor is mounted on the receiver coil tube, but the one in my kit made absolutely no difference to the frequency tuning, nor was my capacitance meter able to determine any capacitance value for it at all, even though it had no trouble at all in measuring the 101 pF capacitor which was exactly the capacitance printed on it. For that reason, it is shown in blue in the circuit diagram above (figure 15). Disconnecting it made no difference whatsoever.

In this particular kit, standard screw connectors have had one screw replaced with an Allen key headed bolt which has a head large enough to allow finger tightening. Unfortunately, those bolts have a square cut tip where a domed tip is essential if small diameter wires are to be clamped securely. If you get the kit, then I suggest that you replace the connectors with a standard electrical screw connector strip.

In tests, the LED lights up when the coils are aligned and within about 100 mm of each other, or if they are close together side by side. This immediately makes the Hubbard device spring to mind. Hubbard has a central "electromagnetic transmitter" surrounded by a ring of "receivers" closely coupled magnetically to the transmitter, each of which will receive a copy of the energy sent by the transmitter, as shown in figure 16.

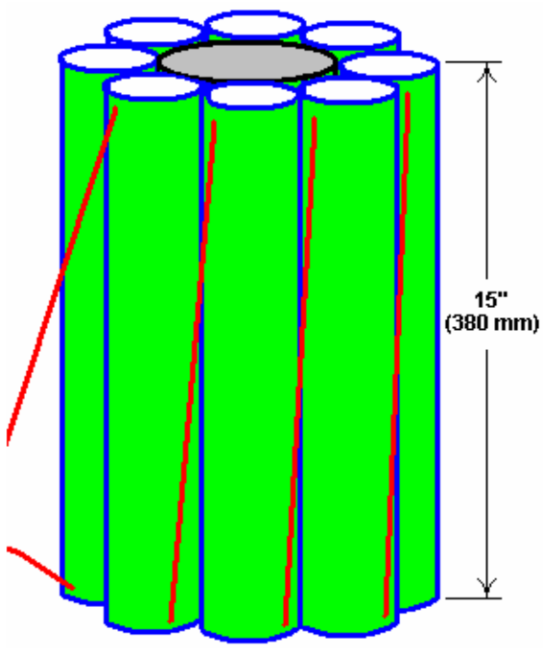


Figure 16: The Hubbard device. Hubbard has a central "electromagnetic transmitter" surrounded by a ring of "receivers" closely coupled magnetically to the transmitter, each of which will receive a copy of the energy sent by the transmitter, as shown in the above diagram.

Don Smith points to an even more clearly demonstrated occurrence of this effect in the Tesla Coil. In a typical Tesla Coil, the primary coil is much larger diameter than the inner secondary coil. See figure 17.

If, for example, 8,000 volts is applied to the primary coil which has four turns, then each turn would have 2,000 volts of potential. Each turn of the primary coil transfers electromagnetic flux to every single turn of the secondary winding, and the secondary coil has a very large number of turns. Massively more power is produced in the secondary coil than was used to energise the primary coil. A common mistake is to believe that a Tesla Coil can't produce serious amperage. If the primary coil is positioned in the middle of the secondary coil as shown, then the amperage generated will be as large as the voltage generated. A low power input to the primary coil can produce kilowatts of usable electrical power as described in chapter 5 of [1].

Figure 17: In a typical Tesla Coil, the primary coil is much larger diameter than the inner secondary coil.

Figure 18: Everything has it's own resonant frequency, whether it is a coil or any other electronic component. When components are connected together to form a circuit, the circuit has an overall resonant frequency. As a simple example, consider a swing shown above.

4. Resonance. An important factor in circuits aimed at tapping external energy is resonance. It can be hard to see where this comes in when it is an electronic circuit which is being considered. However, everything has it's own resonant frequency, whether it is a coil or any other electronic component. When components are connected together to form a circuit, the circuit has an overall resonant frequency. As a simple example, consider a swing in figure 18.

If the swing is pushed before it reaches the highest point on the mother's side, then the push actually opposes the swinging action. The time of one full swing is the resonant frequency of the swing, and that is determined by the length of the supporting ropes holding the seat and not the weight of the child nor the power with which the child is pushed. Provided that the timing is exactly right, a very small push can get a swing moving in a substantial arc. The key factor is, matching the pulses applied to the swing, that is, to the resonant frequency of the swing. Get it right and a large movement is produced. Get it wrong, and the swing doesn't get going at all (at which point, critics would say "see, see... swings just don't work —this proves it !!"). This principle is demonstrated in the video at http://www.youtube.com/watch?v=irwK1VfoiOA. Establishing the exact pulsing rate needed for a resonant circuit is not particularly easy, because the circuit contains coils (which have inductance, capacitance and resistance), capacitors (which have capacitance and a small amount of resistance) and resistors and wires, both of which have resistance and some capacitance. These kinds of circuit are called "LRC" circuits because "L" is the symbol used for inductance, "R" is the symbol used for resistance and "C" is the symbol used for capacitance.

Don Smith provides instructions for winding and using the type of air-core coils needed for a Tesla Coil. He says:

(1) Decide a frequency and bear in mind, the economy of the size of construction selected. The factors are:

  (a) Use radio frequency (above 20 kHz).
  (b) Use natural frequency, i.e. match the coil wire length to the frequency —coils have both capacitance and inductance.
  (c) Make the wire length either one quarter, one half of the full wavelength.
  (d) Calculate the wire length in feet as follows:
    (i) If using one quarter wavelength, then divide 247 by the frequency in MHz.
    (ii) If using one half wavelength, then divide 494 by the frequency in MHz.
    (iii) If using the full wavelength, then divide 998 by the frequency in MHz.

  For wire lengths in metres:
    (i) If using one quarter wavelength, then divide 75.29 by the frequency in MHz.
    (ii) If using one half wavelength, then divide 150.57 by the frequency in MHz.
    (iii) If using the full wavelength, then divide 304.19 by the frequency in MHz.

(2) Choose the number of turns to be used in the coil when winding it using the wire length just calculated. The number of turns will be governed by the diameter of the tube on which the coil is to be wound. Remember that the ratio of the number of turns in the "L-1" and "L-2" coils, controls the overall output voltage. For example, if the voltage applied to the large outer coil "L-1" is 2,400 volts and L-1 has ten turns, then each turn of L-1 will have 240 volts dropped across it. This 240 volts of magnetic induction transfers 240 volts of electricity to every turn of wire in the inner "L-2" coil. If the diameter of L-2 is small enough to have 100 turns, then the voltage produced will be 24,000 volts. If the diameter of the L-2 former allows 500 turns, then the output voltage will be 120,000 volts.

(3) Choose the length and diameter of the coils. The larger the diameter of the coil, the fewer turns can be made with the wire length and so the coil length will be less, and the output voltage will be lower.

(4) For example, if 24.7 MHz is the desired output frequency, then the length of wire, in feet, would be 247 divided by 24.7 which is 10 feet of wire (3,048 mm). The coil may be wound on a standard size of PVC pipe or alternatively, it can be purchased from a supplier —typically, an amateur radio supply store.

If the voltage on each turn of L-1 is arranged to be 24 volts and the desired output voltage 640 volts, then there needs to be 640 / 24 = 26.66 turns on L-2, wound with the 10 feet of wire already calculated.

Note: At this point, Don's calculations go adrift and he suggests winding 30 turns on a 2-inch former. If you do that, then it will take about 16 feet of wire and the resonant point at 10-feet will be at about 19 turns, giving an output voltage of 458 volts instead of the required 640 volts, unless the number of turns on L-1 is reduced to give more than 24 volts per turn. However, the actual required diameter of the coil former (plus one diameter of the wire) is $10 \times 12 / (26.67 \times 3.14159) = 1.43$ inches. You can make this size of former up quite easily if you want to stay with ten turns on the L-1 coil.

(5) Connect to the start of the coil. To determine the exact resonant point on the coil, a measurement is made. Off-the-shelf multimeters are not responsive to high-frequency signals so a cheap neon is used instead. Holding one wire of the neon in one hand and running the other neon wire along the outside of the L-2 winding, the point of brightest light is located. Then the neon is

moved along that turn to find the brightest point along that turn, and when it is located, a connection is made to the winding at that exact point. L-2 is now a resonant winding. It is possible to increase the ("Q") effectiveness of the coil by spreading the turns out a bit instead of positioning them so that each turn touches both of the adjacent turns.

(6) The input power has been suggested as 2,400 volts. This can be constructed from a Jacob's ladder arrangement or any step-up voltage system. An off-the-shelf module as used with lasers is another option.

(7) Construction of the L-1 input coil has been suggested as having 10 turns. The length of the wire in this coil is not critical. If a 2-inch diameter PVC pipe was used for the L-2 coil, then the next larger size of PVC pipe can be used for the L-1 coil former. Cut a 10-turn length of the pipe (probably a 3-inch diameter pipe). The pipe length will depend on the diameter of the insulated wire used to make the winding. Use a good quality multimeter or a specialised LCR meter to measure the capacitance (in Farads) and the inductance (in henrys) of the L-2 coil. Now, put a capacitor for matching L-1 to L-2 across the voltage input of L-1, and a spark gap connected in parallel is required for the return voltage from L-1. A trimmer capacitor for L-1 is desirable.

(8) The performance of L-2 can be further enhanced by attaching an earth connection to the base of the coil. The maximum output voltage will be between the ends of coil L-2 and lesser voltages can be taken off intermediate points along the coil if that is desirable.

This frequency information can be rather hard to understand in the way that Don states it. It may be easier to follow the description given by one developer who says:

"I have noticed that any machine can be made a super machine just by adding a bipolar capacitor across the coil. Nothing else is needed. With the correct capacitor the coil becomes Naturally Resonant and uses very little Amperage. Each machine uses a different size capacitor. The correct capacitor size can be calculated by dividing the speed of light by the coil's wire length first to get the coil's Natural Frequency and then dividing the voltage to be used by that frequency. The result is the correct size for the capacitor. Your machine will then be very powerful even working from a 12V car battery, no other additions needed.

My coil's wire length is 497.333 meters.

Figure 19: One of Don Smith's devices shown here provides quite an amount of information.

299000000 m/sec / 497.333 m = 600000 Hz. 12V / 600000 = 0.00002 or 20 microfarads. A beautiful Naturally Resonant Tank circuit. You can use this with any coil for overunity!
Once we have a Naturally Resonant Coil/Capacitor combination we can bring the frequency down to 50 Hz by calculating for the Power Factor Correction:

Hz = Resistance × Farads
then 50 Hz = R × 0.00002
so 50 / 0.00002 = 2500000
and R = 2500000 or 2.5 Mega Ohms.

We then place all three components in parallel and our coil should give us a 50 Hz output."

Don provides quite an amount of information on one of his devices shown in figure 19.

Without his description of the device, it would be difficult to understand it's construction and method of operation. As I understand it, the circuit of what is mounted on this board is as shown in figure 20.

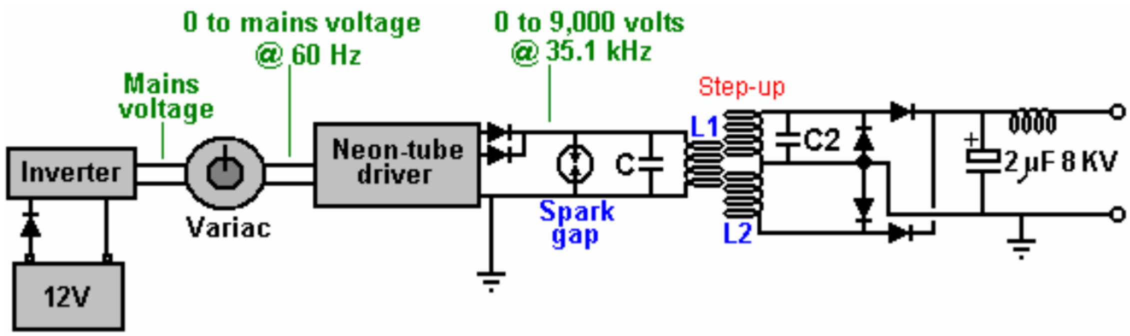


Figure 20: As Patrick Kelly understands it, the circuit of what is mounted on this board of figure 19, is shown here.

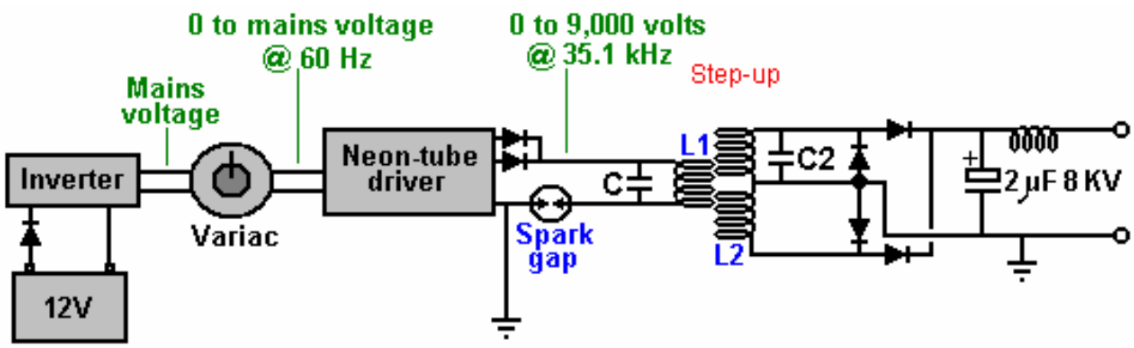


Figure 21: The arrangement in figure 20 has bothered some readers recently as they feel that the spark gap should be in series with the L1 coil, as shown above.

This arrangement (figure 20) has bothered some readers recently as they feel that the spark gap should be in series with the L1 coil, as shown in figure 21.

This is understandable, as there is always a tendency to think of the spark gap as being a device which is there to protect against excessive voltages rather than seeing it as an active component of the circuit, a component which is in continuous use. In 1925, Hermann Plauson was granted a patent for a whole series of methods for converting the high voltage produced by a tall aerial system into useable, standard electricity. Hermann starts off by explaining how high voltage can be converted into a convenient form and he uses a Wimshurst static electricity generator as an example of a constant source of high voltage. The output from a rectified Tesla Coil, a

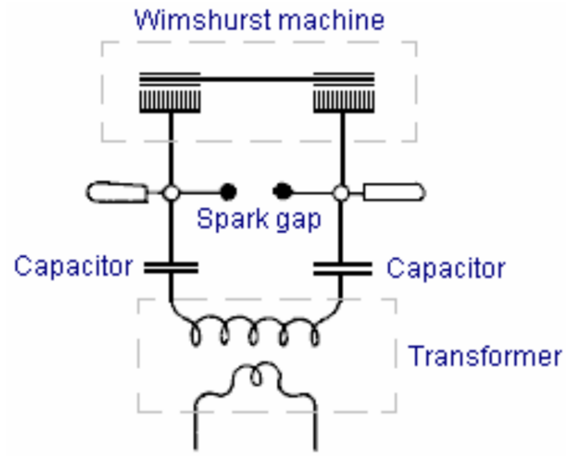


Figure 22: Hermann starts off by explaining how high voltage can be converted into a convenient form and he uses a Wimshurst static electricity generator as an example of a constant source of high voltage. The output from a rectified Tesla Coil, a Wimshurst machine and a tall aerial are very much alike, and so Hermann's comments are very relevant here. He shows it as seen in circuit above.

Wimshurst machine and a tall aerial are very much alike, and so Hermann's comments are very relevant here. He shows it as in figure 22.

Here (figure 22), the output of the Wimshurst machine is stored in two high-voltage capacitors (Leyden jars) causing a very high voltage to be created across those capacitors. When the voltage is high enough, a spark jumps across the spark gap, causing a massive surge of current through the primary winding of the transformer, which in his case is a step-down transformer as he is aimed at getting a lower output voltage. Don's circuit is almost identical, shown in figure 23.

Here the high voltage comes from the battery/inverter/neon-tube driver/rectifiers, rather than from a mechanically driven Wimshurst machine. He has the same build up of voltage in a capacitor with a spark gap across the capacitor. The spark gap will fire when the capacitor voltage reaches its designed level. The only difference is in the positioning of the capacitor, which if it matched Hermann's arrangement exactly, would be like figure 24.

This would be a perfectly viable arrangement (figure 24) as far as I can see. You will remember that Tesla, who always speaks very highly of the energy released by

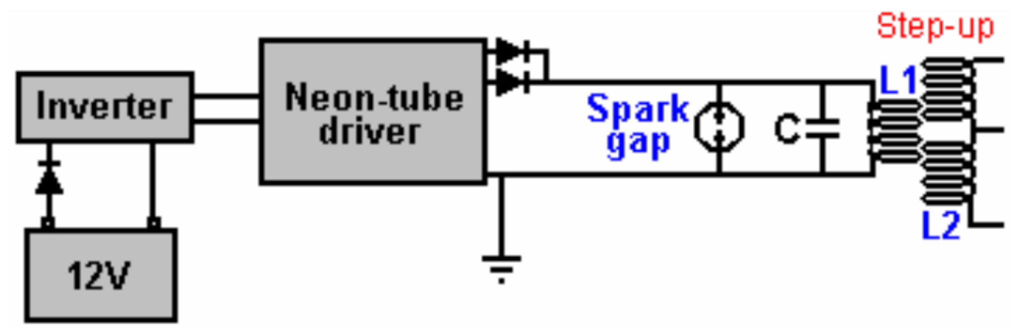


Figure 23: Don Smith's circuit, shown here, is almost identical to the Wimshurst machine.

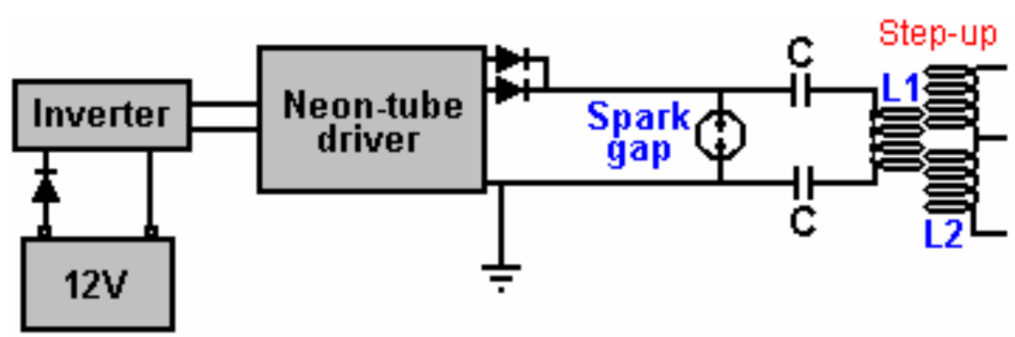


Figure 24: The spark gap will fire when the capacitor voltage reaches its designed level. The only difference is (from figure 23) in the positioning of the capacitor, which if it matched Hermann's arrangement exactly, would be as shown here.

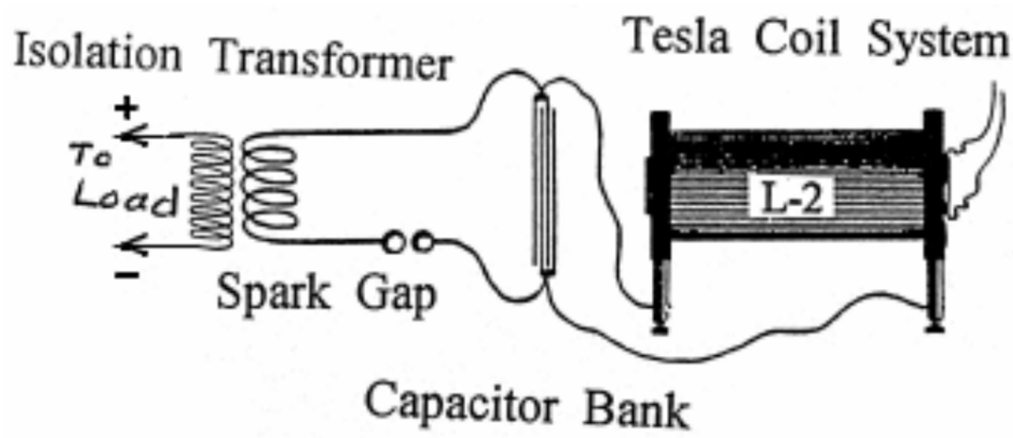


Figure 25: You will remember that Tesla, who always speaks very highly of the energy released by the very sharp discharge produced by a spark, shows a high-voltage source feeding a capacitor with the energy passing through a spark gap to the primary winding of a transformer, as shown above.

the very sharp discharge produced by a spark, shows a high-voltage source feeding a capacitor with the energy passing through a spark gap to the primary winding of a transformer, shown in figure 25.

However, with Don's arrangement (figure 19), it can be a little difficult to see why the capacitor is not short-circuited by the very low resistance of the few turns of thick wire forming the L1 coil. Well, it would do that if we were operating with DC, but we are most definitely not doing that as the output from the neon-tube driver circuit is pulsing 35,000 times per second. This causes the DC resistance of the L1 coil to be of almost no consequence and instead, the coil's "impedance" or "reactance" (effectively, it's AC resistance) is what counts. Actually, the capacitor and the L1 coil being connected across each other have a combined "reactance" or resistance to pulsing current at this frequency. This is where the nomograph diagram (see figure 38) comes into play, and there is a much easier to understand version of it a few pages later on in this document. So, because of the high pulsing frequency, the L1 coil does not short-circuit the capacitor and if the pulsing frequency matches the resonant frequency of the L1 coil (or a harmonic of that frequency), then the L1 coil will actually have a very high resistance to current flow through it. This is how a crystal set radio receiver tunes in a particular radio station, broadcasting on it's own frequency.

Anyway, coming back to Don's device shown in the photograph in figure 19, the electrical drive is from a 12-volt battery which is not seen in the photograph. Interestingly, Don remarks that if the length of the wires connecting the battery to the inverter are exactly one quarter of the wave length of the frequency of the oscillating magnetic field generated by the circuit, then the current induced in the battery wires will recharge the battery continuously, even if the battery is supplying power to the circuit at the same time.

The battery supplies a small current through a protecting diode, to a standard off-the-shelf "true sine-wave" inverter. An inverter is a device which produces mains-voltage Alternating Current from a DC battery. As Don wants adjustable voltage, he feeds the output from the inverter into a variable transformer called a "Variac" although this is often made as part of the neon-driver circuit to allow the brightness of the neon tube to be adjusted by the user. This arrangement produces an AC output voltage which is adjustable from zero volts up to the full mains voltage (or a little higher, though Don does not want to use a higher voltage). The use of this kind of adjustment usually makes it essential for the inverter to be a true sine-wave type. As the power requirement of the neon-tube driver circuit is so low, the inverter should not cost very much.

The neon-tube driver circuit is a standard off-the-shelf device used to drive neon tube displays for commercial establishments. The one used by Don contains an oscillator and a step-up transformer, which together produce an Alternating Current of 9,000 volts at a frequency of 35,100 Hz (sometimes written as 35.1 kHz). The term "Hz" stands for "cycles per second". Don lowers the 9,000 volts as he gets great power output at lower input voltages and the cost of the output capacitors is a significant factor. The particular neon-tube driver circuit which Don is using here, has two separate outputs out of phase with each other, so Don connects them together and uses a blocking diode in each line to prevent either of them affecting the other one. Not easily seen in the photograph, the high-voltage output line has a very small, encapsulated, Gas-Discharge Tube spark gap in it and the line is also earthed. The device looks like figure 26.

Please note that when an earth connection is mentioned in connection with Don Smith's devices, we are talking about an actual wire connection to a metal object physically buried in the ground, whether it is a long copper rod driven into the ground, or an old car radiator buried in a hole like Tariel Kapanadze uses. When

Figure 26: The neon-tube driver circuit is a standard off-the-shelf device used to drive neon tube displays for commercial establishments. Not easily seen in the photograph shown above, the high-voltage output line has a very small, encapsulated, Gas-Discharge Tube spark gap in it and the line is also earthed.

Thomas Henry Moray performed his requested demonstration deep in the countryside at a location chosen by the sceptics, the light bulbs which formed his demonstration electrical load, glowed more brightly with each hammer stroke as a length of gas pipe was hammered into the ground to form his earth connection.

It should be remarked that since Don purchased his neon-tube driver module that newer designs have generally taken over completely, especially in Europe, and these designs have built in "earth-leakage current" protection which instantly disables the circuit if any current is detected leaking to ground. This feature makes the unit completely unsuitable for use in a Don Smith circuit because there, the transfer of current to the ground is wholly intentional and vital for the operation of the circuit.

The output of the neon-tube driver circuit is used to drive the primary "L1" winding of a Tesla Coil style transformer. This looks ever so simple and straightforward, but there are some subtle details which need to be considered.

The operating frequency of 35.1 kHz is set and maintained by the neon-tube driver circuitry, and so, in theory, we do not have to do any direct tuning ourselves. However, we want the resonant frequency of the L1 coil and the capacitor across it to match the neon-driver circuit frequency. The frequency of the "L1" coil winding will induce exactly the same frequency in the "L2" secondary winding. However, we need to pay special attention to the ratio of the wire lengths of the two coil windings as we want these two windings to resonate together. A rule of thumb followed by most Tesla Coil builders is to have the same weight of copper in the L1 and L2 coils, which means that the wire of the L1 coil is usually much thicker than the wire of the L2 coil. If the L1 coil is to be one quarter of the length of the L2 coil, then we would expect the cross-sectional area of the L1 coil to be four times that of the wire of the L2 coil and so the wire should have twice the diameter (as the area is proportional

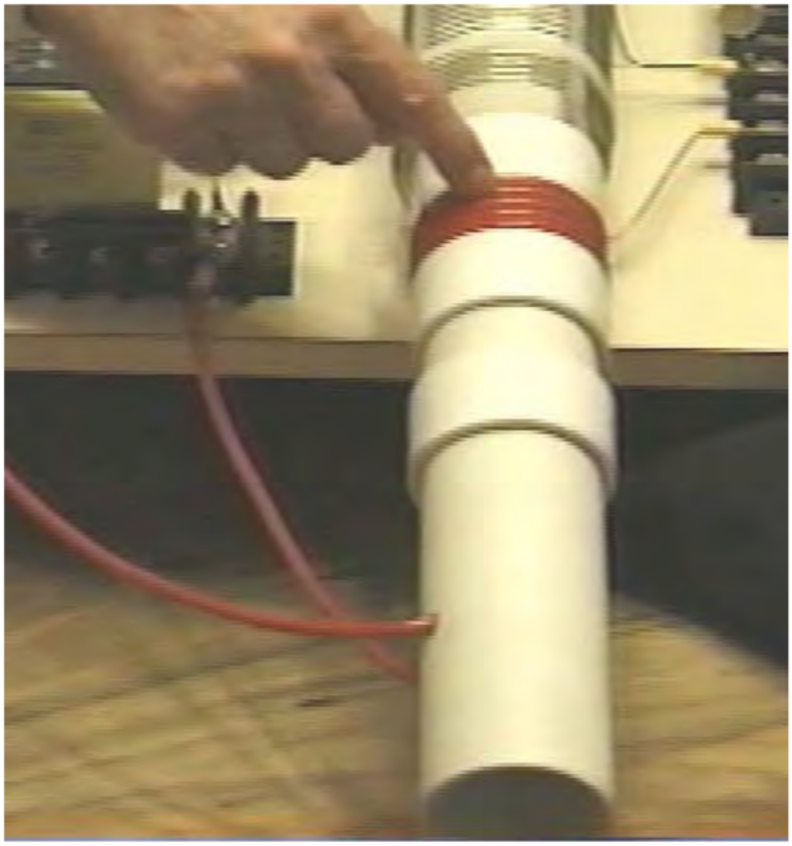


Figure 27: Don uses a white plastic tube as the former for his “L1” primary coil winding. As you can see here, the wire is fed into the former, leaving sufficient clearance to allow the former to slide all the way into the outer coil.

to the square of the radius, and the square of two is four).

Don uses a white plastic tube as the former for his “L1” primary coil winding (figure 27). As you can see here, the wire is fed into the former, leaving sufficient clearance to allow the former to slide all the way into the outer coil. The wire is fed up inside the pipe and out through another hole to allow the coil turns to be made on the outside of the pipe. There appear to be five turns, but Don does not always go for a complete number of turns, so it might be 4.3 turns or some other value. The key point here is that the length of wire in the “L1” coil turns should be exactly one quarter of the length of wire in the “L2” coil turns.

The "L2" coil used here is a commercial 3-inch diameter unit from Barker & Williamson, constructed from uninsulated, solid, single-strand "tinned" copper wire (how to make home-build versions is shown later on). Don has taken this coil and unwound four turns in the middle of the coil in order to make a centre-tap. He then measured the exact length of wire in the remaining section and made the length of the "L1" coil turns to be exactly one quarter of that length. The wire used for the "L1" coil looks like Don's favourite "Jumbo Speaker Wire" which is a very flexible wire with a very large number of extremely fine uninsulated copper wires inside it.

You will notice that Don has placed a plastic collar on each side of the winding, matching the thickness of the wire, in order to create a secure sliding operation inside the outer "L2" coil, and the additional plastic collars positioned further along the pipe provide further support for the inner coil. This sliding action allows the primary coil "L1" to be positioned at any point along the length of the "L2" secondary coil, and that has a marked tuning effect on the operation of the system. The outer "L2" coil does not have any kind of tube support but instead, the coil shape is maintained by the stiffness of the solid wire plus four slotted strips. This style of construction produces the highest possible coil performance at radio frequencies. With a Tesla Coil, it is most unusual to have the L1 coil of smaller diameter than the L2 coil.

The "L2" coil has two separate sections, each of seventeen turns. One point to note is the turns are spaced apart using slotted strips to support the wires and maintain an accurate spacing between adjacent turns. It must be remembered that spacing coil turns apart like this alters the characteristics of the coil, increasing it's "capacitance" factor substantially. Every coil has resistance, inductance and capacitance, but the form of the coil construction has a major effect on the ratio of these three characteristics. The coil assembly is held in position on the base board by two off-white plastic cable ties. The nearer half of the coil is effectively connected across the further half as shown in the circuit diagram above in figure 28.

One point which Don stresses, is that the length of the wire in the "L1" coil and the length of wire in the "L2" coil, must be an exact even division or multiple of each other (in this case, the "L2" wire length in each half of the "L2" coil is exactly four times as long as the "L1" coil wire length). This is likely to cause the "L1" coil to have part of a turn, due to the different coil diameters. For example, if the length of the "L2" coil wire is 160 inches and "L1" is to be one quarter of that length, namely, 40 inches. Then, if the "L1" coil has an effective diameter of 2.25 inches, (allowing for the thickness of the wire when wound on a 2-inch diameter former), then the

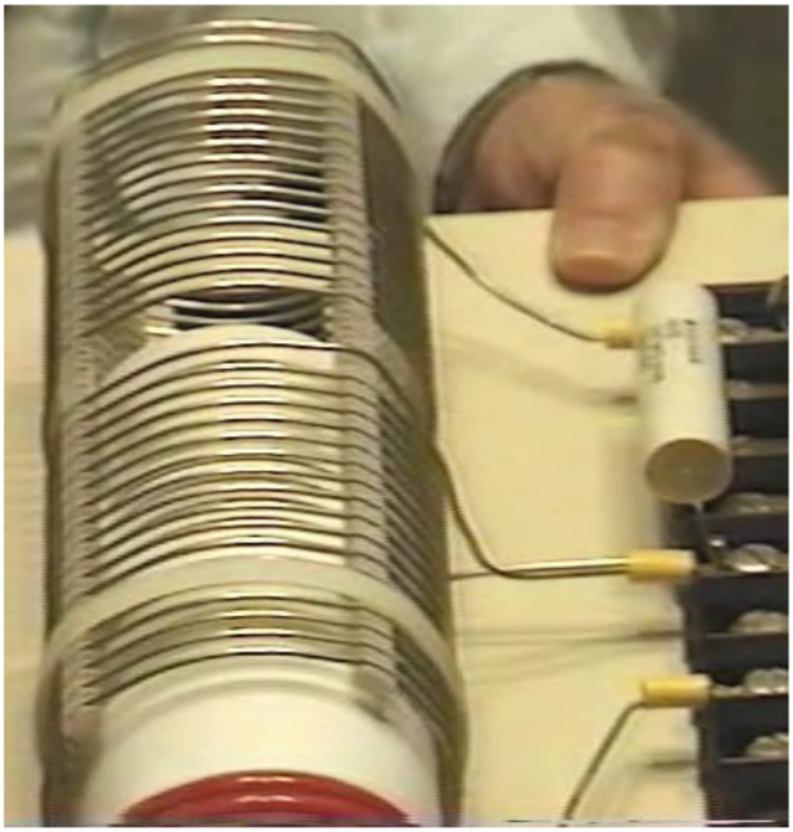


Figure 28: The "L2" coil has two separate sections, each of seventeen turns. One point to note is the turns are spaced apart using slotted strips to support the wires and maintain an accurate spacing between adjacent turns. It must be remembered that spacing coil turns apart like this alters the characteristics of the coil, increasing it's "capacitance" factor substantially. Every coil has resistance, inductance and capacitance, but the form of the coil construction has a major effect on the ratio of these three characteristics. The coil assembly is held in position on the base board by two off-white plastic cable ties. The nearer half of the coil is effectively connected across the further half as shown in the circuit diagram above.

“L1” coil would have 5.65 (or 5 and 2/3) turns which causes the finishing turn of “L2” to be 240 degrees further around the coil former than the start of the first turn —that is, five full turns plus two thirds of the sixth turn.

The L1 / L2 coil arrangement is a Tesla Coil. The positioning of the “L1” coil along the length of the “L2” coil, adjusts the voltage to current ratio produced by the coil. When the “L1” coil is near the middle of the “L2” coil, then the amplified voltage and amplified current are roughly the same. The exact wire ratio of these two coils gives them an almost automatic tuning with each other, and the exact resonance between them can be achieved by the positioning of the “L1” coil along the length of the “L2” coil. While this is a perfectly good way of adjusting the circuit, in the build shown in the photograph, Don has opted to get the exact tuning by connecting a capacitor across “L1” as marked as “C” in the circuit diagram. Don found that the appropriate capacitor value was around the 0.1 microfarad (100 nF) mark. It must be remembered that the voltage across “L1” is very high, so if a capacitor is used in that position it will need a voltage rating of at least 9,000 volts. Don remarks that the actual capacitors seen in the photograph (figure 28) of this prototype are rated at fifteen thousand volts, and were custom made for him using a “self-healing” style of construction. As has already been remarked, this capacitor is an optional component. Don also opted to connect a small capacitor across the “L2” coil, also for fine-tuning of the circuit, and that component is optional and so is not shown on the circuit diagram. As the two halves of the “L2” coil are effectively connected across each other, it is only necessary to have one fine-tuning capacitor. However, Don stresses that the “height” length of the coil (when standing vertically) controls the voltage produced while the coil “width” (the diameter of the turns) controls the current produced.

The exact wire length ratio of the turns in the “L1” and “L2” coils gives them an almost automatic synchronous tuning with each other, and the exact resonance between them can be achieved by the positioning of the “L1” coil along the length of the “L2” coil. While this is a perfectly good way of adjusting the circuit, in the 1994 build shown in the photograph (figure 29), Don has opted to get the exact tuning by connecting a capacitor across “L1” as marked as “C” in the circuit diagram. Don found that the appropriate capacitor value for his particular coil build, was about 0.1 microfarad (100 nF) and so he connected two 47 nF high-voltage capacitors in parallel to get the value which he wanted. It must be remembered that the voltage across “L1” is very high, so a capacitor used in that position needs a voltage rating of at least 9,000 volts. Don remarks that the actual capacitors seen in the photograph

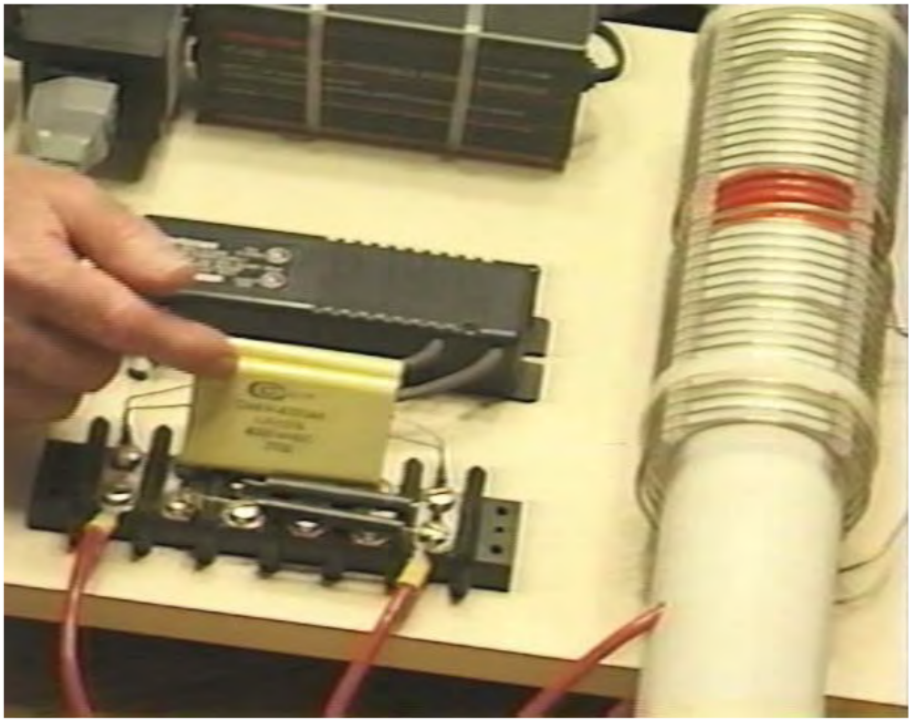


Figure 29: The exact wire length ratio of the turns in the “L1” and “L2” coils gives them an almost automatic synchronous tuning with each other, and the exact resonance between them can be achieved by the positioning of the “L1” coil along the length of the “L2” coil. While this is a perfectly good way of adjusting the circuit, in the 1994 build shown in the photograph, Don has opted to get the exact tuning by connecting a capacitor across “L1” as marked as “C” in the circuit diagram.

of this prototype are rated at fifteen thousand volts, and were custom made for him using a “self-healing” style of construction.

Don has also connected a small capacitor across the “L2” coil, and that optional component is marked as “C2” in the circuit diagram and the value used by Don happened to be a single 47nF, high-voltage capacitor. As the two halves of the “L2” coil are effectively connected across each other, it is only necessary to have one capacitor for “L2” as shown in figure 30.

There are various ways of dealing with the output from the “L2” coil in order to get large amounts of conventional electrical power out of the device. The method

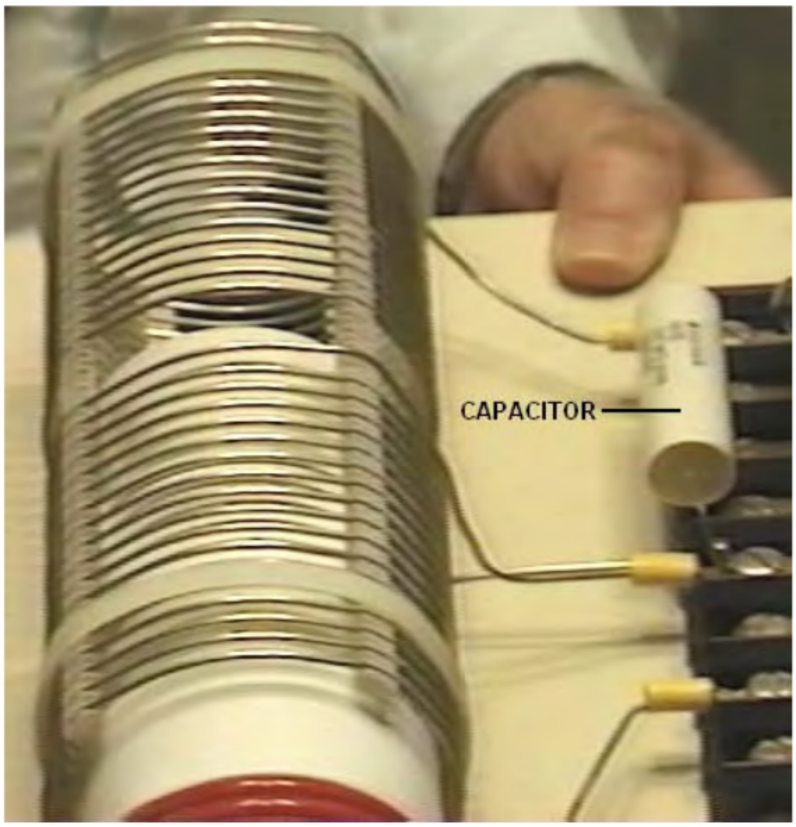


Figure 30: Don has also connected a small capacitor across the “L2” coil, and that optional component is marked as “C2” in the circuit diagram and the value used by Don happened to be a single 47nF, high-voltage capacitor. As the two halves of the “L2” coil are effectively connected across each other, it is only necessary to have one capacitor for “L2” as shown above.

shown here uses the four very large capacitors seen in the photograph. These have an 8,000 or 9,000 volt rating and a large capacity and they are used to store the circuit power as DC prior to use in the load equipment. This is achieved by feeding the capacitor bank (figure 25) through a diode which is rated for both high voltage and high current, as Don states that the device produces 8,000 volts at 20 amps, in which case, this rectifying diode has to be able to handle that level of power, both at start-up when the capacitor bank is fully discharged and "L2" is producing 8,000 volts, and when the full load of 20 amps is being drawn.

This capacitor bank is fed through a diode which is rated for both high voltage and high current, as Don states that the device produces 8,000 volts at 20 amps, in which case, this rectifying diode has to be able to handle that level of power, both at start-up when the capacitor bank is fully discharged and "L2" is producing 8,000 volts, and when the full load of 20 amps is being drawn. The actual diodes used by Don happen to be rated at 25 kV but that is a far greater rating than is actually needed.

In passing, it might be remarked that the average home user will not have an electrical requirement of anything remotely like as large as this, seeing that 10 kW is more than most people use on a continuous basis, while 8 kV at 20 A is a power of 160 kilowatts. As the neon-tube driver circuit can put out 9,000 volts and since the L1 / L2 coil system is a step-up transformer, if the voltage fed to the capacitor bank is to be kept down to 8,000 volts, then the Variac adjustment must be used to reduce the voltage fed to the neon-tube driver circuit, in order to lower the voltage fed to the L1 / L2 coil pair, typically, to 3,000 volts.

A very astute and knowledgeable member of the EVGRAY Yahoo EVGRAY forum (see @ https://groups.io/g/EVGRAY) whose ID is "silverhealtheu" has recently pointed out that Don Smith says quite freely that he does not disclose all of the details of his designs, and it is his opinion that a major item which has not been disclosed is that the diodes in the circuit diagrams shown here are the wrong way round and that Don operates his voltages in reverse to the conventional way. In fact, the circuit diagram should be what is shown in figure 31.

He ("silverhealtheu") comments:

"The diodes leaving the Neon-tube Driver may need to be reversed as we want to collect the negative polarity. The spark gap will then operate on ambient inversion and the spark will look and sound totally different with a much faster crack and

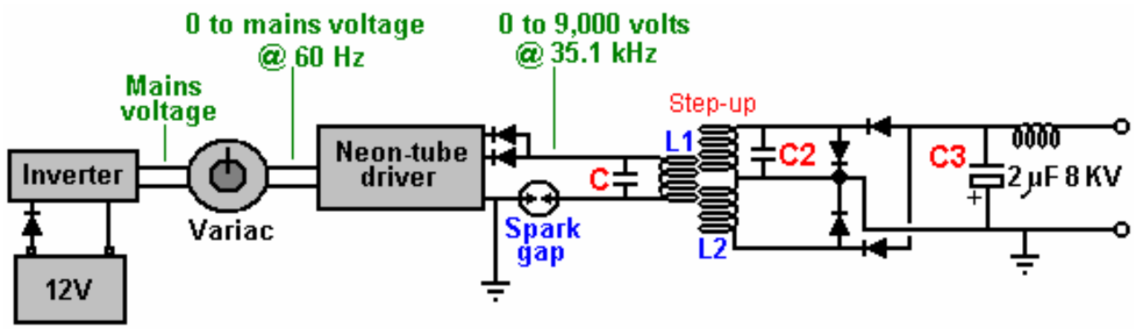


Figure 31: According to "silverhealtheu" (see above), a major item which has not been disclosed is that the diodes in the circuit diagrams shown previously are the wrong way round and that Don operates his voltages in reverse to the conventional way. In fact, the circuit diagram should be as shown here.

producing very little heat and even becoming covered in frost is possible.

"The Variac should be raised up just enough to get a spark going then backed off slightly. Any higher voltage is liable to make the Neon-tube Driver think that it has a short-circuit condition, and the new electronic designs will then shut down automatically and fail to operate at all if this method is not followed.

"When running, C, L1 and L2 operate somewhere up in the Radio Frequency band because the Neon-tube Driver only acts as a tank-circuit exciter. The large collection capacitor C3, should fill inverted to earth polarity as shown above. The load will then be pulling electrons from the earth as the cap is REFILLED back to ZERO rather than the joules in the capacitor being depleted.

"Also remember that the Back-EMF systems of John Bedini and others, create a small positive pulse but they collect a super large NEGATIVE polarity spike which shoots off the bottom of an oscilloscope display. This is what we want, plenty of this stored in capacitors, and then let the ambient background energy supply the current when it makes the correction."

This is a very important point and it may well make a really major difference to the performance of a device of this nature.

One reader has drawn attention to the fact that Don's main document indicates that there should be a resistor "R" across the L1 coil as well as the capacitor "C" and he suggests that the circuit should actually be as shown above, considering what Don said earlier about his "suitcase" design. Another reader points out that the wire in the output choke shown in the photograph below (figure 32) appears to be wound with wire that is far too small diameter to carry the currents mentioned by Don. It seems likely that a choke is not needed in that position except to suppress possible radio frequency transmissions from the circuit, but a more powerful choke can easily be wound using larger diameter wire.

When the circuit is running, the storage capacitor bank behaves like an 8,000 volt battery which never runs down and which can supply 20 amps of current for as long as you want. The circuitry for producing a 220 volt 50 Hz AC output or a 110 volt 60 Hz AC output from the storage capacitors is just standard electronics. In passing, one option for charging the battery is to use the magnetic field caused by drawing mains-frequency current pulses through the output "choke" coil, shown here in figure 32.

The output current flows through the left hand winding on the brown cylindrical former, and when the photograph (figure 32) was taken, the right-hand winding was no longer in use. Previously, it had been used to provide charging power to the battery by rectifying the electrical power in the coil, caused by the fluctuating magnetic field caused by the pulsing current flowing through the left hand winding, as shown in figure 33.

The DC output produced by the four diodes was then used to charge the driving battery, and the power level produced is substantially greater than the minor current drain from the battery. Consequently, it is a sensible precaution to pass this current to the battery via a circuit which prevents the battery voltage rising higher than it should. A simple voltage level sensor can be used to switch off the charging when the battery has reached its optimum level. Other batteries can also be charged if that is wanted. Simple circuitry of the type shown in chapter 12 of [1] can be used for controlling and limiting the charging process. The components on Don's board are laid out as shown in figure 34.

Don draws attention to the fact that the cables used to connect the output of "L2" to the output of the board, connecting the storage capacitors on the way, are very high-voltage rated cables with special multiple coverings to ensure that the cables will remain sound over an indefinite period. It should be remarked at this point,

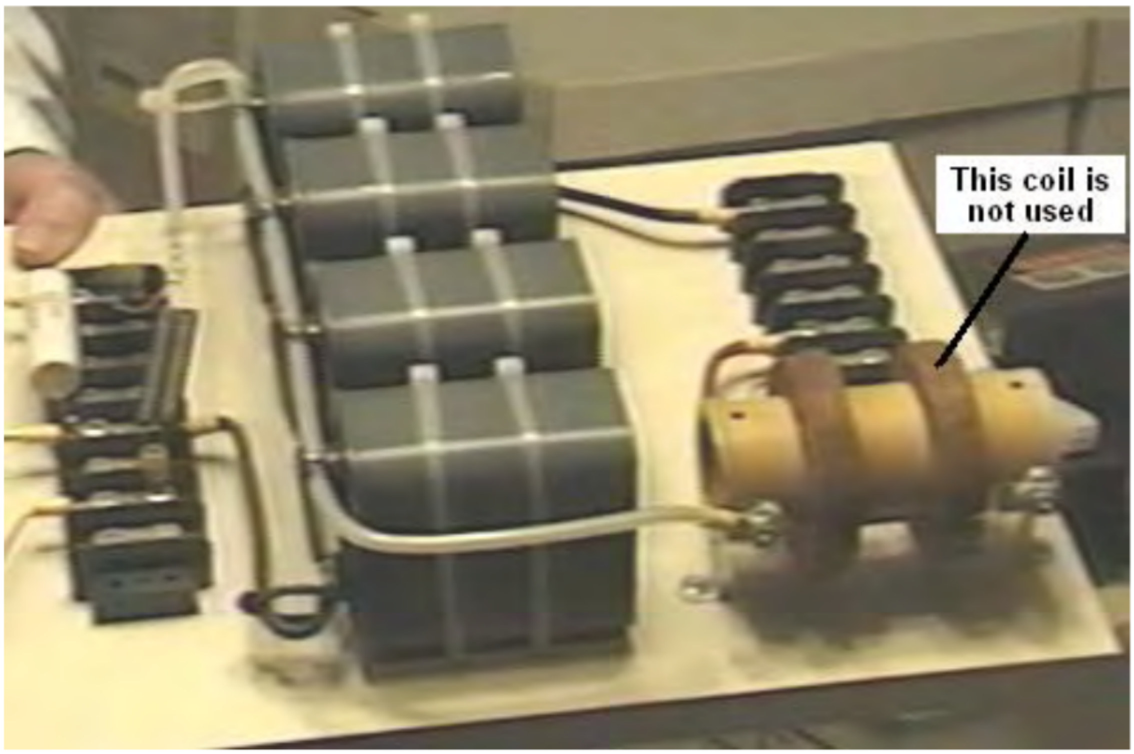


Figure 32: One option for charging the battery is to use the magnetic field caused by drawing mains-frequency current pulses through the output “choke” coil, shown above.

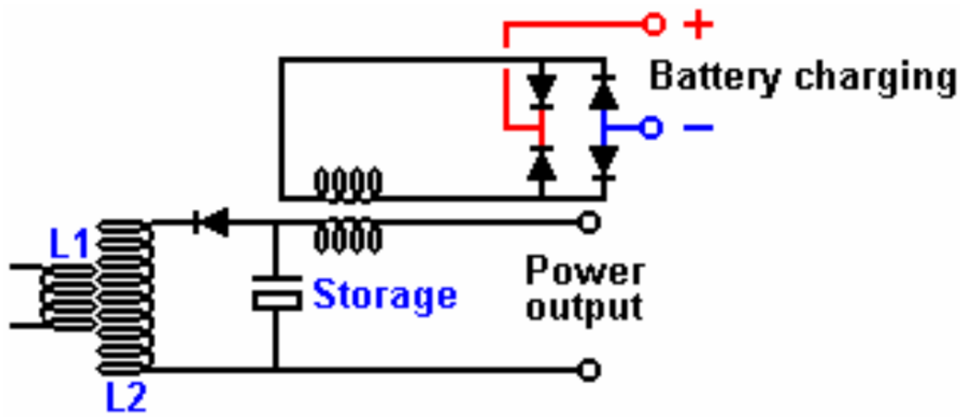


Figure 33: The output current flows through the left hand winding on the brown cylindrical former, and when the photograph (figure 32) was taken, the right-hand winding was no longer in use. Previously, it had been used to provide charging power to the battery by rectifying the electrical power in the coil, caused by the fluctuating magnetic field caused by the pulsing current flowing through the left hand winding, as shown in the above circuit.

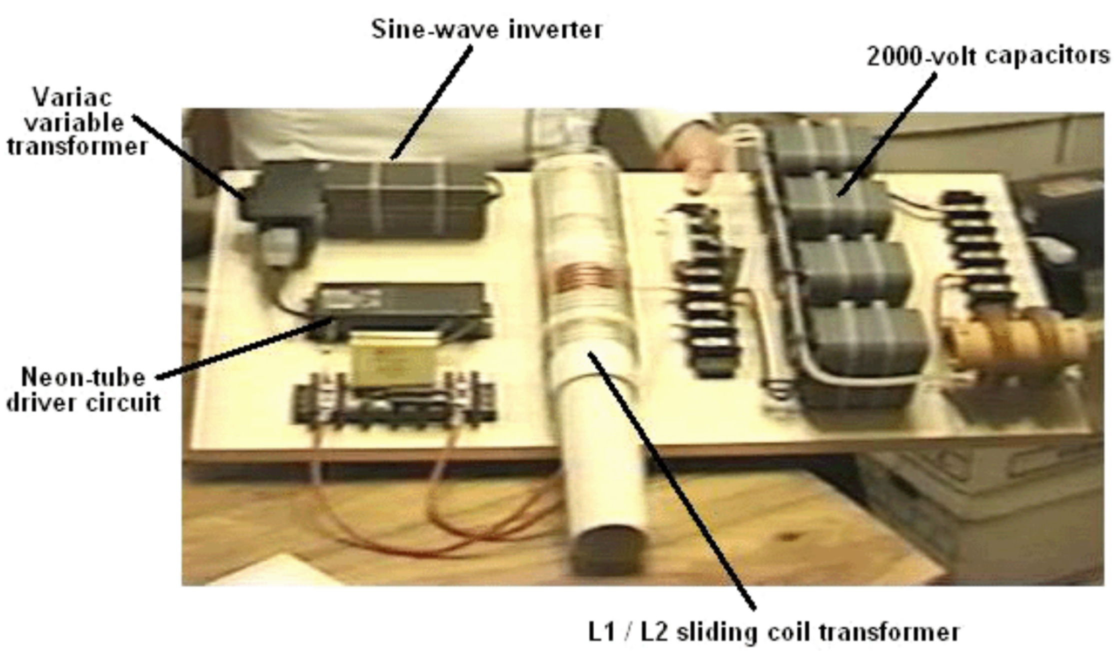


Figure 34: The components on Don's board are laid out as shown here.

that the outer 3" diameter coil used by Don, is not wound on a former, but in order to get higher performance at high frequencies, the turns are supported with four separate strips physically attached to the turns —the technique described later in this document (also see [1]) as being an excellent way for home construction of such coils.

Please bear in mind that the voltages here and their associated power levels are literally lethal and perfectly capable of killing anyone who handles the device carelessly when it is powered up. When a replication of this device is ready for routine use, it must be encased so that none of the high-voltage connections can be touched by anyone. This is not a suggestion, but it is a mandatory requirement, despite the fact that the components shown in the photographs are laid out in what would be a most dangerous fashion were the circuit to be powered up as it stands. Under no circumstances, construct and test this circuit unless you are already experienced in the use of high-voltage circuits or can be supervised by somebody who is experienced in this field. This is a "one hand in the pocket at all times" type of circuit and it needs to be treated with great care and respect at all times, so be sensible.

The remainder of the circuit is not mounted on the board, possibly because there are various ways in which the required end result can be achieved. The one suggested here is perhaps the most simple solution, shown in figure 35.

The voltage has to be dropped, so an iron-cored mains-frequency step-down transformer is used to do this. To get the frequency to the standard mains frequency for the country in which the device is to be used, an oscillator is used to generate that particular mains frequency. The oscillator output is used to drive a suitable high-voltage semiconductor device, be it a FET transistor, an IGBT device, or whatever. This device has to switch the working current at 8,000 volts, though admittedly, that will be a current which will be at least thirty six times lower than the final output current, due to the higher voltage on the primary winding of the transformer. The available power will be limited by the current handling capabilities of this output transformer which needs to be very large and expensive.

As the circuit is capable of picking up additional magnetic pulses, such as those generated by other equipment, nearby lightning strikes, etc. an electronic component called a "varistor" marked "V" in the diagram, is connected across the load. This

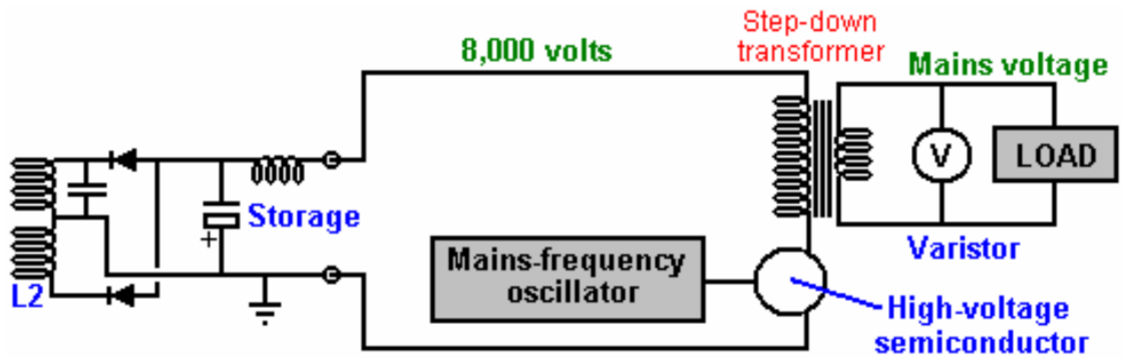


Figure 35: The remainder of the circuit is not mounted on the board, possibly because there are various ways in which the required end result can be achieved. The one suggested/shown here is perhaps the most simple solution.

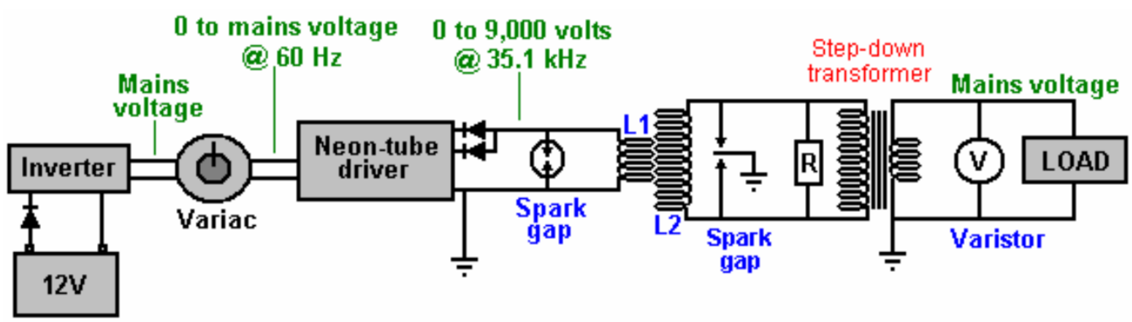


Figure 36: Don also explains an even more simple version of the circuit as shown here.

device acts as a voltage spike suppressor as it short circuits any voltage above its design voltage, protecting the load from power surges.

Don also explains an even more simple version of the circuit as shown in figure 36.

This simplified circuit avoids the need for expensive capacitors and the constraints of their voltage ratings, and the need for electronic control of the output frequency. The wire length in the turns of coil "L2" still needs to be exactly four times the wire length of the turns in coil "L1", but there is only one component which needs to be introduced, and that is the resistor "R" placed across the primary winding of the step-down isolation transformer. This transformer is a laminated iron-core type, suitable for the low mains frequency, but the output from "L2" is at much higher frequency. It is possible to pull the frequency down to suit the step-down transformer by connecting the correct value of resistor "R" across the output transformer (or a coil and resistor, or a coil and a capacitor). The value of resistor needed can be predicted from the American Radio Relay League graph (shown as Fig.44 in Don's pdf document which can be downloaded using http://www.free-energy-info.com/Smith.pdf —BJD note: this link does not work at time of editing). The sixth edition of the Howard Sams book "Handbook of Electronics Tables and Formulas" (ISBN-10: 0672224690 or ISBN-13: 978-0672224690) has a table which goes down to 1 kHz and so does not need to be extended to reach the frequencies used here. The correct resistor value could also be found by experimentation. You will notice that an earthed dual spark gap has been placed across "L2" in order to make sure that the voltage levels always stay within the design range.

Don also explains an even more simple version which does not need a Variac, high voltage capacitors or high voltage diodes. Here, a DC output is accepted which means that high-frequency step-down transformer operation can be used. This calls for an air-core transformer which you would wind yourself from heavy duty wire. Mains loads would then be powered by using a standard off-the-shelf inverter. In this version, it is of course, necessary to make the "L1" turns wire length exactly one quarter of the "L2" turns wire length in order to make the two coils resonate together. The operating frequency of each of these coils is imposed on them by the output frequency of the neon-tube driver circuit. That frequency is maintained throughout the entire circuit until it is rectified by the four diodes feeding the low-voltage storage capacitor. The target output voltage will be either just over 12 volts or just over 24 volts, depending on the voltage rating of the inverter which is to be driven by the system. The circuit diagram is as shown in figure 37.

As many people will find the nomograph chart in Don's pdf document very difficult to understand and use, here is an easier version, in figure 38.

The objective here is to determine the "reactance" or 'AC resistance' in ohms and the way to do that is as follows.

Suppose that your neon-tube driver (figure 40) is running at 30 kHz and you are using a capacitor of 100 nF (which is the same as 0.1 microfarad), and you want to know what is the AC resistance of your capacitor is at that frequency. Also, what coil inductance would you have that at same AC resistance. Then the procedure for

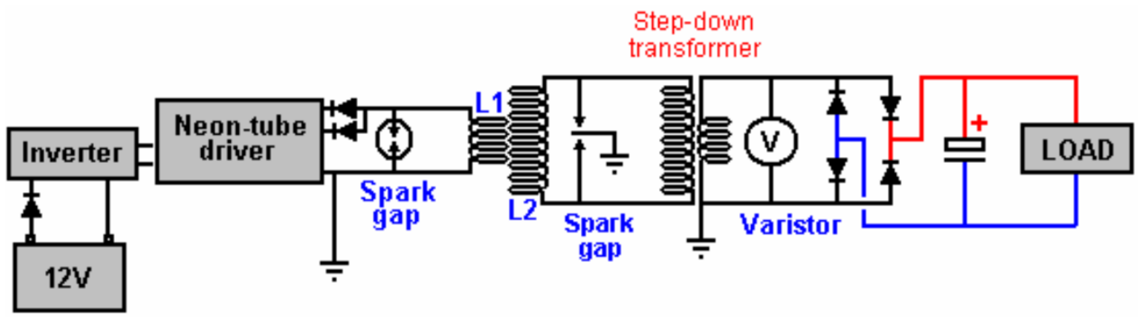


Figure 37: Don also explains an even more simple version which does not need a Variac, high voltage capacitors or high voltage diodes. The circuit diagram is as shown here.

finding that out is as follows, shown in figure 39.

As shown in figure 39, draw a straight line from your 30 kHz frequency (purple line) through your 100 nanofarad capacitor value and carry the line on as far as the (blue) inductance line as shown above. You can now read the reactance ("AC resistance") off the red line, which looks like 51 ohms to me. This means that when the circuit is running at a frequency of 30 kHz, then the current flow through your 100 nF capacitor will be the same as through a 51 ohm resistor. Reading off the blue "Inductance" line that same current flow at that frequency would occur with a coil which has an inductance of 0.28 millihenries. I have recently been passed a copy of Don's circuit diagram for this device, and it is shown in figure 40.

The 4000 V, 30 mA transformer shown in this circuit diagram (figure 40), may use a ferrite-cored transformer from a neon-tube driver module which steps up the voltage but it does not raise the frequency as that is clearly marked at 120 Hz pulsed DC. You will notice that this circuit diagram is drawn with Plus shown below Minus (which is most unusual).

Please note that when an earth connection is mentioned in connection with Don Smith's devices, we are talking about an actual wire connection to a metal object physically buried in the ground, whether it is a long copper rod driven into the ground, or an old car radiator buried in a hole like Tariel Kapanadze used, or a buried metal plate. When Thomas Henry Moray performed his requested demonstration deep in the countryside at a location chosen by the sceptics, the light bulbs which formed his demonstration electrical load, glowed more brightly with each ham-

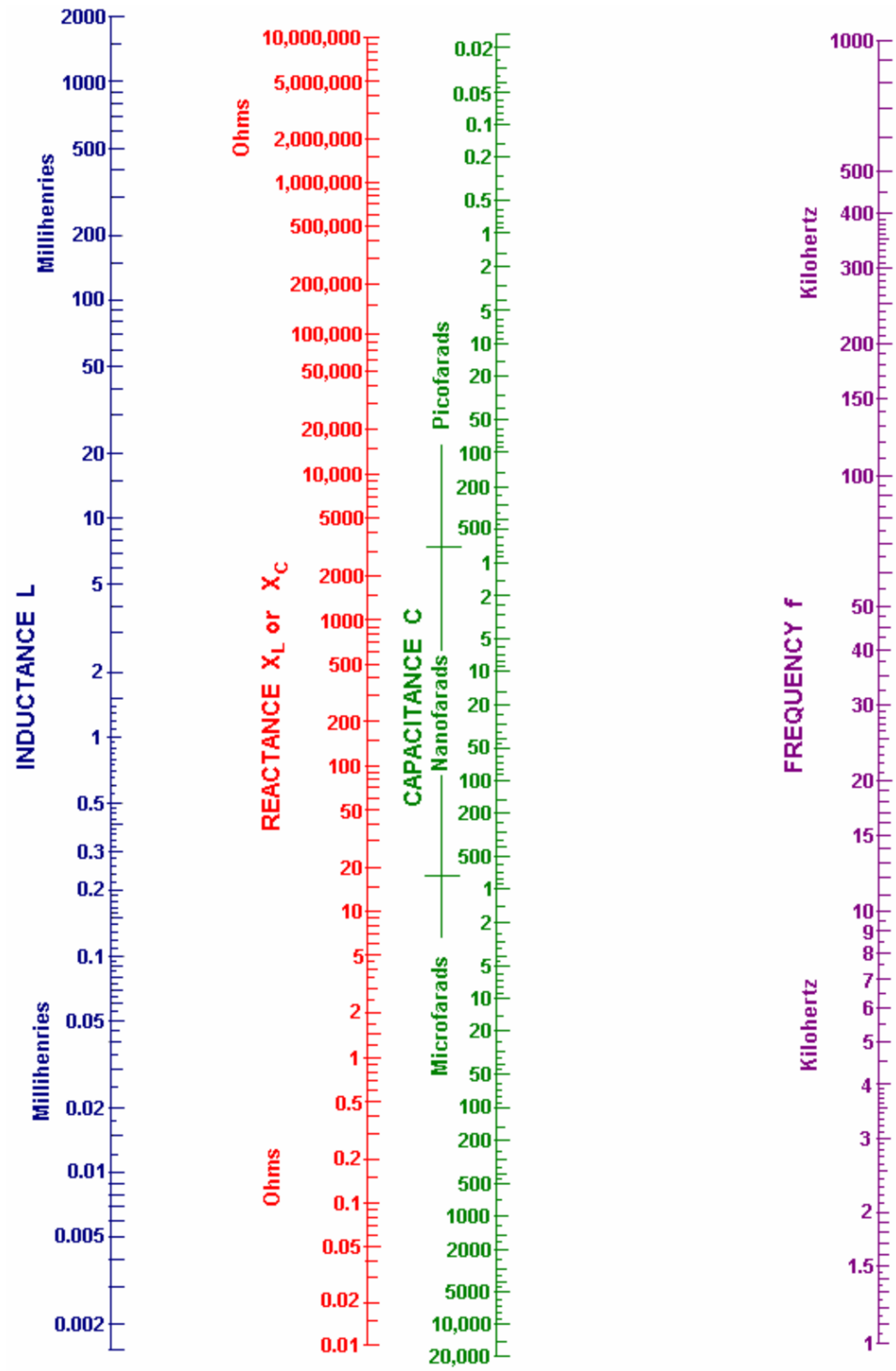


Figure 38: As many people will find the nomograph chart in Don's pdf document very difficult to understand and use, here is an easier version shown above.

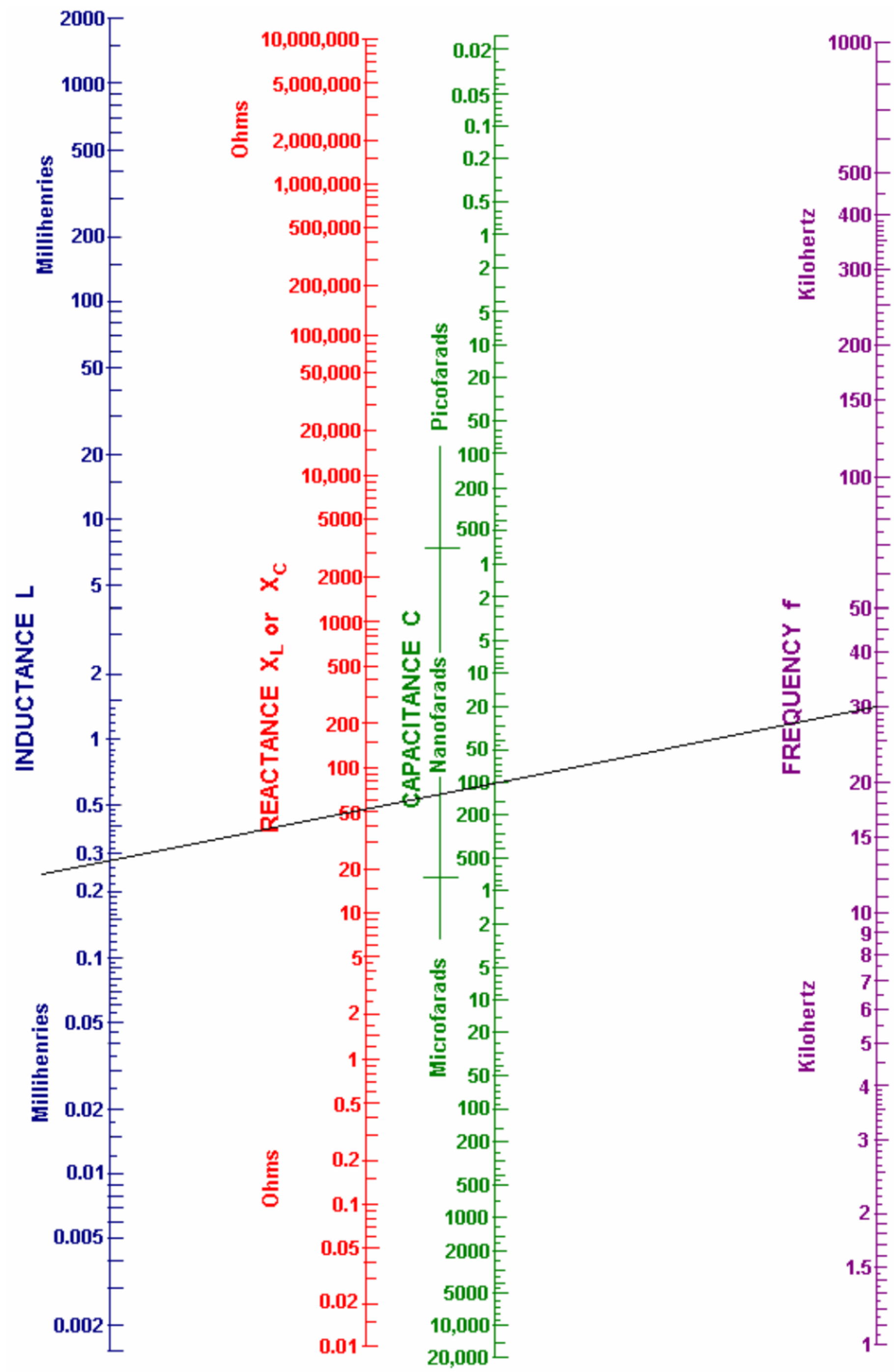


Figure 39: 2nd image of nomograph, to obtain the required values of reactance X_L or X_C and inductance L, at frequency $f = 30$ kHz with capacitance $C = 100$ nF.

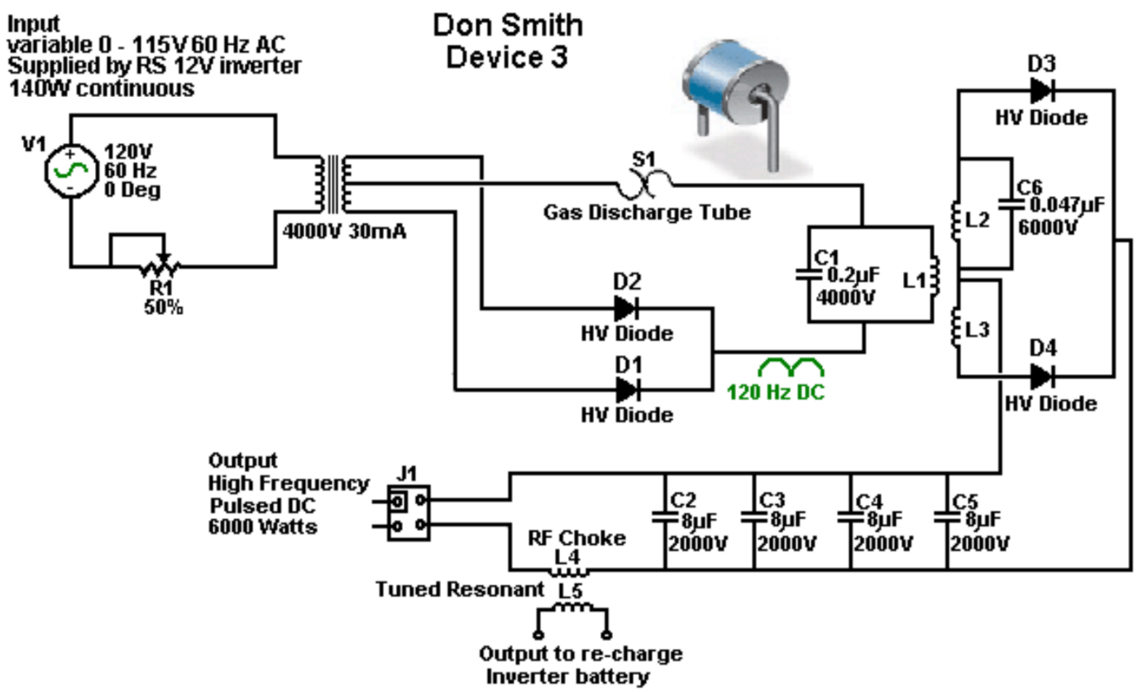


Figure 40: PJK had recently been passed a copy of Don's circuit diagram for this device (neon-tube driver) (c.2008 —2020), and it is shown here.

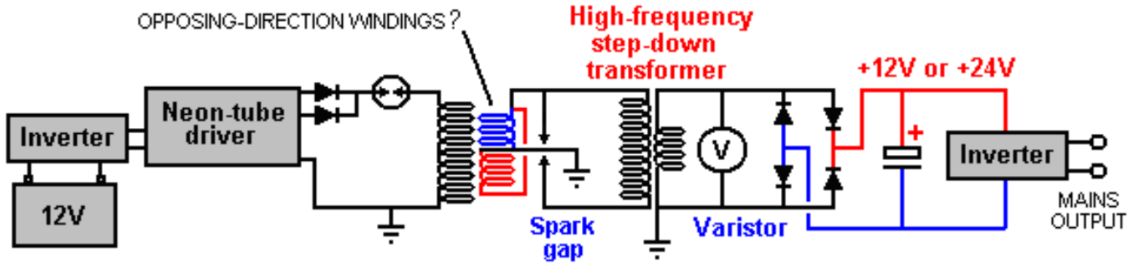


Figure 41: Circuit that is effectively two Tesla Coils back-to-back.

mer stroke as a length of gas pipe was hammered into the ground to form his earth connection.

Don also explains an even more simple version of his main device. This version does not need a Variac (variable voltage transformer) or high voltage capacitors. Here, a DC output is accepted which means that high-frequency step-down transformer operation can be used. This calls on the output side, for an air-core (or ferrite rod core) transformer which you would wind yourself from heavy duty wire. Mains loads would then be powered by using a standard off-the-shelf inverter. In this version, it is of course, very helpful to make the "L1" turns wire length exactly one quarter of the "L2" turns wire length in order to make the two coils automatically resonate together. The operating frequency of each of these coils is imposed on them by the output frequency of the neon-tube driver circuit. That frequency is maintained throughout the entire circuit until it is rectified by the four diodes feeding the low-voltage storage capacitor. The target output voltage will be either just over 12 volts or just over 24 volts, depending on the voltage rating of the inverter which is to be driven by the system.

As the circuit is capable of picking up additional magnetic pulses, such as those generated by other equipment, nearby lightning strikes, etc. an electronic component called a "varistor" marked "V" in the diagram, is connected across the load. This device acts as a voltage spike suppressor as it short-circuits any voltage above its design voltage, protecting the load from power surges. A Gas-Discharge Tube is an effective alternative to a varistor.

This circuit is effectively two Tesla Coils back-to-back and the circuit diagram might be as shown in figure 41.

It is by no means certain that in this circuit (figure 41), the red and blue windings are wound in opposing directions. The spark gap (or gas-discharge tube) in series with the primary of the first transformer alters the operation in a somewhat unpredictable way as it causes the primary to oscillate at a frequency determined by it's inductance and it's self-capacitance, and that may result in megahertz frequencies. The secondary winding(s) of that transformer must resonate with the primary and in this circuit which has no frequency-compensating capacitors, that resonance is being produced by the exact wire length in the turns of the secondary. This looks like a simple circuit, but it is anything but that. The excess energy is produced by the raised frequency, the raised voltage, and the very sharp pulsing produced by the spark. That part is straight forward. The remainder of the circuit is likely to be very difficult to get resonating as it needs to be in order to deliver that excess energy to the output inverter.

When considering the "length" of wire in a resonant coil, it is necessary to pay attention to the standing wave created under those conditions. The wave is caused by reflection of the signal when it reaches the end of the wire OR when there is a sudden change in the diameter of the wire as that changes the signal reflection ability at that point in the connection. You should pay attention to Richard Quick's very clear description of this in the section of his patent which is included later on in this chapter (also see [1]). Also, remember what Don Smith said about locating the peaks of the standing wave by using a hand-held neon lamp.

One very significant thing which Don pointed out is that the mains electricity available through the wall socket in my home, does not come along the wires from the generating station. Instead, the power station influences a local 'sub-station' and the electrons which flow through my equipment actually come from my local environment because of the influence of my local sub-station. Therefore, if I can create a similar influence in my home, then I no longer need that sub-station and can have as much electrical energy as I want, without having to pay somebody else to provide that influence for me.

4 A practical implementation of one of Don Smith's designs

The objective here, is to determine how to construct a self-powered, free-energy electrical generator which has no moving parts, is not too expensive to build, uses readily available parts and which has an output of some kilowatts. However, under no circumstances should this document be considered to be an encouragement for you, or anyone else to actually build one of these devices. This document is presented solely for information and educational purposes, and as high voltages are involved, it should be considered to be a dangerous device unsuited to being built by inexperienced amateurs. The following section is just my opinions and so should not be taken as tried and tested, working technology, but instead, just the opinion of an inexperienced writer.

However, questions from several different readers indicate that a short, reasonably specific description of the steps needed to attempt a replication of a Don Smith device would be helpful. Again, this document must not be considered to be a recommendation that you actually build one of these high-voltage, potentially dangerous devices. This is just information intended to help you understand what I believe is involved in this process.

In broad outline, the following steps are used in the most simple version of the arrangement.

1. The very low frequency and voltage of the local mains supply is discarded in favour of an electrical supply which operates at more than 20,000 Hz (cycles per second) and has a voltage of anything from 350 volts to 10,000 volts. The higher voltages can give greater overall output power, but they involve greater effort in getting the voltage back down again to the level of the local mains voltage in order for standard mains equipment to be used.

2. This high-frequency high voltage is used to create a series of very rapid sparks using a spark gap which is connected to a ground connection. Properly done, the spark frequency is so high that there is no audible sound caused by the sparks. Each spark causes a flow of energy from the local environment into the circuit. This energy is not standard electricity which makes things hot when current flows through them, but instead this energy flow causes things to become cold when the power flows through them, and so it is often called "cold" electricity. It is tricky to use this energy unless all you want to do is light up a series of light bulbs (which incidentally, give out a different quality of light when powered with this energy). Surprisingly, the circuit now contains substantially more power than the amount of power needed to produce the sparks. This is because additional energy flows in from the ground as well as from the local environment. If you have conventional training and have been

fed the myth of "closed systems", then this will seem impossible to you. So, let me ask you the question: if, as can be shown, all of the electricity flowing into the primary winding of a transformer, flows back out of that winding, then where does the massive, continuous flow of electricity coming from the secondary winding come from? None of it comes from the primary circuit and yet millions of electrons flow out of the secondary in a continuous stream which can be supplied indefinitely. So, where do these electrons come from? The answer is 'from the surrounding local environment which is seething with excess energy' but your textbooks won't like that fact as they believe that the transformer circuit is a 'closed system' —something which probably can't be found anywhere in this universe.

3. This high-voltage, high-frequency, high-power energy needs to be converted to the same sort of hot electricity which comes out of a mains wall socket at the local voltage and frequency. This is where skill and understanding come into play. The first step is to lower the voltage and increase the available current with a step-down resonant transformer. This sounds highly technical and complicated, and looking at Don Smith's expensive Barker & Williamson coil, makes the whole operation appear to be one for rich experimenters only. This is not the case and a working solution can be cheap and easy. It is generally not convenient to get the very high voltage all the way down to convenient levels in a single step, and so, one or more of those resonant transformers can be used to reach the target voltage level. Each step down transformer boosts the available current higher and higher.

4. When a satisfactory voltage has been reached, we need to deal with the very high frequency. The easiest way to deal with it is to use high-speed diodes to convert it to pulsing DC and feed that into a capacitor to create what is essentially, an everlasting battery. Feeding this energy into a capacitor converts it into conventional "hot" electricity and a standard off-the-shelf inverter can be used to give the exact voltage and frequency of the local mains supply. In most of the world, that is 220 volts at 50 cycles per second. In America it is 110 volts at 60 cycles per second. Low-cost inverters generally run on either 12 volts or 24 volts with the more common 12 volt units being cheaper.

So, let's take a look at each of these steps in more detail and see if we can understand what is involved and what our options are.

1. We want to produce a high-voltage, high-frequency, low-current power source. Don Smith shows a Neon-Sign Transformer module. His module produced a voltage

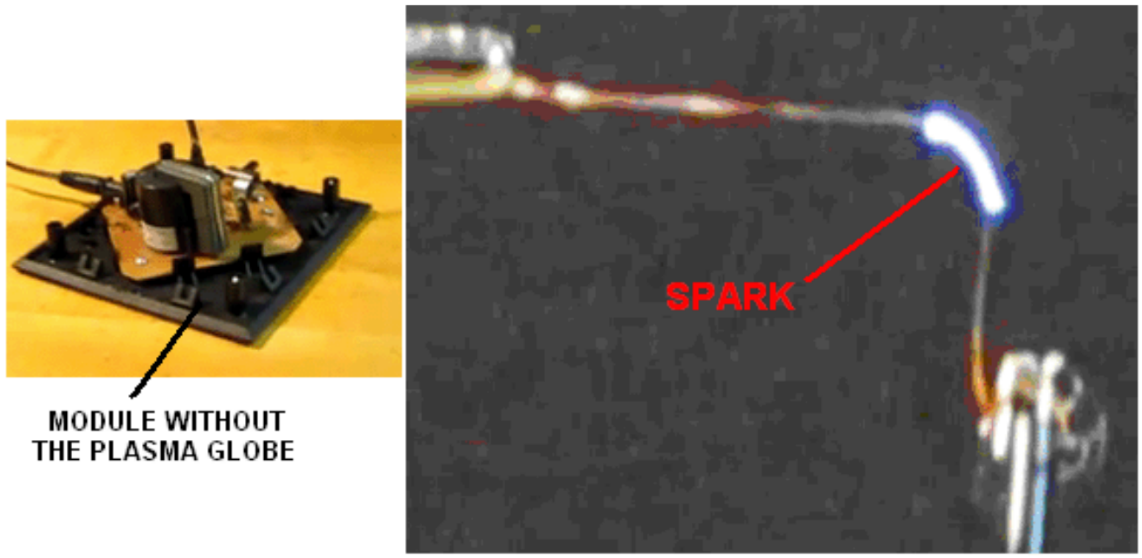


Figure 42: A much cheaper alternative —small plasma globe circuit is used to generate a high-frequency spark.

which was higher than was convenient and so he used a variable AC transformer or "Variac" as it is commonly known, to lower the input voltage and so, lower the output voltage. There is actually no need for a Variac as we can handle the higher voltage or alternatively, use a more suitable Neon-Sign Transformer module. However, we have a problem with using that technique. In the years since Don bought his module, they have been redesigned to include circuitry which disables the module if any current flows out of it directly to earth, and as that is exactly what we would want to use it for, so most, if not all of the currently available neon-sign transformer modules are not suitable for our needs. However, I'm told that if the module has an earth wire and that earth wire is left unconnected, that it disables the earth-leakage circuitry, allowing the unit to be used in a Don Smith circuit. Personally, I would not recommend that if the module is enclosed in a metal housing. A much cheaper alternative is shown here: http://www.youtube.com/watch?v=RDDRe_4D93Q where a small plasma globe circuit is used to generate a high-frequency spark. It seems highly likely that one of those modules would suit our needs, as shown in figure 42.

An alternative method is to build your own power supply from scratch. Doing that is not particularly difficult and if you do not understand any electronics, then perhaps, reading the beginner's electronics tutorial in chapter 12 (of [1]) (http://www.free-energy-info.com/Chapter12.pdf —BJD note: this link does not work at time of edit-

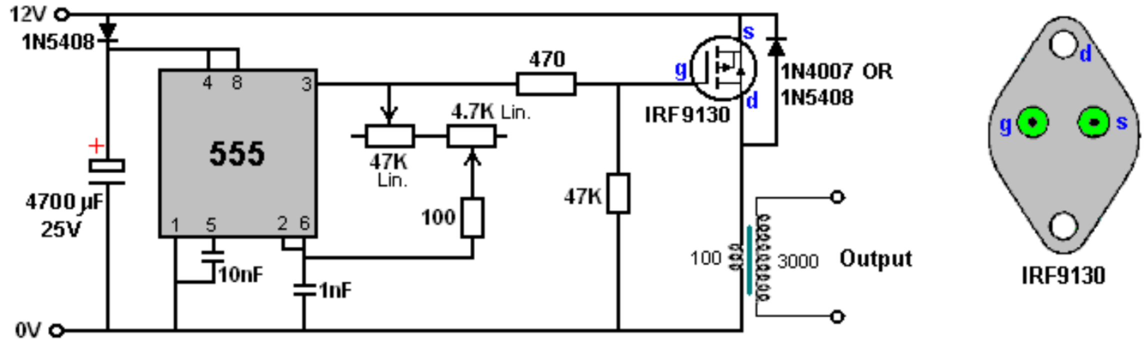


Figure 43: For power supply —here is a variable frequency design for home-construction.

Figure 44: While this circuit (figure 43) shows the rather expensive IRF9130 transistor, I expect that other P-channel FETs would work satisfactorily in this circuit. The IRF9130 transistor looks like as shown here.

ing) will fill you in on all of the basics needed for understanding (and probably designing your own) circuits of this type. Here is a variable frequency design for home-construction, shown in figure 43.

One advantage of this circuit is that the output transformer is driven at the frequency set by the 555 timer and that frequency is not affected by the number of turns in the primary winding, nor it's inductance, wire diameter, or anything else to do with the coil. While this circuit shows the rather expensive IRF9130 transistor, I expect that other P-channel FETs would work satisfactorily in this circuit. The IRF9130 transistor looks like this, as shown in figure 44.

The circuit has a power supply diode and capacitor, ready to receive energy from the output at some later date if that is possible and desired. The 555 circuit is standard, giving a 50% Mark/Space ratio. The 10 nF capacitor is there to maintain the stability of the 555 and the timing section consists of two variable resistors, one fixed resistor and the 1 nF capacitor. This resistor arrangement gives a variable resistance of anything from 100 ohms to 51.8 K and that allows a substantial frequency range. The 47 K (Linear) variable resistor controls the main tuning and the 4.7 K (Linear) variable resistor gives a more easily adjustable frequency for exact tuning. The 100 ohm resistor is there in case both of the variable resistors are set to zero resistance. The output is fed through a 470 ohm resistor to the gate of a very powerful P-channel FET transistor which drives the primary winding of the output transformer.

The output transformer can be wound on an insulating spool covering a ferrite rod, giving both good coupling between the windings, and high-frequency operation as well. The turns ratio is set to just 30:1 due to the high number of primary winding turns. With a 12-volt supply, this will give a 360-volt output waveform, and by reducing the primary turns progressively, allows the output voltage to be increased in controlled steps. With 10 turns in the primary, the output voltage should be 3,600 volts and with just 5 turns 7,200 volts. The higher the voltage used, the greater the amount of work needed later on to get the voltage back down to the output level which we want.

Looking at the wire specification table, indicates that quite a small wire diameter could be used for the oscillator output of the transformer's secondary winding. While this is perfectly true, it is not the whole story. Neon Tube Drivers are very small and the wire in their output windings is very small diameter indeed. Those driver modules are very prone to failure. If the insulation on any one turn of the winding fails and one turn becomes a short-circuit, then that stops the winding from oscillating, and a replacement is needed. As there are no particular size constraints for this project, it might be a good idea to use enamelled copper wire of 0.45 mm or larger in an attempt to avoid this insulation failure hazard. No part of the transformer coil spool should be metal and it would not be any harm to cover each layer of secondary winding with a layer of electrical tape to provide additional insulation between the coil turns in one layer and the turns in the layer on top of it.

A plug-in board layout might be as shown in figure 45.

Please remember that you can't just stick your average voltmeter across a 4 kV capacitor (unless you really do want to buy another meter) as they only measure up to about a thousand volts DC. So, if you are using high voltage, then you need to

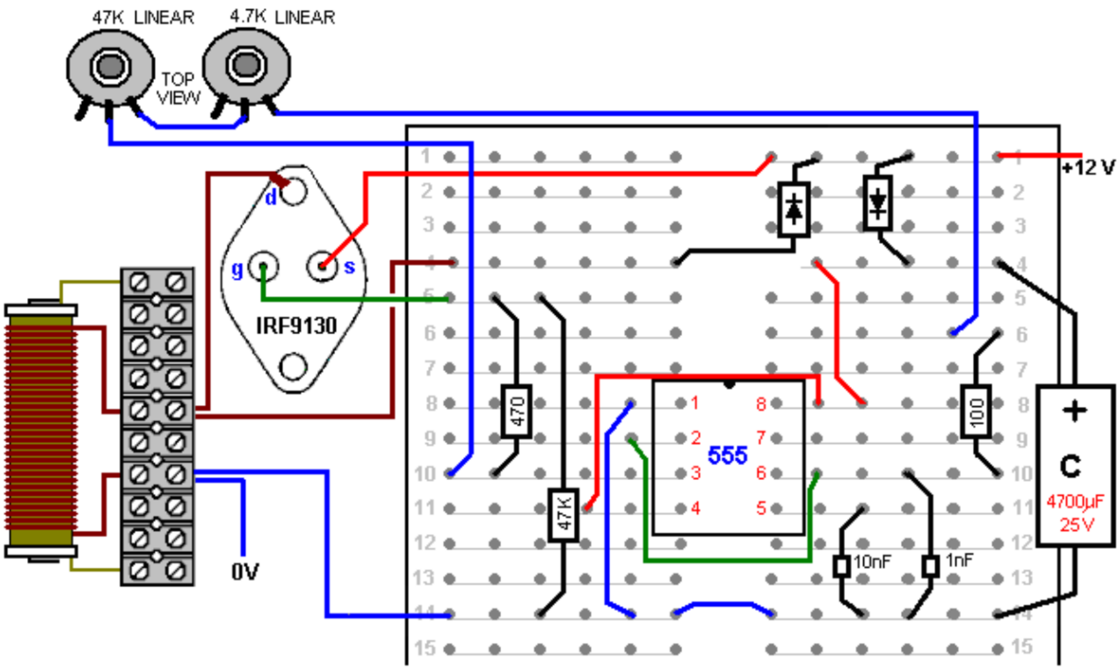


Figure 45: A plug-in board layout for the power supply, might be as shown here.

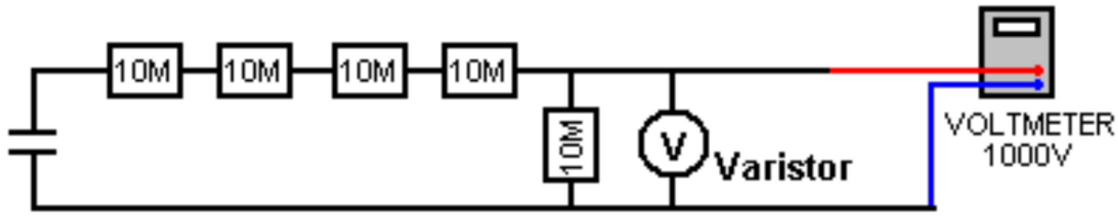


Figure 46: You can't just stick your average voltmeter across a 4 kV capacitor (unless you really do want to buy another meter) as they only measure up to about a thousand volts DC. So, if you are using high voltage, then you need to use a resistor-divider pair and measure the voltage on the lower resistor.

use a resistor-divider pair and measure the voltage on the lower resistor. But what resistor values should you use? If you put a 10 Megohm resistor across your 4 kV charged capacitor, the current flowing through the resistor would be 0.4 milliamps. Sounds tiny, doesn't it? But that 0.4 mA is 1.6 watts which is a good deal more than the wattage which your resistor can handle. Even using this arrangement, shown in figure 46, the current will be 0.08 mA and the wattage per resistor will be 64 mW.

The meter reading will be about 20% of the capacitor voltage which will give a voltmeter reading of 800 volts. The input resistance of the meter needs to be checked and possibly, allowed for as the resistance in this circuit is so high (see chapter 12 of [1]). When making a measurement of this type, the capacitor is discharged, the resistor chain and meter attached, and then, and only then, is the circuit powered up, the reading taken, the input power disconnected, the capacitor discharged, and the resistors disconnected. High-voltage circuits are highly dangerous, especially so, where a capacitor is involved. The recommendation to wear thick rubber gloves for this kind of work, is not intended to be humorous. Circuits of this type are liable to generate unexpected high-voltage spikes, and so, it might be a good idea to connect a varistor across the meter to protect it from those spikes. The varistor needs to be set to the voltage which you intend to measure and as varistors may not be available above a 300 V threshold, two or more may need to be connected in series where just one is shown in the diagram above (figure 46). The varistor should not have a higher voltage rating than your meter.

2. We now need to use this high voltage to create a strategically positioned spark to a ground connection. When making an earth connection, it is sometimes suggested

Figure 47: The spark gaps shown here, can be commercial high-voltage gas discharge tubes, adjustable home-made spark gaps with stainless steel tips about 1 mm apart, car spark plugs, or standard neon bulbs.

that connecting to water pipes or radiators is a good idea as they have long lengths of metal piping running under the ground and making excellent contact with it. However, it has become very common for metal piping to be replaced with cheaper plastic piping and so any proposed pipe connection needs a check to ensure that there is metal piping which runs all the way into the ground.

The spark gaps shown in figure 47, can be commercial high-voltage gas discharge tubes, adjustable home-made spark gaps with stainless steel tips about 1 mm apart, car spark plugs, or standard neon bulbs, although these run rather hot in this application. A 15 mm $\times$ 6 mm size neon bulb operates with only 90 or 100 volts across it, it would take a considerable number of them connected in series to create a high voltage spark gap, but it is probably a misconception that the spark gap itself needs a high voltage. Later on in this chapter, there is an example of a very successful system where just one neon bulb is used for the spark gap and an oscillating magnetic field more than a meter wide is created when driven by just an old 2,500 volt neon-sign transformer module. If using a neon bulb for the spark gap, then an experienced developer recommends that a 22 K resistor is used in series with the neon in order to extend it's working life very considerably.

This circuit is one way to connect the spark gap and ground connection as shown in figure 48.

This is an adaption of a circuit arrangement used by the forum member "SLOW-'N-EASY" on the Don Smith topic in the energeticforum. Here, he is using a 'LowGlow' neon transformer intended for use on a bicycle. The diodes are there to protect the

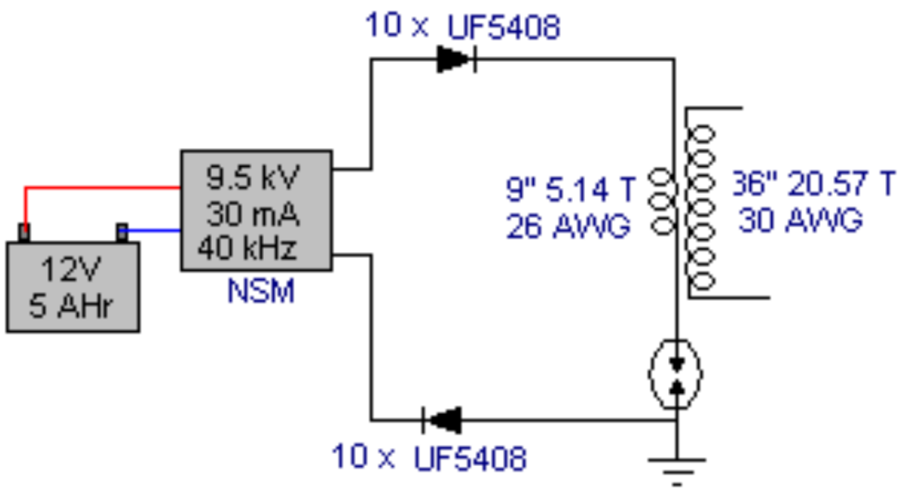


Figure 48: This circuit is one way to connect the spark gap and ground connection.

high-voltage power supply from any unexpected voltage spikes created later on in the circuit. The spark gap is connected between the primary winding of a step-up transformer and the earth connection. No capacitor is used. Seeing this circuit (figure 48), we immediately think of Don Smith's large and expensive coils, but this experimenter does not use anything like that. Instead, he winds his transformer on a simple plastic former like this, shown in figure 49.

And to make matters 'worse' the primary winding wire is just 9 inches (228.6 mm) long and the secondary just 36 inches (914.4 mm) long, the primary being wound directly on top of the secondary. Not exactly a large or expensive construction and yet one which appears to perform adequately in actual tests.

This is a very compact form of construction, but there is no necessity to use exactly the same former for coils, nor is there anything magic about the nine-inch length of the L1 coil, as it could easily be any convenient length, say two feet or 0.5 metres, or whatever. The important thing is to make the L2 wire length exactly four times that length, cutting the lengths accurately. It is common practice to match the weight of copper in each coil and so the shorter wire is usually twice the diameter of the longer wire.

The circuit above, produces a cold electricity output of high voltage and high frequency. The voltage will not be the same as the neon transformer voltage, nor is the

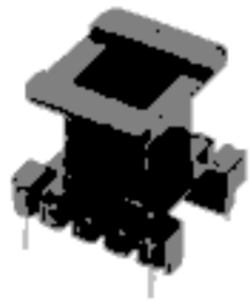


Figure 49: Seeing this circuit (figure 48), we immediately think of Don Smith's large and expensive coils, but this experimenter does not use anything like that. Instead, he winds his transformer on a simple plastic former, shown above.

frequency the same either. The two coils resonate at their own natural frequency, unaltered by any capacitors.

3. The next step is to get the high voltage down to a more convenient level, perhaps, like this, shown in figure 50.

Here, an identical transformer, wound in exactly the same way, is used in reverse, to start the voltage lowering sequence. The wire length ratio is maintained to keep the transformer windings resonant with each other. Supposing we were to wind the L2 coil of this second transformer in a single straight winding and instead of winding just one L1 winding on top of it, two or more L1 identical windings were placed on top of it —what would happen? See figure 51.

Now for a comment which will seem heretical to people steeped in the present day (inadequate) level of technology. The power flowing in these transformers is cold electricity which operates in an entirely different way to hot electricity. The coupling between these coils would be inductive if they were carrying hot electricity and in that case, any additional power take-off from additional L1 coils would have to be 'paid' for by additional current draw through the L2 coil. However, with the cold electricity which these coils are actually carrying, the coupling between the coils is

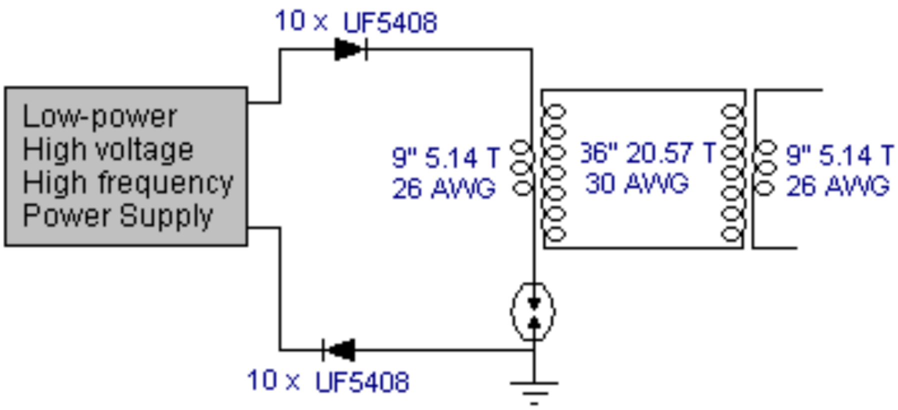


Figure 50: The next step is to get the high voltage down to a more convenient level via a transformer, perhaps, like this, shown here.

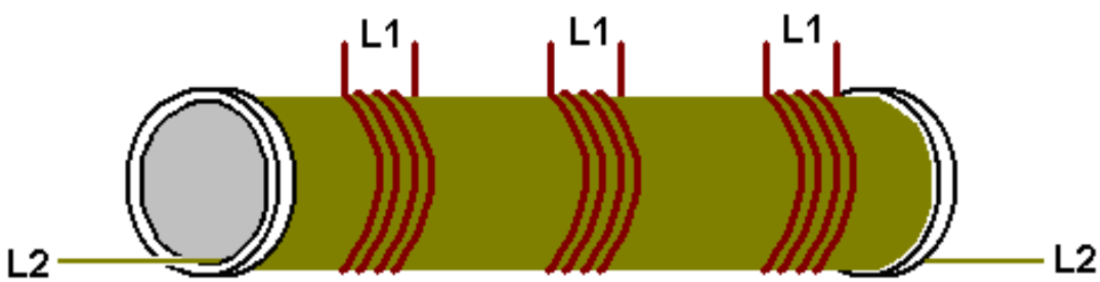


Figure 51: Here, an identical transformer, wound in exactly the same way, is used in reverse, to start the voltage lowering sequence. The wire length ratio is maintained to keep the transformer windings resonant with each other. Supposing we were to wind the L2 coil of this second transformer in a single straight winding and instead of winding just one L1 winding on top of it, two or more L1 identical windings were placed on top of it —what would happen?

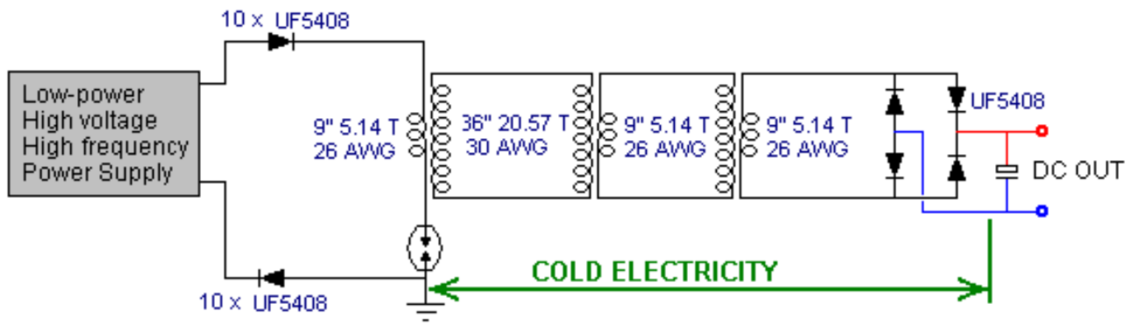


Figure 52: There is likely to be at least one further step-down transformer needed and eventually, we need conversion to hot electricity, as shown above.

magnetic and not inductive and that results in no increase in L2 current, no matter how many L1 coil take-offs there are. Any additional L1 coils will be powered for free. However, the position of the coils relative to each other has an effect on the tuning, so the L1 coil should be in the middle of the L2 coil, which means that any additional L1 coils are going to be slightly off the optimum tuning point.

4. Anyway, following through on just one L1 coil, there is likely to be at least one further step-down transformer needed and eventually, we need conversion to hot electricity. See figure 52.

Probably the easiest conversion is by feeding the energy into a capacitor and making it standard DC. The frequency is still very high, so high-speed diodes (such as the 75-nanosecond UF54008) are needed here although the voltage level is now low enough to be no problem. The DC output can be used to power an inverter so that standard mains equipment can be used. It is not necessary to use just one (expensive) large-capacity inverter to power all possible loads as it is cheaper to have several smaller inverters, each powering it's own set of equipment. Most equipment will run satisfactorily on square-wave inverters and that includes a mains unit for powering the input oscillator circuit.

PVC pipe is not a great material when using high-frequency high-voltage signals, and grey PVC pipe is a particularly poor coil former material. The much more expensive acrylic pipe is excellent, but if using PVC, then performance will be better if the PVC pipe is coated with an insulating lacquer (or table tennis balls dissolved in acetone as shown on YouTube).

However, there are some other factors which have not been mentioned. For example, if the L1 coil is wound directly on top of the L2 coil, it will have roughly the same diameter and so, the wire being four times longer, will have roughly four times as many turns, giving a step-up or step-down ratio of around 4:1. If, on the other hand, the coil diameters were different, the ratio would be different as the wire lengths are fixed relative to each other. If the L2 coil were half the diameter of the L1 coil, then the turns ratio would be about 8:1 and at one third diameter, 12:1 and at a quarter diameter 16:1 which means that a much greater effect could be had from the same wire length by reducing the L2 coil diameter. However, the magnetic effect produced by a coil is linked to the cross-sectional area of the coil and so a small diameter is not necessarily at great advantage. Also, the length of the L1 coil wire and number of turns in it, affect the DC resistance, and more importantly, the AC impedance which affects the amount of power needed to pulse the coil.

It is also thought that having the same weight of copper in each winding gives an improved performance, but what is not often mentioned is the opinion that the greater the weight of copper, the greater the effect. You will recall that Joseph Newman (chapter 11 of [1]) uses large amounts of copper wire to produce remarkable effects. So, while 9 inches and 36 inches of wire will work for L1 and L2, there may well be improved performance from longer lengths of wire and/or thicker wires.

We should also not forget that Don Smith pointed out that voltage and current act (out of phase and) in opposite directions along the L2 coil, moving away from the L1 coil as shown in figure 53.

It has been suggested that a greater and more effective power output can be obtained by splitting the L2 coil underneath the L1 coil position, winding the second part of L2 in the opposite direction and grounding the junction of the two L2 windings. Don doesn't consider it necessary to reverse the direction of winding. The result is an L2 winding which is twice as long as before and arranged as shown in figure 54.

Here, the additional high-voltage diodes allow the two out of phase windings to be connected across each other. You will notice that this arrangement calls for two separate earth connections, both of which need to be high quality connections, something like a pipe or rod driven deeply into moist soil or alternatively, a metal plate or similar metal object of substantial surface area, buried deep in moist earth, and a thick copper wire or copper braid used to make the connection. These earthing points

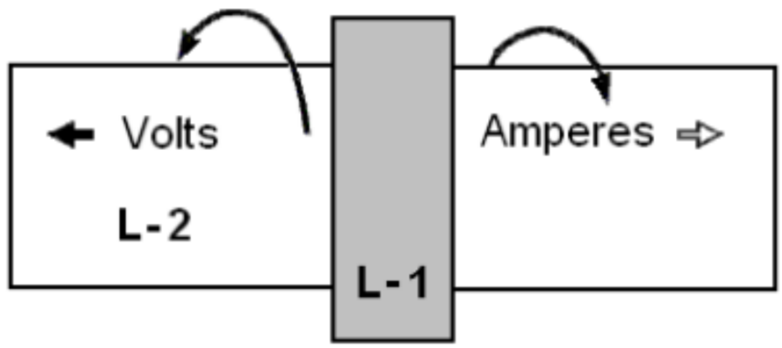


Figure 53: We should also not forget that Don Smith pointed out that voltage and current act (out of phase and) in opposite directions along the L2 coil, moving away from the L1 coil as shown here.

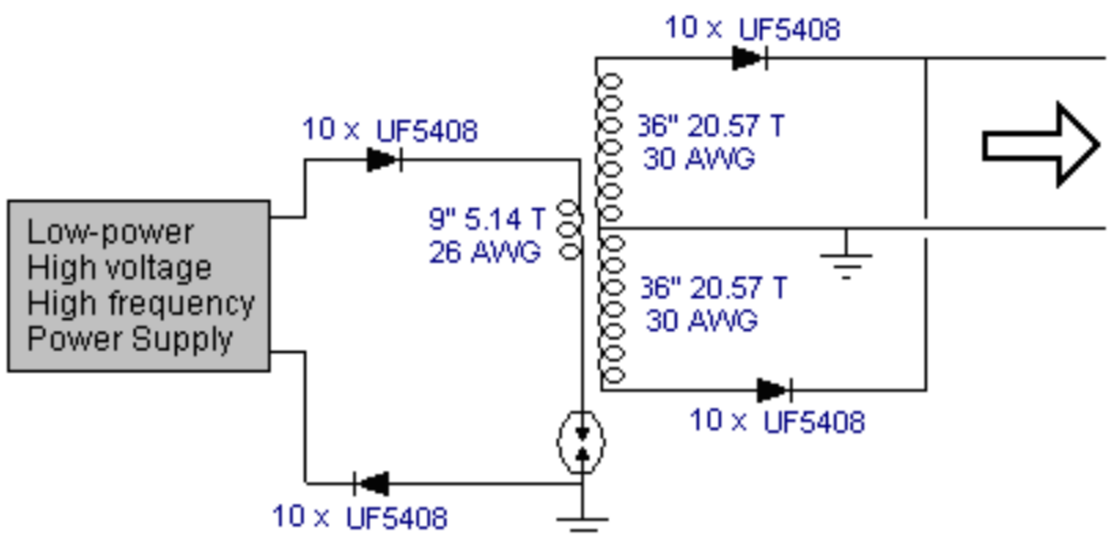


Figure 54: It has been suggested that a greater and more effective power output can be obtained by splitting the L2 coil underneath the L1 coil position, winding the second part of L2 in the opposite direction and grounding the junction of the two L2 windings. Don doesn't consider it necessary to reverse the direction of winding. The result is an L2 winding which is twice as long as before and arranged as shown here.

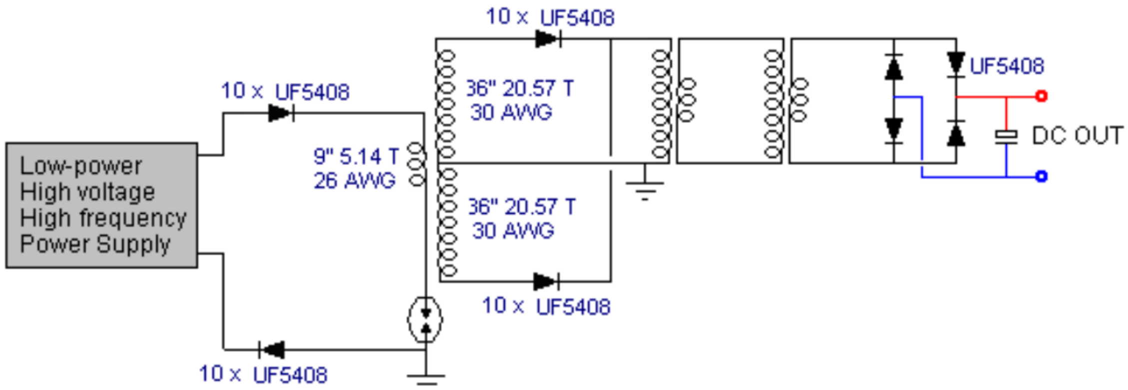


Figure 55: Here, the additional high-voltage diodes allow the two out of phase windings to be connected across each other. A single earth connection can't be used as that would effectively short-circuit across the L1/L2 transformer which you really do not want to do. With this arrangement, the outline circuit becomes as shown above.

need to be fairly far apart, say, ten metres. A single earth connection can't be used as that would effectively short-circuit across the L1/L2 transformer which you really do not want to do.

With this arrangement, the outline circuit becomes as shown in figure 55.

The thick earth wiring is helpful because in order to avoid the earth wire being included in the resonant wire length, you need a sudden change in wire cross-section as shown in figure 56.

These are just some ideas which might be considered by some experienced developer who may be thinking of investigating Don Smith style circuitry.

To give you some idea of the capacity of some commercially available wires when carrying hot electricity, Table 3 may help.

It is recommended that the wire have a current carrying capacity of 20% more than the expected actual load, so that it does not get very hot when in use. The wire diameters do not include the insulation, although for solid enamelled copper wire, that can be ignored. There is a most impressive video and circuit shown at http://youtu.be/Q3vr6qmOwLw where a very simple arrangement produces an im-

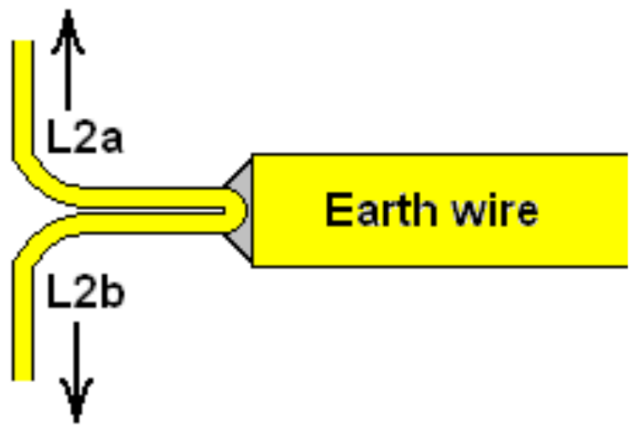


Figure 56: The thick earth wiring is helpful because in order to avoid the earth wire being included in the resonant wire length, you need a sudden change in wire cross-section as shown above.

AWG	SWG	Diameter	Maximum Amps	220V kW	110V kW
1	2	7.01 mm	119	26.18	13.09
3	4	5.89 mm	75	16.50	8.25
4	6	4.88 mm	60	13.20	6.60
6	8	4.06 mm	37	8.14	4.07
8	10	3.25 mm	24	5.28	2.64
10	12	2.64 mm	15	3.30	1.65
12	14	2.03 mm	9.3	2.05	1.02
13	15	1.83 mm	7.4	1.63	801 W
14	16	1.63 mm	5.9	1.30	650 W
15	17	1.42 mm	4.7	1.03	515 W
16	18	1.22 mm	3.7	814 W	407 W

Table 3: Capacity of some commercially available wires when carrying hot electricity.

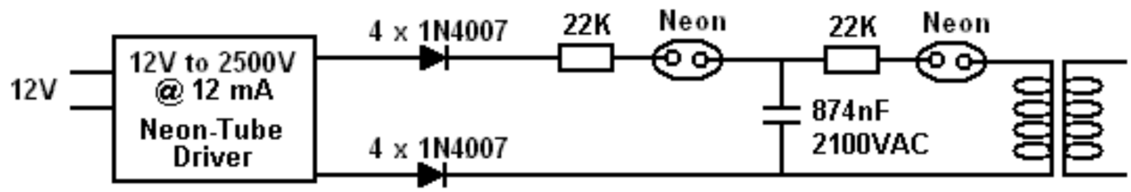


Figure 57: There is a most impressive video and circuit shown at http://youtu.be/Q3vr6qmOwLw where a very simple arrangement produces an immediately successful performance for the front end of Don's circuitry. The circuit of a simple Neon Sign Transformer module appears to be as shown above.

mediately successful performance for the front end of Don's circuitry. The circuit appears to be as shown in figure 57.

Here, a simple Neon Sign Transformer module (an image from the above video link is shown in figure 58), which has no earth connection, is used to produce a 2.5 kV voltage with a frequency of 25 kHz and a maximum output current capacity of 12 mA. There is no difficulty in constructing the equivalent to that power supply unit. The two outputs from the module are converted to DC by a chain of four 1N4007 diodes in series in each of the two outputs (each chain being inside a plastic tube for insulation).

This output is fed through an optional 22 K resistor via a neon lamp to a microwave oven capacitor which happens to be 874 nF with a voltage rating of 2,100 volts. You might feel that the voltage rating of the capacitor is too low for the output voltage of the neon sign module, but the neon has a striking voltage of just 90 volts and so the capacitor is not going to reach the output voltage of the power supply. The resistors are solely to extend the life of the neons as the gas inside the tube gets a considerable jolt in the first nanosecond after switch-on. It is unlikely that omitting those resistors would have any significant effect, but then, including them is a trivial matter. The second neon feeds the primary of the resonant transformer which is only shown in notional outline in the diagram above as the developer suggests that the primary acts as a transmitter and that any number of receiving coils can be used as individual secondaries by being tuned to the exact frequency of that resonating primary. See figure 58.

In the video showing this arrangement (figure 58), the developer demonstrates the fluctuating, high-frequency field which extends for some four feet (1.2 m) around the

Figure 58: A simple Neon Sign Transformer module. Here is an image of it from the above video link, also here: http://youtu.be/Q3vr6qmOwLw.

coil. He also remarks that the single neons in his arrangement could each be replaced with two neons in series. In test which I ran, I found that I needed two neons in series ahead of the capacitor in order to get continuous lighting of the output neon. Also, one of the diodes needed to be reversed so that one faced towards the input and one away from it (figure 59). It did not matter which diode was reversed as both configurations worked. Again, please note that this presentation is for information purposes only and it is NOT a recommendation that you should actually build one of these devices. Let me stress again that this is a high-voltage device made even more dangerous by the inclusion of a capacitor, and it is quite capable of killing you, so, don't build one. The developer suggests that it is an implementation of the "transmitter" section of Don's Transmitter/multiple-receivers design shown below.

However, before looking at that design, there is one question which causes a good deal of discussion on the forums, namely, if the centre-tap of the L2 secondary coil is connected to ground, then should that earth-connection wire length be considered to be part of the quarter length of the L1 coil? To examine this possibility in depth, the following quote from Richard Quick's very clear explanation of resonance in his US patent 7,973,296 of 5th July 2011 is very helpful. However, the simple answer is that for there to be exact resonance between two lengths of wire (whether or not part, or all of those lengths of wire happen to be wound into a coil), then one length needs to be exactly four times as long as the other, and ideally, half the diameter as well. At both ends of both lengths of wire, there needs to be a sudden change in wire diameter and Richard explains why this is. But, leaving that detailed explanation for now, we can use that knowledge to explain the above simplified system in more detail. Here is the circuit again in figure 59.

One very important point to note is that no earth connection is required and in spite of that, the performance shown on video (figure 58) is very impressive. While an earth connection can feed substantial power into the circuit, not needing one for the front end is an enormous advantage and potentially, opens the way for a truly portable device. Another very important point is the utter simplicity of the arrangement where only cheap, readily available components are used (and not many of those are needed). The resistors for extending the life of the neon bulbs are not shown, but they can be included if desired and the circuit operation is not altered significantly by having them there. If a higher spark voltage is wanted, then two or more neon bulbs can be used in series where these circuit diagrams show just one.

A point to note is that the lower diode is shown reversed when compared to the pre-

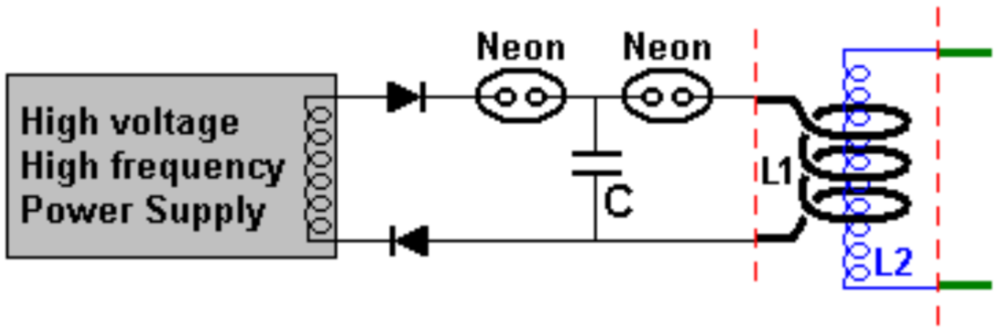


Figure 59: Simple Neon Sign Transformer module adaptions. In test which I ran, I found that I needed two neons in series ahead of the capacitor in order to get continuous lighting of the output neon. Also, one of the diodes needed to be reversed so that one faced towards the input and one away from it. It did not matter which diode was reversed as both configurations worked.

vious diagram. This is because the power supply shown is any generic power supply which drives a simple output coil which does not have a centre tap. The neon supply of the earlier diagram appears to have two separate outputs which will, presumably, be out of phase with each other as that is common practice for neon-sign driver modules. If you wish, the two diodes shown here could be replaced by a diode bridge of four high-voltage, high-speed diodes.

The wire lengths of L1 and L2 are measured very accurately from where the wire diameter changes suddenly, as indicated by the red dashed lines (figure 59). The L2 wire length is exactly four times as long as the L1 wire length and the L2 wire diameter is half of the L1 wire diameter.

How long is the L1 wire? Well, how long would you like it to be? It can be whatever length you want and the radius of the L1 coil can be whatever you want it to be. The theory experts will say that the L1 coil should resonate at the frequency of the power feeding it. Well, good for them, I say, so please tell me what frequency that is. It is not going to be the frequency of the power supply as that will be changed by at least one of the neon bulbs. So, what frequency will the neon bulb produce? Not even the manufacturer could tell you that as there is quite a variation between individual bulbs which are supposedly identical.

Actually, it doesn't matter at all, because the L1 coil (and the L2 coil if you measure

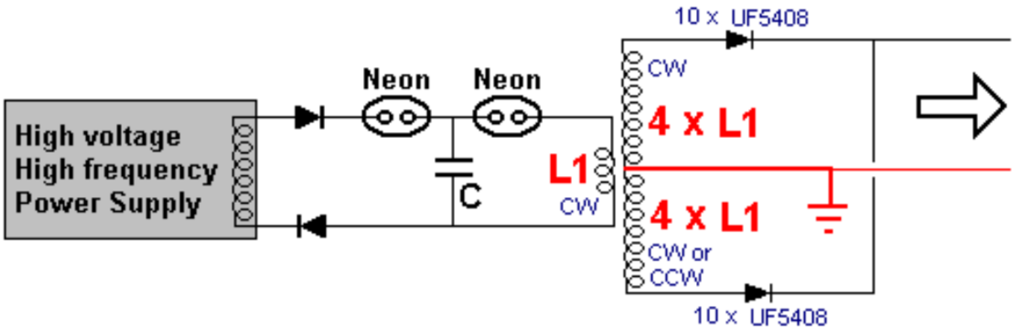


Figure 60: Continued adaptions of the Neon Sign Transformer module. The length of the wire for the L1 coil is the choice of the builder, but once that length is chosen it determines the length of the wire for the L2 coil as that is exactly four times as long, unless the builder decides to use an arrangement which has L2 wound in both the Clockwise and counter-clockwise directions, in which case, each half of the L2 coil will be four times the length of the wire in the L1 coil, like this shown here.

them accurately) has a resonant frequency all of its own and it will vibrate at that frequency no matter what the frequency feeding it happens to be. A coil resonates in very much the same way that a bell rings when it is struck. It doesn't matter how hard you strike the bell or how rapidly you strike it —the bell will ring at it's own natural frequency. So the L1 coil will resonate at it's own natural frequency no matter what rate the voltage spikes striking it arrive, and as the L2 coil has been carefully constructed to have exactly that same frequency, it will resonate in synchronisation with the L1 coil.

This means that the length of the wire for the L1 coil is the choice of the builder, but once that length is chosen it determines the length of the wire for the L2 coil as that is exactly four times as long, unless the builder decides to use an arrangement which has L2 wound in both the Clockwise and counter-clockwise directions, in which case, each half of the L2 coil will be four times the length of the wire in the L1 coil, like this shown in figure 60.

Mind you, there is one other factor to be considered when deciding what the most convenient wire length for L1 might be, and that is the number of turns in the L1 coil. The larger the ratio between the turns in L1 and the turns in L2, the higher the voltage boost produced by the L1/L2 transformer, and remember that the length of L2 is fixed relative to the length of L1.

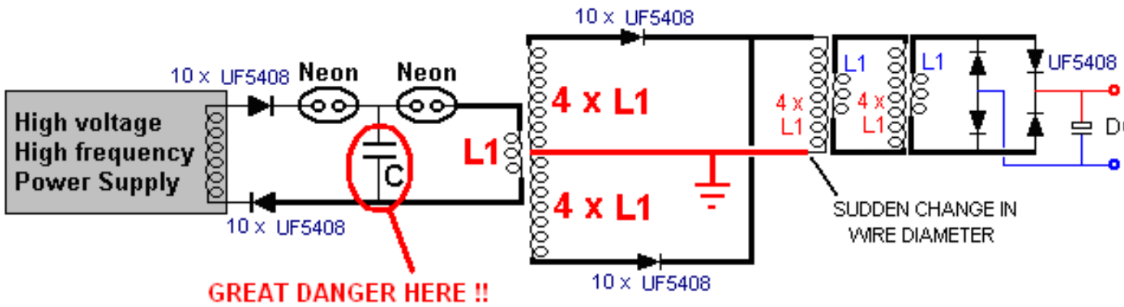


Figure 61: One other factor to be considered for the Neon Sign Transformer module, when deciding what the most convenient wire length for L1 might be, and that is the number of turns in the L1 coil. The larger the ratio between the turns in L1 and the turns in L2, the higher the voltage boost produced by the L1/L2 transformer, and remember that the length of L2 is fixed relative to the length of L1. A possible circuit style might be as shown above.

So, a possible circuit style might be as shown in figure 61.

There are some important points to remember. One is that there must be a sudden change of wire diameter at both ends of each L1 coil and at the ends of each L2 coil. If there isn't, then the connecting wire length will form part of the coil and if there is some change in diameter but not very much, then it is anybody's guess what the resonant wire length for that coil will be. There can be as many step-down isolation air-core L1/L2 transformers as desired and these do not need to be particularly large or expensive.

The builder of this circuit put it together in just a few minutes, using components which were to hand, including the microwave oven capacitor marked "C" in the diagrams above. That capacitor is isolated on both sides by the neon bulb spark gaps and so it will have no modifying effect on the resonant frequency of any of the coils in this circuit. But it is vital to understand that the energy stored in that capacitor can, and will, kill you instantly if you were to touch it, so let me stress once again that this information is NOT a recommendation that you actually build this circuit. The DC output from the circuit is intended to power a standard inverter, which in turn, would be perfectly capable of powering the high voltage, high frequency input oscillator.

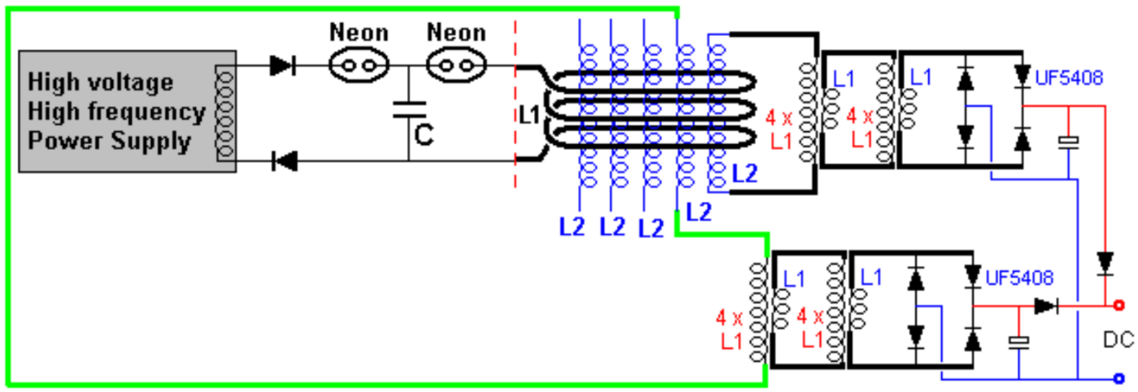


Figure 62: One final point is that as demonstrated in the video, the oscillating magnetic field produced by the L1 coil can power several identical L2 coils, giving several additional power outputs for no increase in input power, because the coupling is magnetic and not inductive as mentioned earlier in this chapter (also see [1]). One possible arrangement might be as shown here.

One final point is that as demonstrated in the video, the oscillating magnetic field produced by the L1 coil can power several identical L2 coils, giving several additional power outputs for no increase in input power, because the coupling is magnetic and not inductive as mentioned earlier in this chapter (also see [1]). Please notice that neither the L1 coil nor the L2 coil has a capacitor connected across it, so resonance is due solely to wire length and no expensive high-voltage capacitors are needed to get every L1/L2 coil pair resonating together. One possible arrangement might be like figure 62.

Where two of the L2 coils are shown connected together (figure 62) to give increased output power. This arrangement uses low-voltage inexpensive components for the output stages and there is no obvious limit to the amount of output power which could be provided. As the circuit operates at high frequency throughout, there is no particular need for additional L2 coils to be placed physically inside the L1 coil as shown in figure 63.

However, there can be an advantage to this arrangement in that the wire length of the L1 coil is greater, which in turn makes the wire length of each L2 coil greater (being four times longer). This gives greater flexibility when planning the turns ratio of the L1/L2 transformer. The voltage step-up or step-down of that transformer happens to be in the ratio of the turns, in spite of the fact that this is not inductive

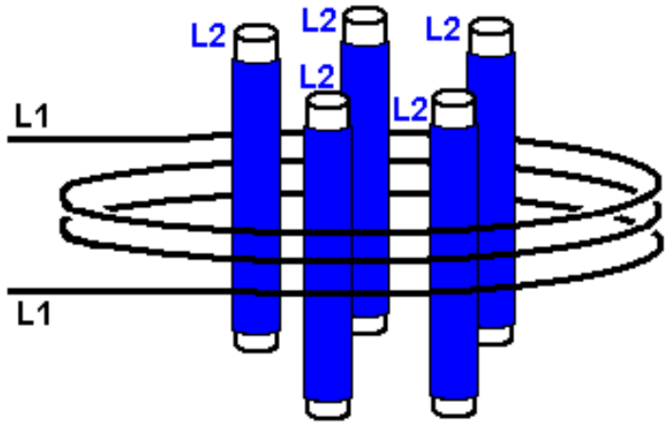


Figure 63: As the circuit operates at high frequency throughout, there is no particular need for additional L2 coils to be placed physically inside the L1 coil, as shown here.

coupling and so standard transformer technology does not apply.

When you choose the number of turns and coil diameter for L1, that also gives the length of the L2 wire. In order to get the desired output voltage, if perhaps, the step-down ratio is needed to be an amount of 46:1, then you need 46 times the number of L1 turns on the L2 coil. That means that you know both the wire length and number of turns wanted in the L2 coil. But, as each turn will have a length of 3.14159 (number π) times the diameter, it follows then that the wanted diameter is the wire length per turn, divided by 3.14159. The wire sits on top of the tube on which it is wound and so has a greater diameter by one wire thickness, so the calculated tube diameter needs to be reduced by one wire diameter. For example, if the length per turn is 162 mm and the wire diameter 0.8 mm, then the tube diameter would be $162/3.14159 - 0.8$ which is 50.766 mm (just over two inches).

So, if we have resonant standing-wave voltages in our L2 coil and some of that signal passes through the wire connecting one end of the coil to the earth, then what will happen? The best way to check it is to test the way in which a prototype behaves, however, if I may express an opinion, I would suggest that the signal passing down the earth wire will be absorbed when it reaches the earth and that will prevent the signal being reflected back to the L2 coil to upset it's operation.

Another device of Don's is particularly attractive because almost no home-construction

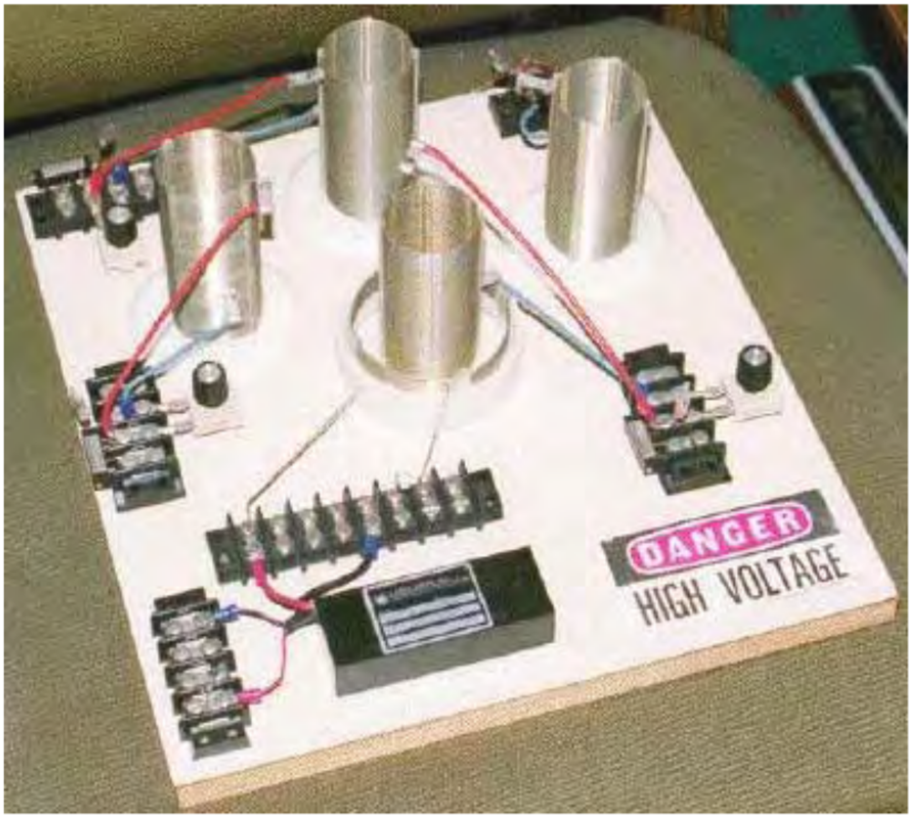


Figure 64: Another device of Don's is particularly attractive because almost no home-construction is needed, all of the components being available commercially, and the output power being adaptable to any level which you want.

is needed, all of the components being available commercially, and the output power being adaptable to any level which you want. Don particularly likes this circuit because it demonstrates COP > 1 so neatly and he remarks that the central transmitter Tesla Coil on its own is sufficient to power a household. See figure 64.

The coil in the centre of the board (figure 64) is a power transmitter made from a Tesla Coil constructed from two Barker & Williamson ready-made coils. Three more of the inner coil are also used as power receivers. The outer, larger diameter coil is a few turns taken from one of their standard coils and organised so that the coil wire length is one quarter of the coil wire length of the inner coil ("L2").

As before, a commercial neon-tube driver module is used to power the "L1" outer

Figure 65: Here is the circuit image again from a different angle: for, another device of Don's that is particularly attractive because almost no home-construction is needed, all of the components being available commercially, and the output power being adaptable to any level which you want.

coil with high voltage and high frequency. It should be understood that as power is drawn from the local environment each time the power driving the transmitter coil "L1" cycles, that the power available is very much higher at higher frequencies. The power at mains frequency of less than 100 Hz is far, far less than the power available at 35,000 Hz, so if faced with the choice of buying a 25 kHz neon-tube driver module or a 35 kHz module, then the 35 kHz module is likely to give a much better output power at every voltage level. Here is the circuit image again from a different angle figure 65.

The "L1" short outer coil is held in a raised position by the section of white plastic

Figure 66: Here is the circuit image again shown enlarged. The "L1" short outer coil is held in a raised position by the section of white plastic pipe in order to position it correctly relative to the smaller diameter "L2" secondary coil.

pipe in order to position it correctly relative to the smaller diameter "L2" secondary coil. Here is the circuit image again shown enlarged in figure 66.

The secondary coils are constructed using Barker & Williamson's normal method of using slotted strips to hold the tinned, solid copper wire turns in place (figure 66).

As there are very slight differences in the manufactured coils, each one is tuned to the exact transmitter frequency and a miniature neon is used to show when the tuning has been set correctly. See figure 67.

The key feature of this device is the fact that any number of receiver coils can be placed near the transmitter and each will receive a full electrical pick up from the local environment, without altering the power needed to drive the Tesla Coil transmitter

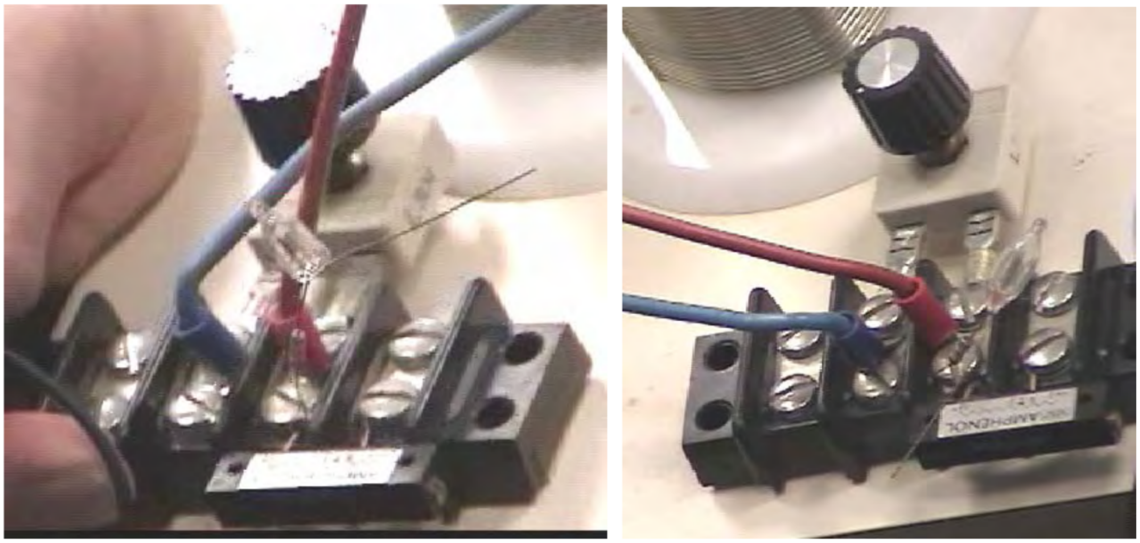


Figure 67: Here is another enlarged image of the circuit. As there are very slight differences in the manufactured coils, each one is tuned to the exact transmitter frequency and a miniature neon is used to show when the tuning has been set correctly.

—more and more output without increasing the input power —unlimited COP values, all of which are over 1. The extra power is flowing in from the local environment where there is almost unlimited amounts of excess energy and that inflow is caused by the rapidly vibrating magnetic field generated by the central Tesla Coil. While the additional coils appear to just be scattered around the base board, this is not the case. The YouTube video http://www.youtube.com/watch?v=TiNEHZRm4z4&feature=related demonstrates that the pick-up of these coils is affected to a major degree by the distance from the radiating magnetic field. This is to do with the wavelength of the signal driving the Tesla Coil, so the coils shown above (figures 64, 65 and 66) are all positioned at exactly the same distance from the Tesla Coil. You still can have as many pick-up coils as you want, but they will be mounted in rings around the Tesla Coil and the coils in each ring will be at the same distance from the Tesla Coil in the centre.

Each of the pick up coils act exactly the same as the "L2" secondary coil of the Tesla Coil transmitter, each picking up the same level of power. Just as with the actual "L2" coil, each will need an output circuit arrangement as described for the previous device. Presumably, the coil outputs could be connected in parallel to increase the output amperage, as they are all resonating at the same frequency and in phase

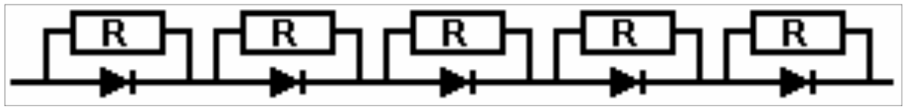


Figure 68: As there will be minor manufacturing differences in the diodes, it is good practice to connect a high value resistor (in the 1 to 10 megohm range) across each diode as that ensures that there is a roughly equal voltage drop across each of the diodes, as shown above.

with each other. Each will have its own separate output circuit with a step-down isolation transformer and frequency adjustment as before. If any output is to be a rectified DC output, then no frequency adjustment is needed, just rectifier diodes and a smoothing capacitor following the step-down transformer which will need to be an air core or ferrite core type due to the high frequency. High voltage capacitors are very expensive. The http://www.richieburnett.co.uk/parts.html web site shows various ways of making your own high-voltage capacitors and the advantages and disadvantages of each type.

There are two practical points which need to be mentioned. Firstly, as the Don Smith devices shown above feed radio frequency waveforms to coils which transmit those signals, it may be necessary to enclose the device in an earthed metal container in order not to transmit illegal radio signals. Secondly, as it can be difficult to obtain high-voltage high-current diodes, they can be constructed from several lower power diodes. To increase the voltage rating, diodes can be wired in a chain. Suitable diodes are available as repair items for microwave ovens. These typically have about 4,000 volt ratings and can carry a good level of current. As there will be minor manufacturing differences in the diodes, it is good practice to connect a high value resistor (in the 1 to 10 megohm range) across each diode as that ensures that there is a roughly equal voltage drop across each of the diodes, as shown in figure 68.

If the diode rating of these diodes were 4 amps at 4,000 volts, then the chain of five could handle 4 amps at 20,000 volts. The current capacity can be increased by connecting two or more chains in parallel. Most constructors omit the resistors and find that they seem to get satisfactory performance.

The impedance of a coil depends on it's size, shape, method of winding, number of turns and core material. It also depends on the frequency of the AC voltage being applied to it. If the core is made up of iron or steel, usually thin layers of iron which are insulated from each other, then it can only handle low frequencies. You can forget about trying to pass 10,000 cycles per second ("Hz") through the coil as the core just can't change it's magnetic poles fast enough to cope with that frequency. A core of that type is ok for the very low 50 Hz or 60 Hz frequencies used for mains power, which are kept that low so that electric motors can use it.

For higher frequencies, ferrite can be used for a core and that is why some portable radios use ferrite-rod aerials, which are a bar of ferrite with a coil wound on it. For higher frequencies (or higher efficiencies) iron dust encapsulated in epoxy resin is used. An alternative is to not use any core material and that is usually referred to as an "air-core" coil. These are not limited in frequency by the core but they have a very much lower inductance for any given number of turns. The efficiency of the coil is called it's "Q" (for "Quality") and the higher the Q factor, the better. The resistance of the wire lowers the Q factor.

A coil has inductance, and resistance caused by the wire, and capacitance caused by the turns being near each other. However, having said that, the inductance is normally so much bigger than the other two components that we tend to ignore the other two. Something which may not be immediately obvious is that the impedance to AC current flow through the coil depends on how fast the voltage is changing. If the AC voltage applied to a coil completes one cycle every ten seconds, then the impedance will be much lower than if the voltage cycles a million times per second.

If you had to guess, you would think that the impedance would increase steadily as the AC frequency increased. In other words, a straight-line graph type of change. That is not the case. Due to a feature called resonance, there is one particular frequency at which the impedance of the coil increases massively. This is used in the tuning method for AM radio receivers. In the very early days when electronic components were hard to come by, variable coils were sometimes used for tuning. We still have variable coils today, generally for handling large currents rather than radio signals, and we call them "rheostats" and some look like this, shown in figure 69.

These have a coil of wire wound around a hollow former and a slider can be pushed along a bar, connecting the slider to different winds in the coil depending on it's position along the supporting bar. The terminal connections are then made to the slider and to one end of the coil. The position of the slider effectively changes the number of turns of wire in the part of the coil which is being used in the circuit. Changing the number of turns in the coil, changes the resonant frequency of that

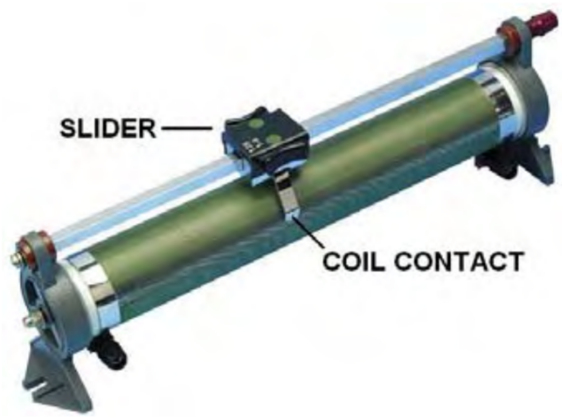


Figure 69: Due to a feature called resonance, there is one particular frequency at which the impedance of the coil increases massively. This is used in the tuning method for AM radio receivers. In the very early days when electronic components were hard to come by, variable coils were sometimes used for tuning. We still have variable coils today, generally for handling large currents rather than radio signals, and we call them "rheostats" and some look like this, shown above.

coil. AC current finds it very, very hard to get through a coil which has the same resonant frequency as the AC current frequency. Because of this, it can be used as a radio signal tuner, shown in figure 70.

If the coil's resonant frequency is changed to match that of a local radio station by sliding the contact along the coil, then that particular AC signal frequency from the radio transmitter finds it almost impossible to get through the coil and so it (and only it) diverts through the diode and headphones as it flows from the aerial wire to the earth wire and the radio station is heard in the headphones. If there are other radio signals coming down the aerial wire, then, because they are not at the resonant frequency of the coil, they flow freely through the coil and don't go through the headphones.

This system was soon changed when variable capacitors became available as they are cheaper to make and they are more compact. So, instead of using a variable coil for tuning the radio signal, a variable capacitor connected across the tuning coil did the same job, shown in figure 71.

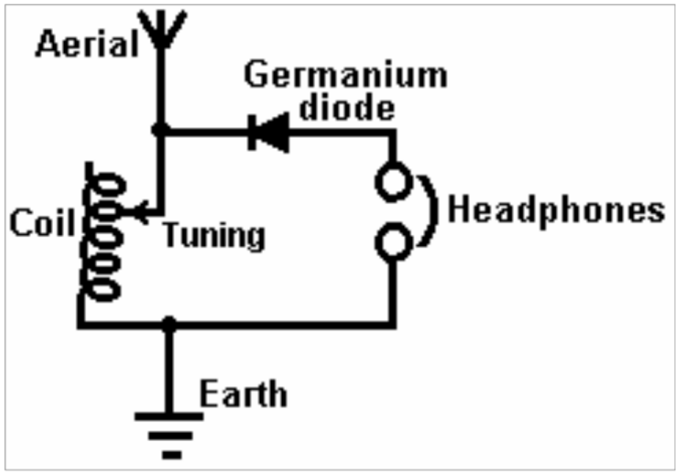


Figure 70: Changing the number of turns in the coil, changes the resonant frequency of that coil. AC current finds it very, very hard to get through a coil which has the same resonant frequency as the AC current frequency. Because of this, it can be used as a radio signal tuner, shown above.

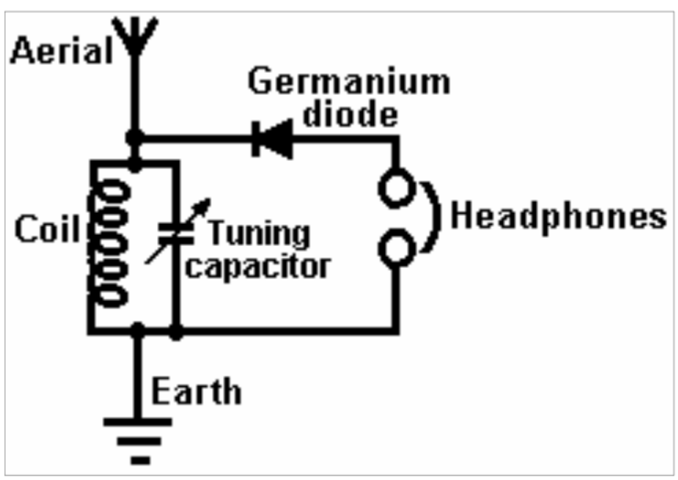


Figure 71: Instead of using a variable coil for tuning the radio signal, a variable capacitor connected across the tuning coil does the same job, shown above.

Figure 72: When a capacitor is placed across a coil "in parallel" as shown in the radio receiver circuit (figure 71), then the combination has a very high impedance (resistance to AC current flow) at the resonant frequency. But if the capacitor is placed "in series" with the coil, then there is nearly zero impedance at the resonant frequency of the combination. The circuits are shown here.

While the circuit diagram above is marked "Tuning capacitor" that is actually quite misleading. Yes, you tune the radio receiver by adjusting the setting of the variable capacitor, but, what the capacitor is doing is altering the resonant frequency of the coil/capacitor combination and it is the resonant frequency of that combination which is doing exactly the same job as the variable coil did on it's own.

This draws attention to two very important facts concerning coil/capacitor combinations. When a capacitor is placed across a coil "in parallel" as shown in this radio receiver circuit (figure 71), then the combination has a very high impedance (resistance to AC current flow) at the resonant frequency. But if the capacitor is placed "in series" with the coil, then there is nearly zero impedance at the resonant frequency of the combination. See figure 72.

This may seem like something which practical people would not bother with, after all, who really cares? However, it is a very practical point indeed. Remember that Don Smith often uses an early version, off-the-shelf neon-tube driver module as an easy way to provide a high-voltage, high-frequency AC current source, typically, 6,000 volts at 30,000 Hz. He then feeds that power into a Tesla Coil which is itself, a power amplifier. The arrangement is like this shown in figure 73.

People who try to replicate Don's designs tend to say, "I get great sparks at the spark gap until I connect the **L1** coil (figure 73) and then the sparks stop. This circuit can never work because the resistance of the coil is too low".

If the resonant frequency of the **L1** coil (figure 73) does not match the frequency being produced by the neon-tube driver circuit, then the low impedance of the **L1** coil at that frequency, will definitely pull the voltage of the neon-tube driver down to a very low value. But if the **L1** coil has the same resonant frequency as the driver circuit,

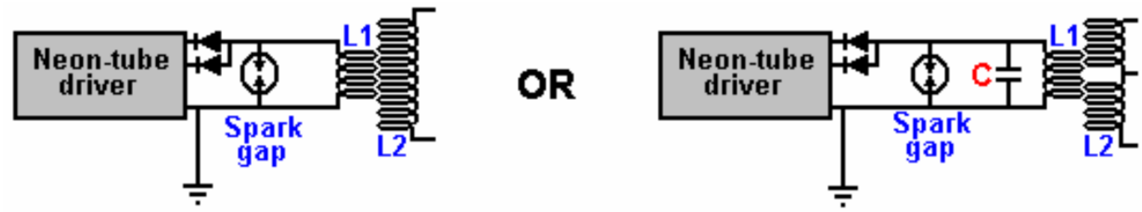


Figure 73: Note, that Don Smith often uses an early version, off-the-shelf neon-tube driver module as an easy way to provide a high-voltage, high-frequency AC current source, typically, 6,000 volts at 30,000 Hz. He then feeds that power into a Tesla Coil which is itself, a power amplifier. The arrangement is like this shown here.

then the **L1** coil (or the **L1** coil/capacitor combination shown on the right (figure 73)), will have a very high resistance to current flow through it and it will work well with the driver circuit. So, no sparks, means that the coil tuning is off. It is the same as tuning a radio receiver, get the tuning wrong and you don't hear the radio station.

This is very nicely demonstrated using simple torch bulbs and two coils in the YouTube video showing good output for almost no input power: http://www.youtube.com/watch?v=kQdcwDCBoNY and while only one resonant pick-up coil is shown, there is the possibility of using many resonant pick-up coils with just the one transmitter.

With a coil (fancy name "inductor" and symbol "L"), AC operation is very different to DC operation. The coil has a DC resistance which can be measured with the ohms range of a multimeter, but that resistance does not apply when AC is being used as the AC current flow is not determined by the DC resistance of the coil. Because of this, a second term has to be used for the current-controlling factor of the coil, and the term chosen is "impedance" which is the feature of the coil which "impedes" AC current flow through the coil.

The impedance of a coil depends on it's size, shape, method of winding, number of turns and core material. It also depends on the frequency of the AC voltage being applied to it. If the core is made up of iron or steel, usually thin layers of iron which are insulated from each other, then it can only handle low frequencies. You can forget about trying to pass 10,000 cycles per second ("Hz") through the coil as the core just can't change it's magnetic poles fast enough to cope with that frequency. A core of that type is ok for the very low 50 Hz or 60 Hz frequencies used for mains power, which are kept that low so that electric motors can use it.

For higher frequencies, ferrite can be used for a core and that is why some portable radios use ferrite-rod aerials, which are a bar of ferrite with a coil wound on it. For higher frequencies (or higher efficiencies) iron dust encapsulated in epoxy resin is used. An alternative is to not use any core material and that is usually referred to as an "air-core" coil. These are not limited in frequency by the core but they have a very much lower inductance for any given number of turns. The efficiency of the coil is called it's "Q" (for "Quality") and the higher the Q factor, the better. The resistance of the wire lowers the Q factor.

5 Constructing high-quality coils

The Barker & Williamson coils used by Don in his constructions are expensive to purchase. Some years ago, in an article in a 1997 issue of the "QST" amateur radio publication, Robert H. Johns shows how similar coils can be constructed without any great difficulty. The Electrodyne Corporation research staff have stated that off-the-shelf solid tinned copper wire produces three times the magnetic field that un-tinned copper does, so perhaps that should be borne in mind when choosing the wire for constructing these coils.

These home-made coils (figure 74) have excellent "Q" Quality factors, some even better than the tinned copper wire coils of Barker & Williamson because the majority of electrical flow is at the surface of the wire and copper is a better conductor of electricity than the silver tinning material.

The inductance of a coil increases if the turns are close together. The capacitance of a coil decreases if the turns are spread out. A good compromise is to space the turns so that there is a gap between the turns of one wire thickness. A common construction method with Tesla Coil builders is to use nylon fishing line or plastic strimmer cord between the turns to create the gap. The method used by Mr Johns allows for even spacing without using any additional material. The key feature is to use a collapsible former and wind the coil on the former, space the turns out evenly and then clamp them in position with strips of epoxy resin, removing the former when the resin has set and cured. See figure 74.

Mr Johns has difficulty with his epoxy being difficult to keep in place, but when mixed with the West System micro fibres, epoxy can be made any consistency and it

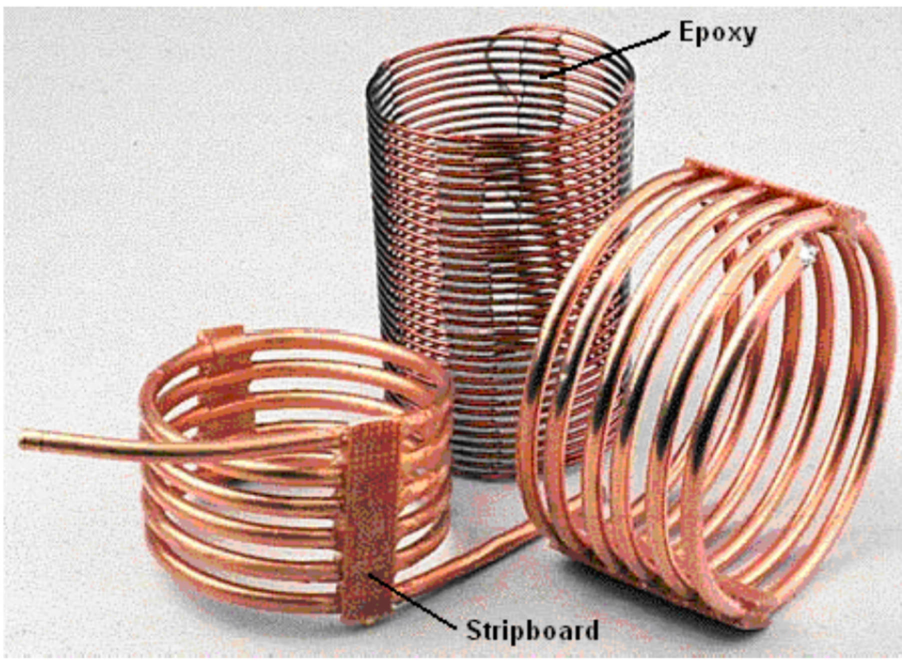


Figure 74: These home-made coils have excellent "Q" Quality factors, some even better than the tinned copper wire coils of Barker & Williamson because the majority of electrical flow is at the surface of the wire and copper is a better conductor of electricity than the silver tinning material.

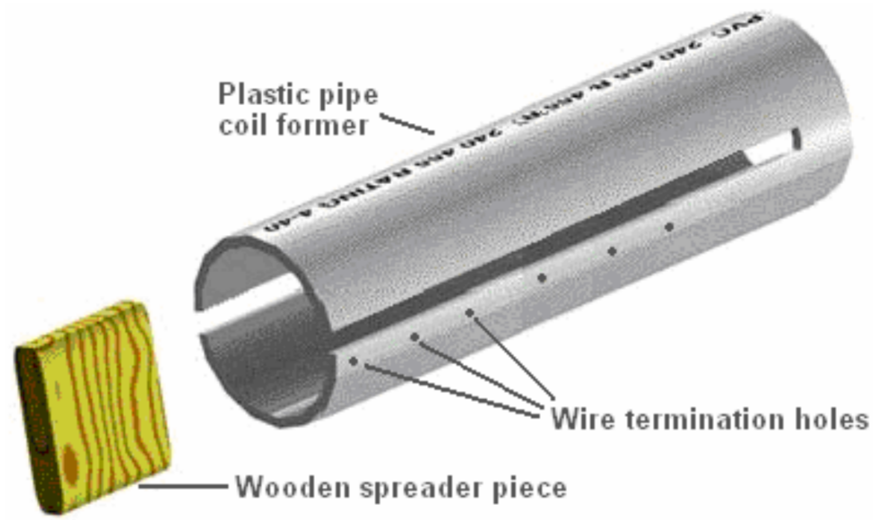


Figure 75: Plastic pipe used as the coil former.

can be applied as a stiff paste without any loss of it's properties. The epoxy is kept from sticking to the former by placing a strip of electrical tape on each side of the former. See figure 74.

I suggest that the plastic pipe used as the coil former (figure 75) is twice the length of the coil to be wound as that allows a good degree of flexing in the former when the coil is being removed. Before the two slots are cut in the plastic pipe, a wooden spreader piece is cut and it's ends rounded so that it is a push-fit in the pipe. This spreader piece is used to hold the sides of the cut end exactly in position when the wire is being wrapped tightly around the pipe.

Two or more small holes are drilled in the pipe beside where the slots are to be cut. These holes are used to anchor the ends of the wire by passing them through the hole and bending them. Those ends have to be cut off before the finished coil is slid off the former, but they are very useful while the epoxy is being applied and hardening. The pipe slots are cut to a generous width, typically 10 mm or more.

The technique is then to wedge the wooden spreader piece in the slotted end of the pipe (figure 75). Then anchor the end of the solid copper wire using the first of the drilled holes. The wire, which can be bare or insulated, is then wrapped tightly around the former for the required number of turns, and the other end of the wire secured in one of the other drilled holes. It is common practice to make the turns by rotating the former. When the winding is completed, the turns can be spaced out more evenly if necessary, and then a strip of epoxy paste applied all along one side of the coil. When that has hardened, (or immediately if the epoxy paste is stiff enough), the pipe is turned over and a second epoxy strip applied to the opposite side of the coil. A strip of paxolin board or strip-board can be made part of the epoxy strip. Alternatively, an L-shaped plastic mounting bracket or a plastic mounting bolt can be embedded in the epoxy ready for the coil installation later on.

When the epoxy has hardened, typically 24 hours later, the coil ends are snipped off, the spreader piece is tapped out with a dowel and the sides of the pipe pressed inwards to make it easy to slide the finished coil off the former. Larger diameter coils can be wound with small-diameter copper pipe.

The coil inductance can be calculated from the following equation.

Inductance in micro henrys:

$$L = \frac{d^2 n^2}{(18d + 40l)}$$

Where:
d is the coil diameter in inches measured from wire centre to wire centre
n is the number of turns in the coil
l is coil length in inches (1 inch = 25.4 mm)

Using this equation for working out the number of turns for a given inductance in micro henrys:

$$n = \frac{\sqrt{L(18d + 40l)}}{d}$$

6 A Russian implementation of Don Smith's design

Here is an attempt to translate a document from an unknown author on a Russian forum:

"Assembly Instructions for the Free-Energy Generator"

6.1 Part 1: Accessories and materials

1) The High-voltage power supply 3000V 100 – 200 W

It is possible to use transformers from neon lamps, or any similar radio amateur designs with high EFFICIENCY of transformation and stabilisation of a desired current. Here is a possible implementation using the fly-back transformer from an old CRT TV set, shown in figure 76.

2) High-frequency resonant system L1/L2

The coil L1 is wound using a high-quality audio speaker cable with a cross-sectional area of 6.10 sq. mm, or alternatively, home-made litz wire. The litz wire or speaker cable length with connecting leads is about 2 meters. The turns are wound on a plastic drain pipe of 50 mm diameter, the number of turns is 4 or 5 (wound to the left, that is, counter-clockwise). Don't cut the rest of the winding wire, instead, pass it through the middle of the tube, and use it to connect the winding to the spark-gap and capacitor of the primary circuit. Example of the construction shown in figure 77.

The secondary coil L2 of the resonant circuit, is wound using solid uninsulated copper wire with a diameter of 2 mm to 3 mm, preferably silver-plated (tinned wire is not so good). The secondary coil is wound with a diameter of about 75 mm. This coil has a tap in the middle. Both halves of the coil are wound in the same clockwise direction (to the right). The approximate number of turns between 2 sets of 16 turns, to 2 sets of 18 turns. The coil must be wound without using a coil former.

These coils should be mounted in such a way as to prevent the flow of high-frequency high-voltage current to other parts of the circuit or components. The ends of the coil wires are clamped in terminal blocks mounted on the base plate, ready for connection to the other circuit components. The ratio of the wire lengths in coils L1 and L2

Figure 76: It is possible to use transformers from neon lamps, or any similar radio amateur designs with high EFFICIENCY of transformation and stabilisation of a desired current. Here is a possible implementation using the fly-back transformer from an old CRT TV set, shown here.

Figure 77: The coil L1 is wound using a high-quality audio speaker cable with a cross-sectional area of 6.10 sq. mm, or alternatively, home-made litz wire. The litz wire or speaker cable length with connecting leads is about 2 meters. The turns are wound on a plastic drain pipe of 50 mm diameter, the number of turns is 4 or 5 (wound to the left, that is, counter-clockwise). An example of the construction is shown here.

Figure 78: The ratio of the wire lengths in coils L1 and L2 is 1 to 4, including the length of the connecting wires reaching to the other circuit components. A possible implementation of the secondary coil is shown here.

is 1 to 4, including the length of the connecting wires reaching to the other circuit components. A possible implementation of the secondary coil is shown here in figure 78.

High-voltage diodes (chains) can be purchased ready-made or can be constructed from individual single diodes. The resulting diode chains should have a current rating of not less than 10 amperes at a voltage of 25 kV to 30 kV. It may be necessary to put several diode chains in parallel in order to meet this current rating requirement. Here are examples of these high-voltage diode chains shown here in figures 79 and 80.

The resonance capacitors (for coils L1, L2) in the primary circuit, need to have a voltage rating of at least 4 kV, the capacitance depends on the frequency of the secondary circuit (28 nF was used by the author for a resonant frequency of 600 kHz). The capacitor must be high quality with minimal dielectric losses and good charge retention.

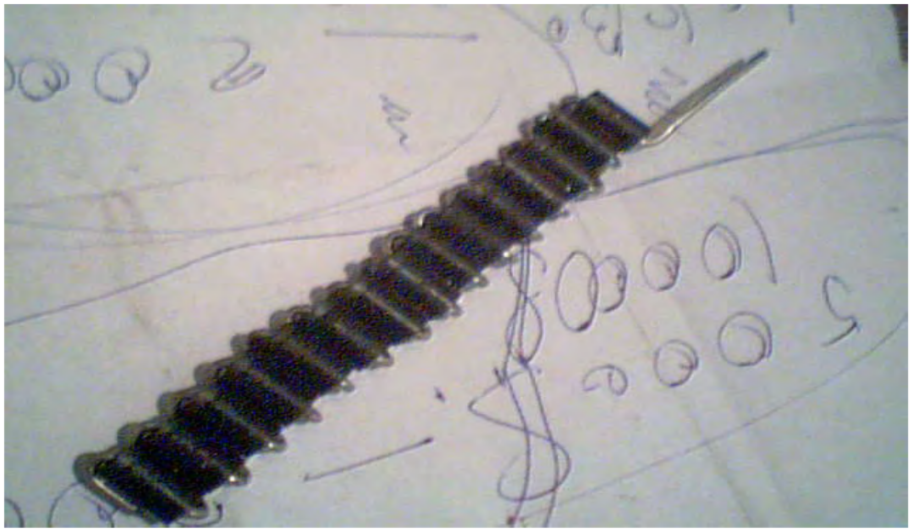


Figure 79: It may be necessary to put several diode chains in parallel in order to meet this current rating requirement. Here are examples of these high-voltage diode chains.

Usually a composite capacitor bank of low-power capacitors is used. The most appropriate types of Russian capacitors are the K78-2, K78-15, K78-25 or similar types, as these types can easily handle the impulse currents of the discharge.

For the capacitor of the secondary circuit it is better to use any of the above types of capacitors, but the composite voltage must not be less than 10 kV. Excellent working Russian capacitors are the KVI-3 type, or even better, the K15-y2 type.

The secondary coil plus a capacitor form a resonant circuit. The capacitor used in the secondary circuit depends on the desired resonant frequency (the author used a KVI-3 type of 2200 pF and a 10 kV rating).

Here is a photograph of the capacitor used in the secondary circuit in figure 81.

The high-frequency smoothing choke was used, wound in such a way as to get the minimum value of stray, parasitic capacitance in the inductor windings. The inductance range of this inductor is 100 - 200 micro-Henry, and using a partitioned winding helps to keep the coil capacitance low. The wire diameter to use is 1.5 to

Figure 80: Here are some more examples of these high-voltage diode chains. It may be necessary to put several diode chains in parallel in order to meet this current rating requirement.

Figure 81: Here is a photograph of the capacitor used in the secondary circuit.

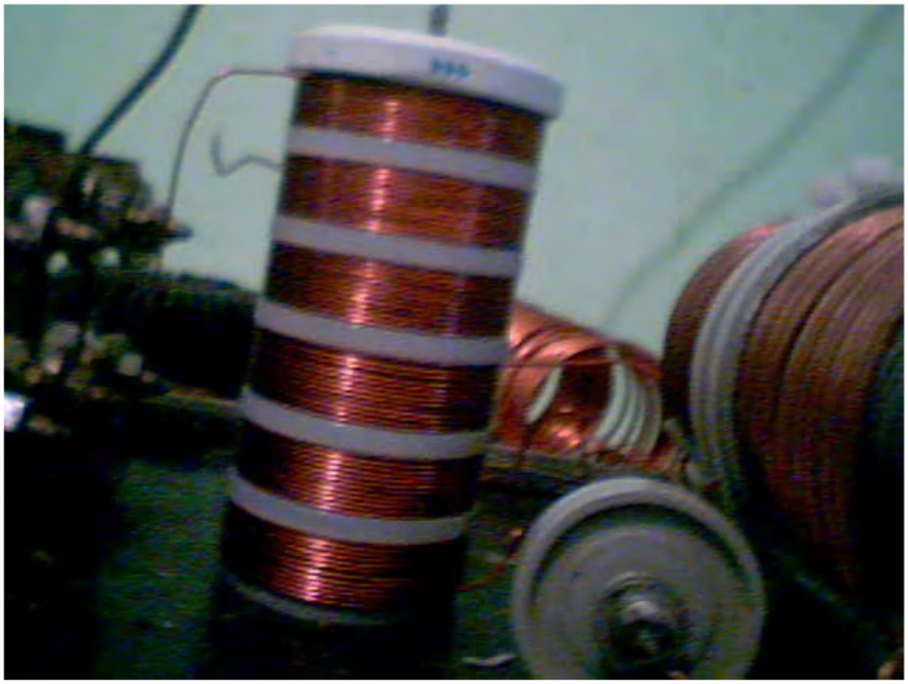


Figure 82: The high-frequency smoothing choke was used, wound in such a way as to get the minimum value of stray, parasitic capacitance in the inductor windings. The wire diameter to use is 1.5 to 2.0 mm enamelled copper wire. Here is a photograph of one implementation of this choke.

2.0 mm enamelled copper wire. Here is a photograph of one implementation of this choke, in figure 82.

These windings can be made on a PVC pipe with a diameter from 50 mm to 75 mm.

For the storage capacitor bank you can use capacitors with a voltage rating of anything from 5 kV to 15 kV with total capacity of about 2 microfarads. Suitable Russian oil-filled capacitors, include all types of K41-1, K75-53 and others. This is the circuit diagram of the device in figure 83.

Diodes VD1, VD2 – high-voltage composites.
Diode VD5 needs to be an ultrafast type rated at 1200 V, 30-150 Amps.
Choke L3 is any kind with an open magnetic core, wound with wire of not less than 6 sq. mm., and giving a 1.5 milli-Henry inductance.

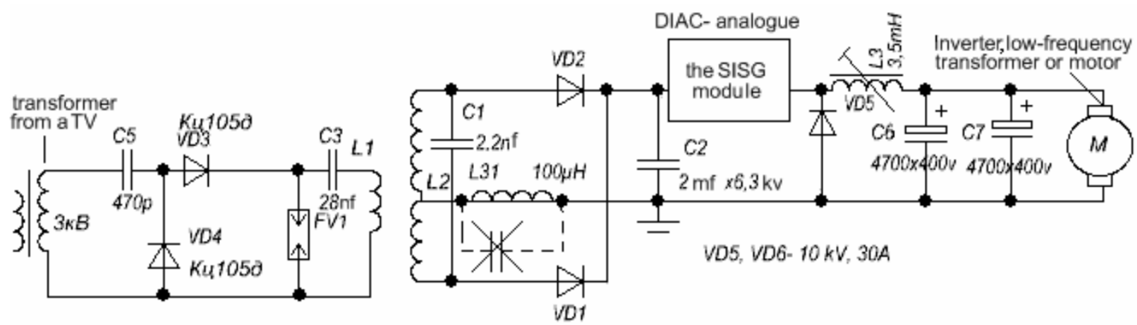


Figure 83: A Russian implementation of Don Smith's design. This is the circuit diagram of the device.

The load (an inverter or a DC motor) requires a low input voltage of 12 V to 110 volts (lower voltage - high power output)

When building and experimenting be sure to take all Safety Precautions as you will be working with more than 1000 Volts.

Video Links showing this device running an angle-grinder and an electric motor are:
http://www.youtube.com/watch?v=NC3EYDYAXDU#
http://www.youtube.com/watch?v=-sckdMe3HCw#
http://www.youtube.com/watch?v=OaqZ52dGMn4#

The "SISG" module shown in the circuit above (figure 83) is an attempt to build a solid-state version of a spark gap. In this version of Don Smith's designs by 'Dynatron' he wanted the equivalent of a diac or a dinistor. A dinistor is basically a thyristor or SCR without the gate. It starts conducting very suddenly if the voltage on it's terminals exceeds it's design value and it stops conducting if the voltage drops to almost zero or the circuit is disconnected, forcing the current to become zero. Diacs or dinistors are hard to find for very high voltages over 5000 V, so Dynatron tried to build equivalent circuits which could be used at high voltage and any one of those designs is what is indicated by the box marked "SISG".

6.2 Sergei's Dynatron circuitry

Russian experimenters are well advanced in their investigations of this type of circuitry. Here is an attempted translation from Russian to English, made, I believe by

Figure 84: Dynatron—Sergei.

the energetic forum member "Davi" of Georgia. While I believe this translation to be reasonably accurate, as I can only understand English, I have no way of knowing if it is accurate. The information comes from an interview with Sergei (figure 84) concerning his Tariel Kapanadze style circuitry.

We begin to draw the schematic diagram, as in figure 85.

We add in an earth ground, a capacitor, a discharger, and a second transformer winding, as in figure 86.

Notice this rectangle in the circuit of figure 87.

In the transformer we have alternating voltage cycles. If we have a threshold voltage —control device, such as a discharger, then positive charges will be pumped from the earth-ground connection, through the diodes. This flow is first, through a one diode, and then through the other diode. That means that the secondary winding of the transformer will accumulate a positive charge. Consequently, you do not need

Figure 85: We begin to draw the schematic diagram. We use a line-scan transformer and point-contact diodes.

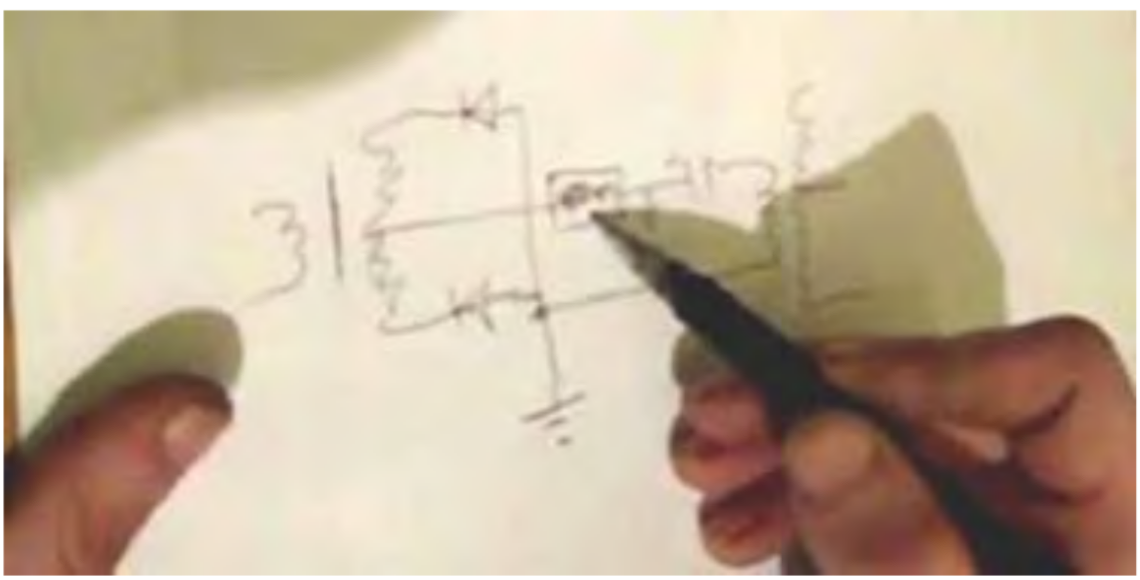


Figure 86: We add in an earth ground, a capacitor, a discharger, and a second transformer winding, as shown above.

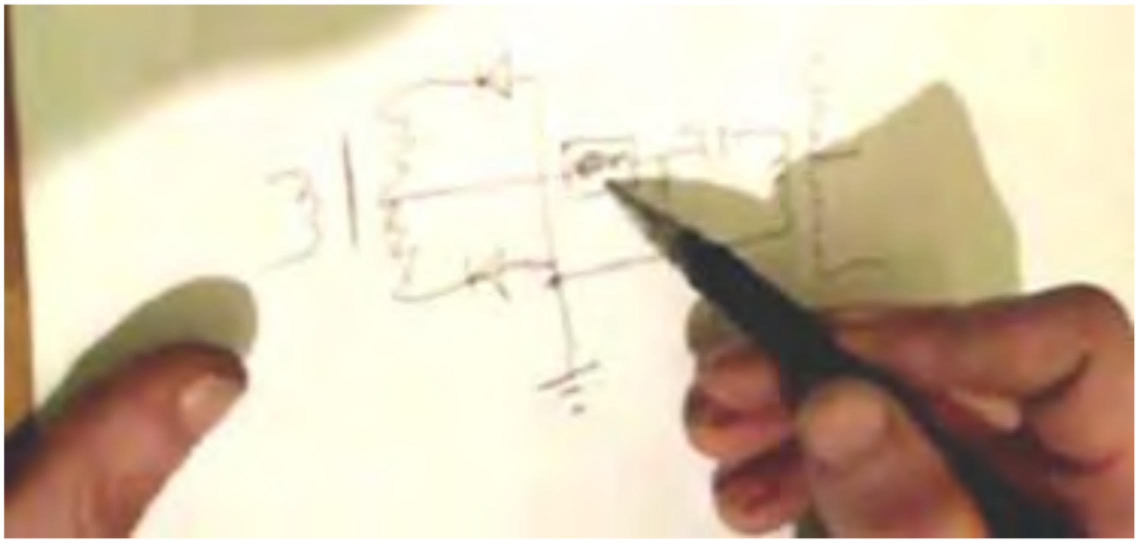


Figure 87: Notice this rectangle, in the circuit above.

a charged capacitor. Instead of the spark gap which Don Smith used, you can put a small choke coil of 100-200 millihenrys or a 100 ohm resistor and either of those work just fine. The usual spark gap will work perfectly well but it does not have a long working life. A resistor can be used and it will work. Vacuum or gas-discharge tubes work well. The voltage here is around 1000 volts.

While you can eliminate the spark gap, but when you do have one, the pumping of charges from the ground works better —it turns out to be something like a fork Avramenko plug. The transformer winding acts on the ground charge with the aid of the voltages developed in it.

The secondary winding of the resonant transformer, destroys the dipole, according to Don Smith. As he explained, the upper plate of the capacitor develops a high voltage from the charges drawn in through the earth connection. This high voltage is then discharged through a diode or a spark gap. See figure 88.

The same thing happens here, as shown in figure 89.

The ground charge enters the secondary winding, and due to it's self-capacitance, accumulates a high voltage on the winding. The diodes used in this location need to be high quality diodes which have a low capacitance. For example, Don Smith used

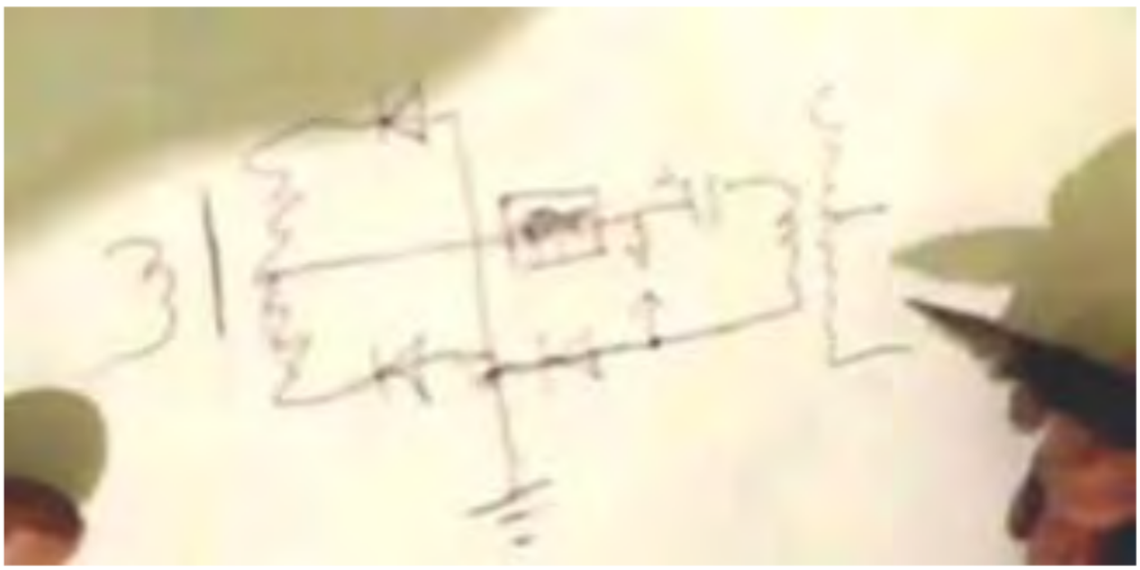


Figure 88: The secondary winding of the resonant transformer, destroys the dipole, according to Don Smith. As he explained, the upper plate of the capacitor develops a high voltage from the charges drawn in through the earth connection. This high voltage is then discharged through a diode or a spark gap.

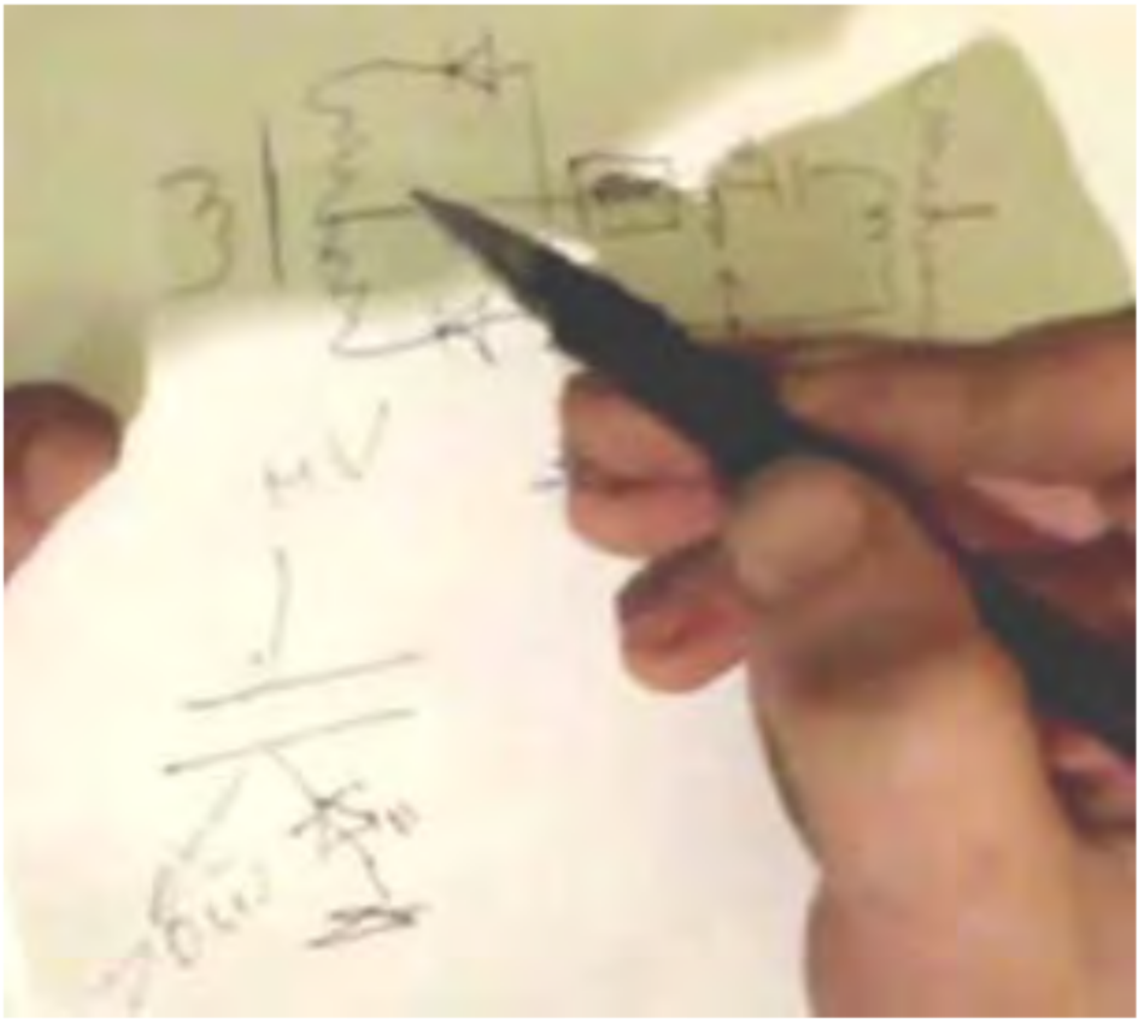


Figure 89: The same thing happens here, i.e. as shown in figure 88.

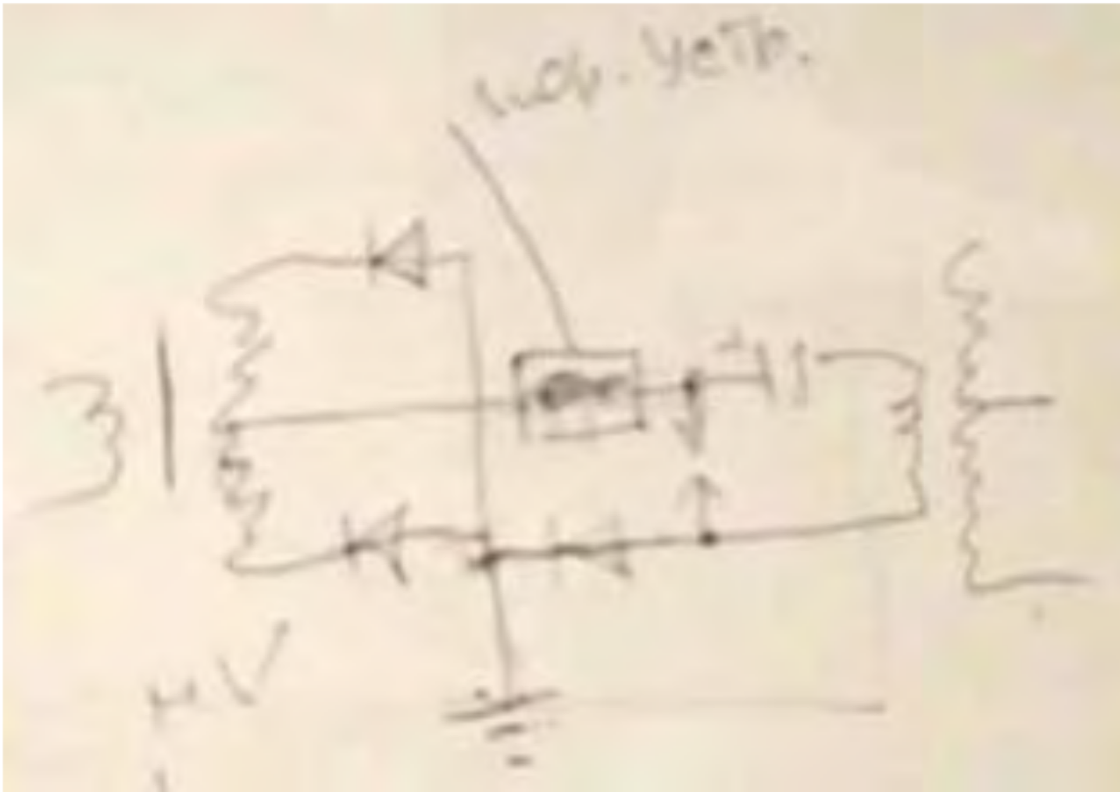


Figure 90: At this point, the pumping scheme will look like this, and I think that it will not change.

diodes which have a capacitance of just 4 pF.

At this point, the pumping scheme will look like this, and I think that it will not change. See figure 90.

The second coil is exactly the same as the first coil (see figure 91).

For the time delay we use a choking coil. The capacitor is an electrolytic type and we use a spark gap to feed an isolation transformer. To ensure that there will be no feedback of unwanted voltage spikes, we connect a 6 kV 20 to 50 A high-voltage diode in parallel with the primary winding of the isolation transformer. This can be arranged by connecting three 1000 V diode bridges together like this (see figure 92).

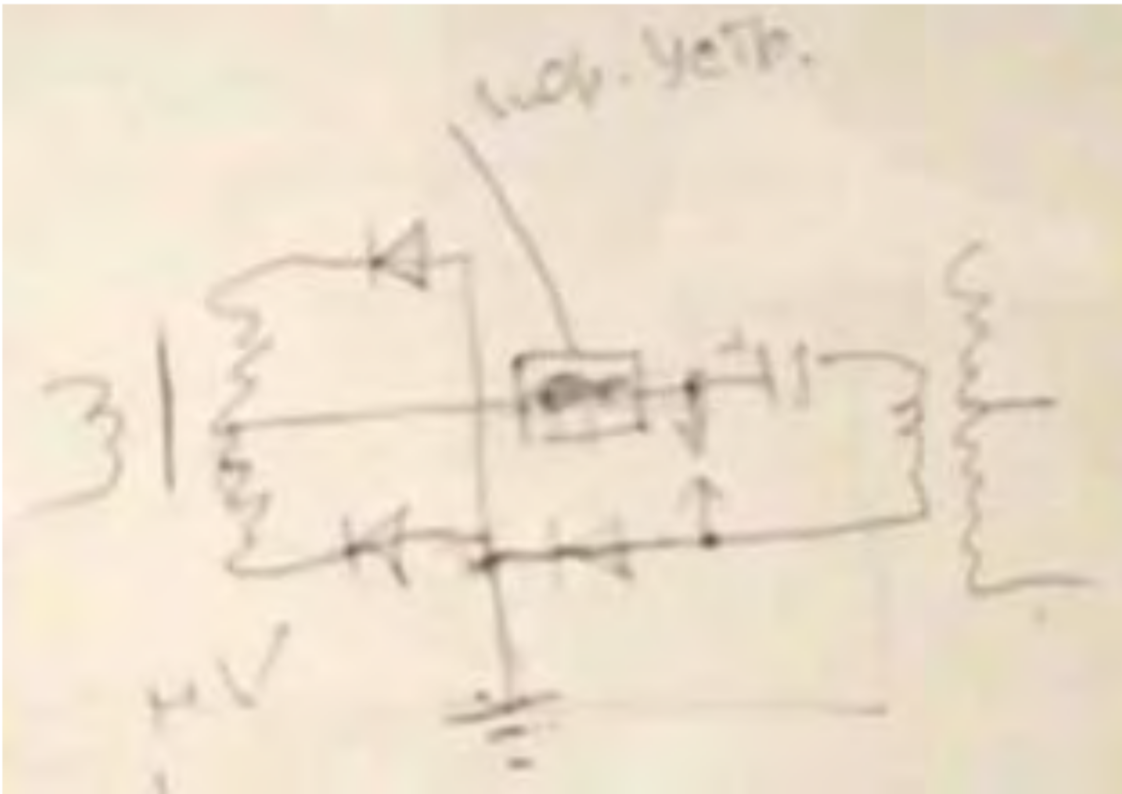


Figure 91: The second coil is exactly the same as the first coil.

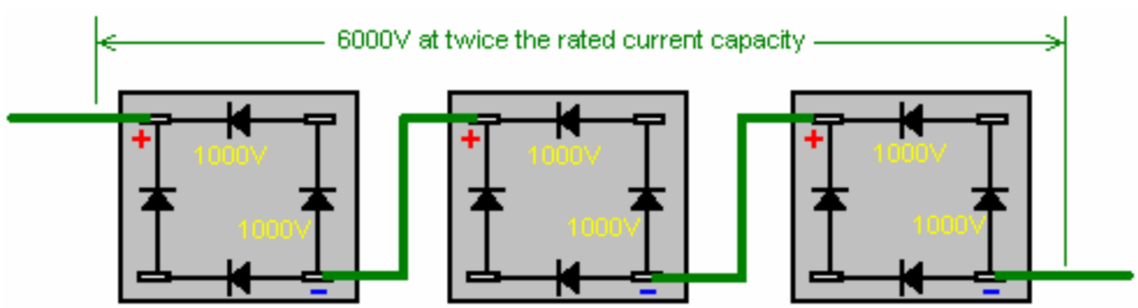


Figure 92: To ensure that there will be no feedback of unwanted voltage spikes, we connect a 6 kV 20 to 50 A high-voltage diode in parallel with the primary winding of the isolation transformer. This can be arranged by connecting three 1000 V diode bridges together like this, shown above.

Figure 93: Three 1000 V diode bridges can be connected to withstand a voltage of 6 kV, as shown in the photo above.

Three 1000 V diode bridges can be connected to withstand a voltage of 6 kV (see figure 93).

The spark gap is inserted in the positive wire, the same as the first spark gap. Why is this? (See figure 94).

Here we have a separation of electrons (see figure 95).

We collect electrons both from the air and from out of the ground. We push the negatively charged electrons into the ground, and so a positive charge accumulates in our capacitor.

The ground wire carries the negative charges into the earth (which is an expansion tank). See figure 96).

If you connect the spark gap between the earth and the upper end of the transformer which is positively charged, then the primary winding wire will get warm, and the efficiency falls. When correctly connected the primary winding can be constructed with wires which are 0.5 - 1.0 mm diameter and the wires remain cold.

If we have achieved the splitting of the electron-positron pair, then if you put them

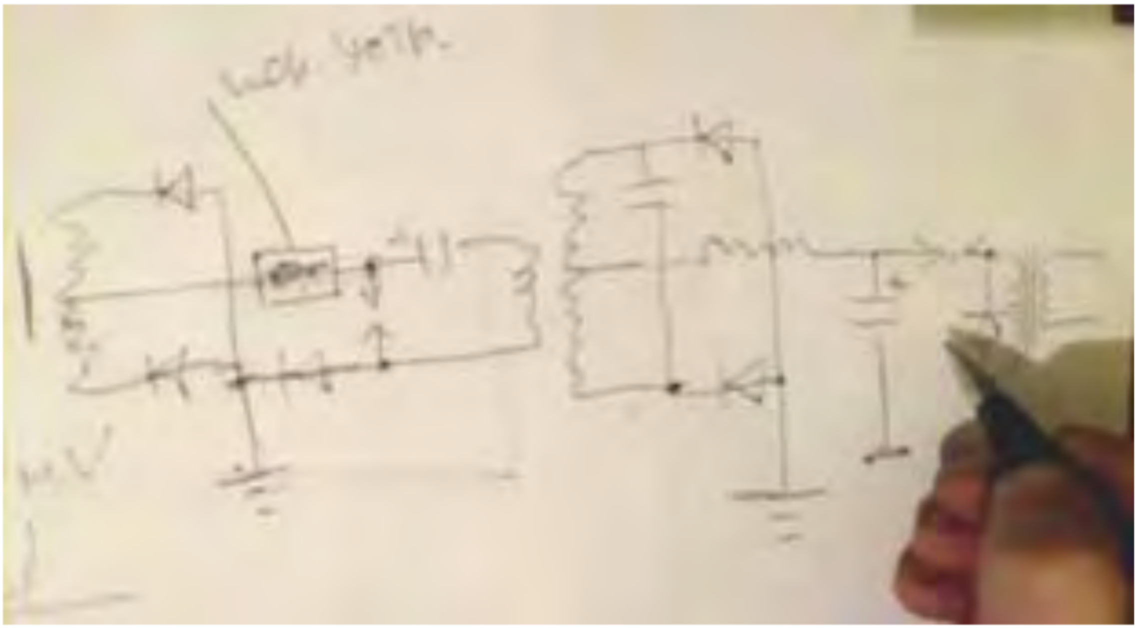


Figure 94: The spark gap is inserted in the positive wire, the same as the first spark gap, see above. Why is this?

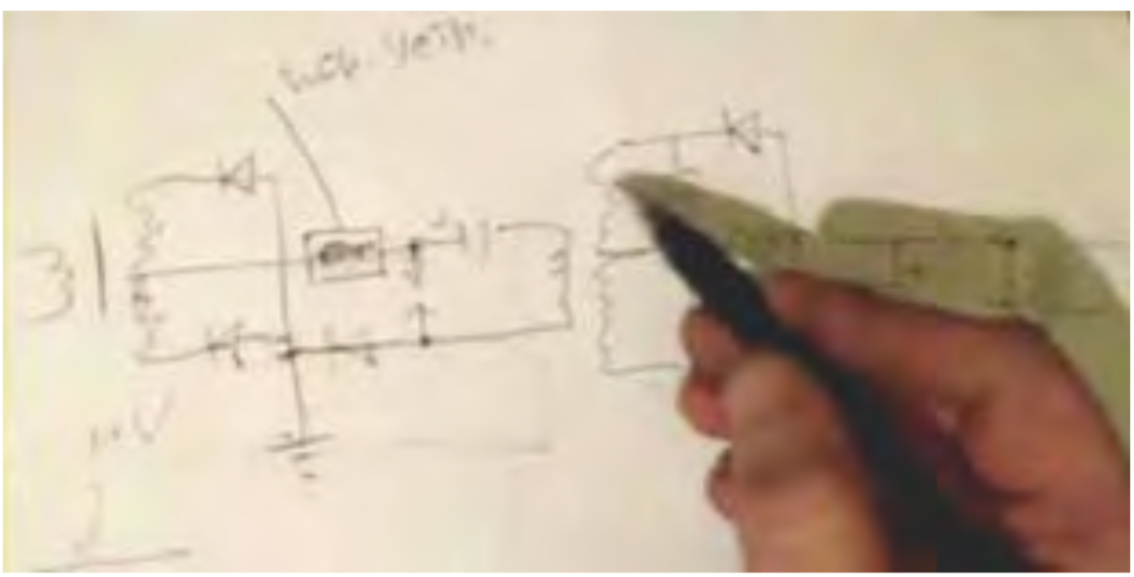


Figure 95: Here, indicated in the photo of the circuit, we have a separation of electrons.

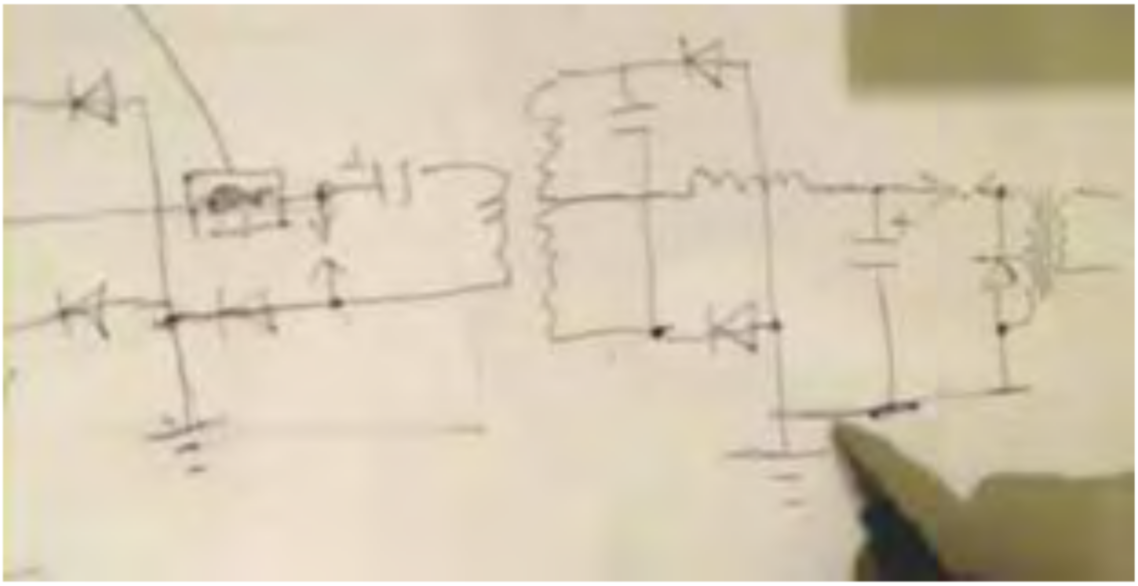


Figure 96: The ground wire carries the negative charges into the earth (which is an expansion tank). See above circuit.

in a discharger, or in a transistor, or whatever, only the radiation remains. However, the really important fact is that the magnetic component passes through the primary winding of the transformer, and it induces a strong magnetic field in the secondary winding. See figure 97).

Don Smith said that if you connect two batteries together and one is say, 30 volts, and the other 10 volts. The 30-volt battery passing 10-volt, the electrons in each battery resist each other. It appears that they do not "like each other" if one can describe it that way.

The same thing happens in an ordinary transformer. The current flowing in the secondary winding resists the flow of current in the primary winding —back EMF. But the following question is relevant: at the instant when the negative ion-electrons just start to flow in the primary winding, the interaction between the primary and secondary windings is absent. Because of this we get a huge load-carrying capacity in the secondary winding, practically without changing the inductance of the primary winding, well, if it is changed then that will be not more than 10% to 20%. See figure 98.

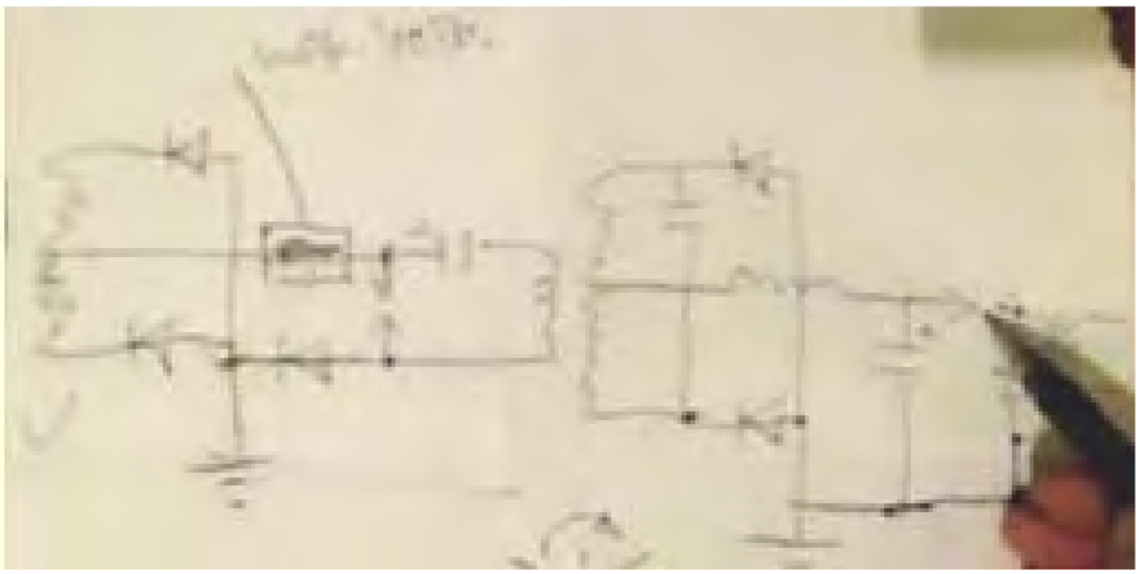


Figure 97: If we have achieved the splitting of the electron-positron pair, then if you put them in a discharger, or in a transistor, or whatever, only the radiation remains. However, the really important fact is that the magnetic component passes through the primary winding of the transformer, and it induces a strong magnetic field in the secondary winding. See above.

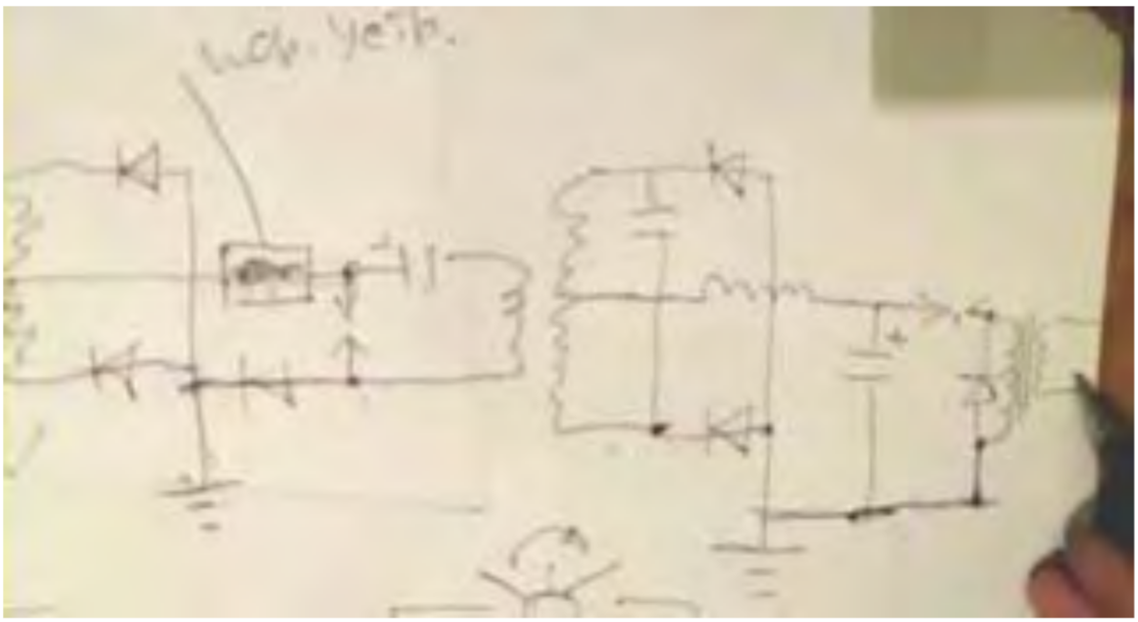


Figure 98: The following question is relevant: at the instant when the negative ion-electrons just start to flow in the primary winding, the interaction between the primary and secondary windings is absent. Because of this we get a huge load-carrying capacity in the secondary winding, practically without changing the inductance of the primary winding, well, if it is changed then that will be not more than 10% to 20%. See above.

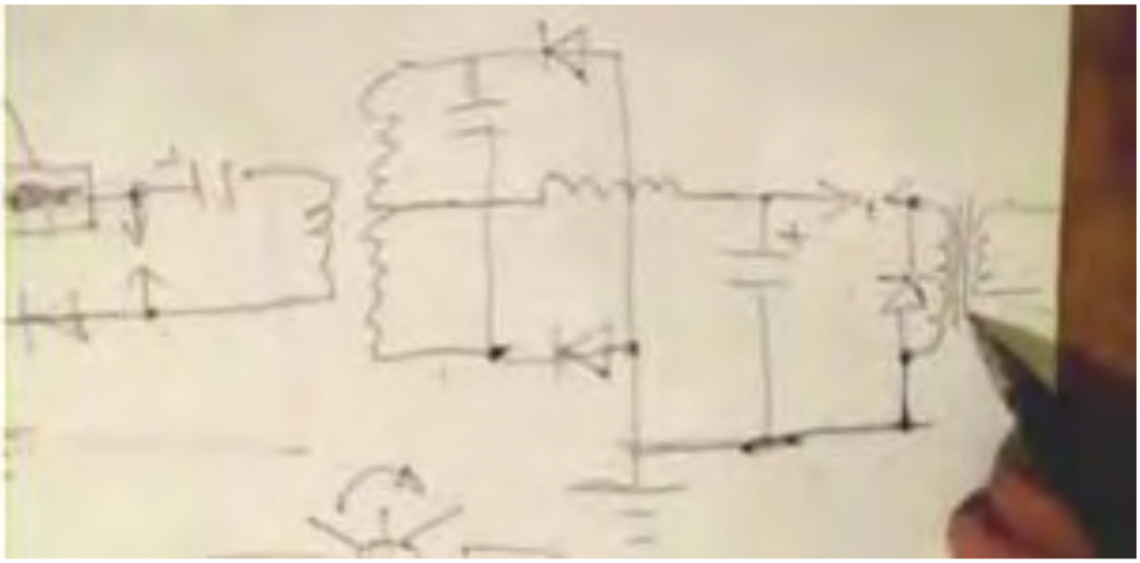


Figure 99: Naturally, here we need very good insulation, shown above.

Generally, the minimum load impedance will kill the inductance causing the frequency to change. But this does not happen here, because the primary current flow is of another kind, which is not affected by the current flowing in the secondary winding. That is, moving a small number of electrons in the primary can cause a large number of electrons to flow in the secondary winding. The thicker the wire of the secondary, the more excited electrons there will be there and so, the greater the current flow in the secondary.

The mass of the secondary electrons does not depend on the mass of the primary electrons. The diameter of the secondary winding is not limited. For example, if you use a 110 mm. tube for the secondary, then the velocity of the electrons flowing through the winding will be the same as if it were wound with a wire diameter of just 1 mm or 2 mm. This is because the current flow is not impeded by the resistance.

The magnetic field of the secondary winding does not interact with the magnetic field of the primary winding. However, the primary magnetic field accelerates the electron moving in the secondary winding, i.e. This produces an asymmetric transformation. Naturally, here we need very good insulation, shown in figure 99.

Roughly speaking, if there is a small hole in the wire insulation, then the vaporous

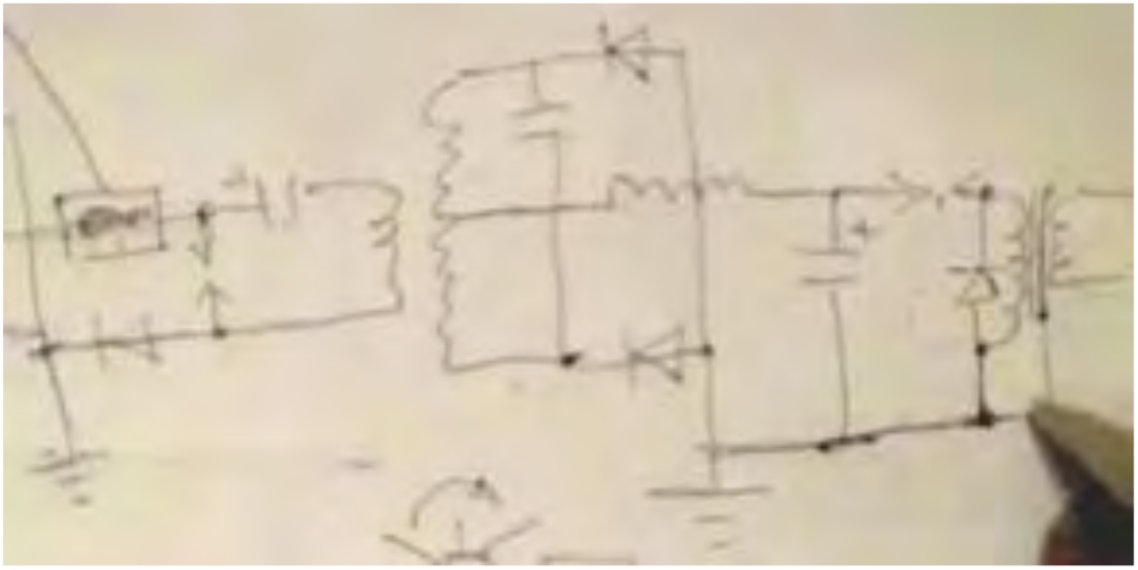


Figure 100: So, all the positively charged particles should go into the ground, shown above.

electrons in the primary winding will hold the equivalent vaporous electrons in the secondary winding, and that will squeeze the heavy electrons in the secondary winding. Consequently, there must be an anti-static screen in the form of a coil, or aluminium foil that is connected to ground. So, all the positively charged particles should go into the ground, shown in figure 100.

If you want to ground the output transformer, then do it through a resistor connected to a ground point which is at least 10 metres away from the first grounding point in the circuit. The farther apart the grounding points are, the better, say, 10 to 30 metres apart. In principle, the length of the ground between the two ground connections can be considered to be an isolation capacitor between those two points in the circuit. The big question is, of course, what should be the ratio of the primary winding turns to the secondary winding turns - 1:4 ? (figure 101) but here is some good advice:

Accurately measure the total length of the secondary winding and make the primary winding wire length exactly one quarter of the wire length of the secondary winding. The connecting wires are not considered in this measurement, and it is better to make them thinner. If, for example, the primary wire has a cross-sectional area of

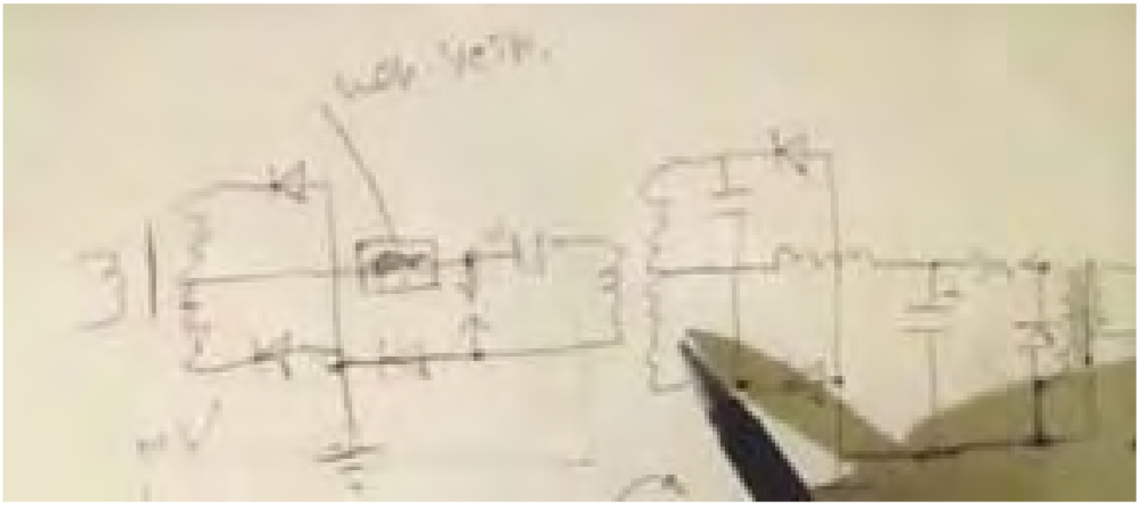


Figure 101: The big question is, of course, what should be the ratio of the primary winding turns to the secondary winding turns - 1:4 ?

8 sq. mm, then make the connecting wires 2.5 sq. mm. in cross sectional area. In other words, here are the terminals of the secondary winding in figure 102.

The oscillation amplitude increases massively at the resonant frequency. Why is that? See figure 103.

Because of the change in impedance at the junction between the two wires, the connection becomes a node and this is reflected in the anti-nodes, and the primary waveform remains a standing wave. See figure 104.

You will recall that Don Smith used a very thick cable but he reduced it to become a thin connection at each end. That thick-to-thin change causes a reflection of the wave. The secondary winding has LC resonance but the inductor depends on it's wave resonance length. See figure 105.

In fact, what we have here is a Tesla transformer, i.e. voltage, current. See figure 106.

You will recall that even in the green box of Tariel Kapanadze with it's thick pipe coil, that thin wires go from the pipe to the spark gap. Changing the impedance of the wire at the junction between the two different cross-sectional areas —That's it! That raises the efficiency, and so the spark gap works better. Ideally, you want to

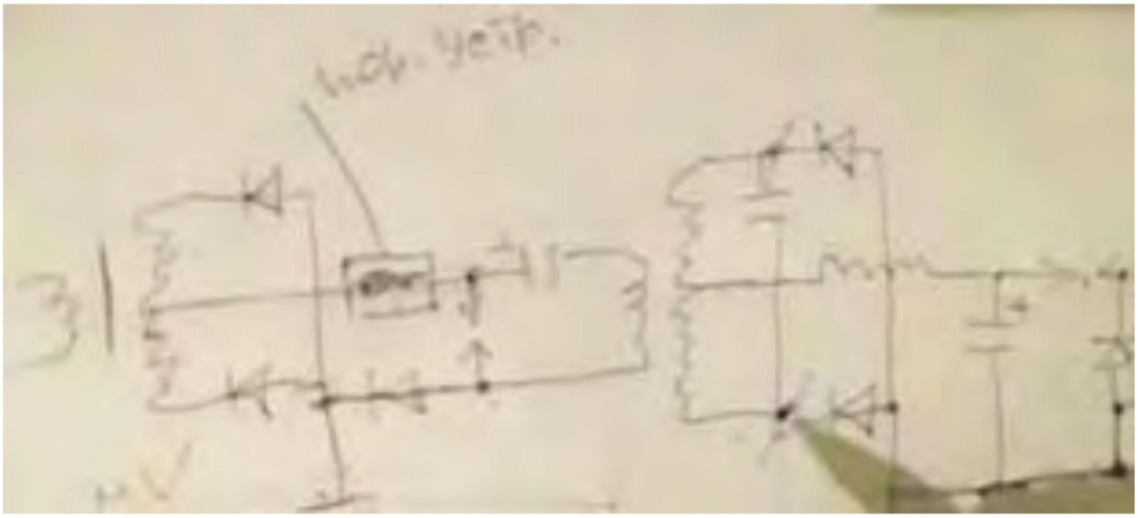


Figure 102: In other words, here are the terminals of the secondary winding, shown above.

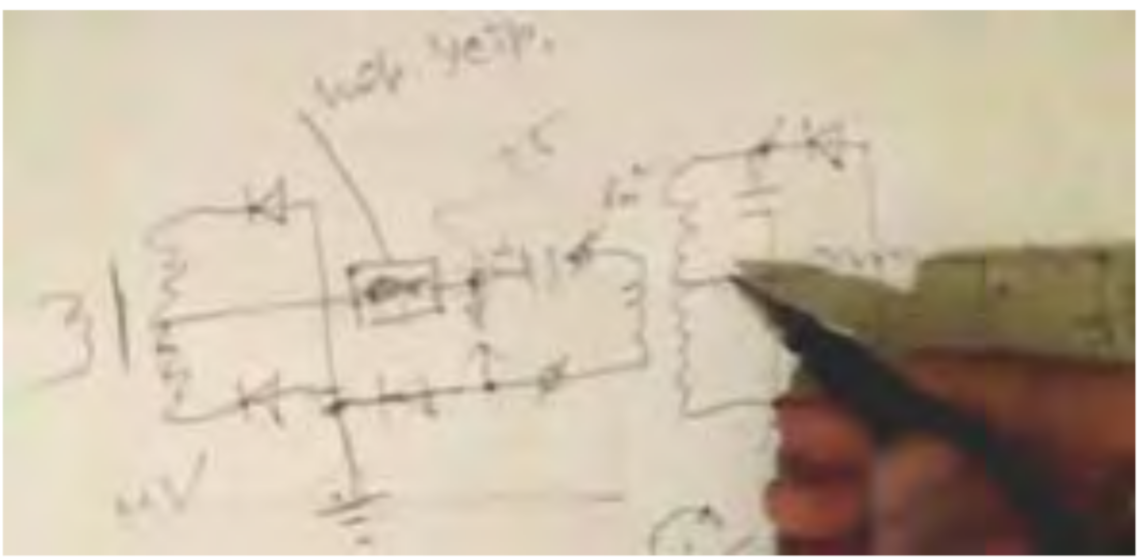


Figure 103: The oscillation amplitude increases massively at the resonant frequency. Why is that?

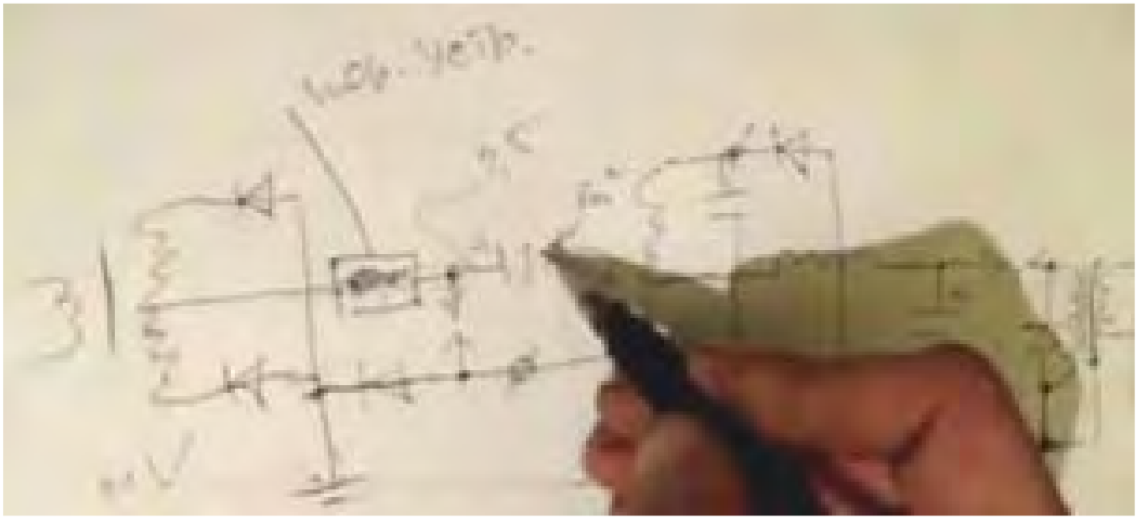


Figure 104: Because of the change in impedance at the junction between the two wires, the connection becomes a node and this is reflected in the anti-nodes, and the primary waveform remains a standing wave.

use a vacuum spark gap. See figure 107.

Unfortunately, our spark is not dispersed in the secondary winding. The spark might be triggered at anything from 50 kV up to 100 kV. We have a great 'Q-factor' (coil 'Quality' factor) in our winding! However, once the spark has occurred we get a roll-back of current moving in the reverse direction through the winding, although it is always less powerful than the forward action. This reverse pulse also passes through the spark gap, effectively shunting, the input circuit and so, decreasing the output Q of the circuit. The circuit's output voltage is reduced. The resonant frequency drifts and so the output power drops. Although this effect can be seen when using an air gap, it is much better to use either a vacuum spark gap or a spark gap which is enclosed in a tube filled with hydrogen gas. You can put a diode in series with the spark gap. See figure 108.

If that is done, then the reverse current will not pass. The diode must be able to withstand a reverse voltage of 10 to 20 kV. We ordered a hydrogen diode with power handling capacity of 120 watts. It's turn-on time is 0.1 ms, off time is less than 1 ms. We connected the current transformer using 24 ohm resistor. The result was a pure current transformer on the load, and without any interference. Let's see what

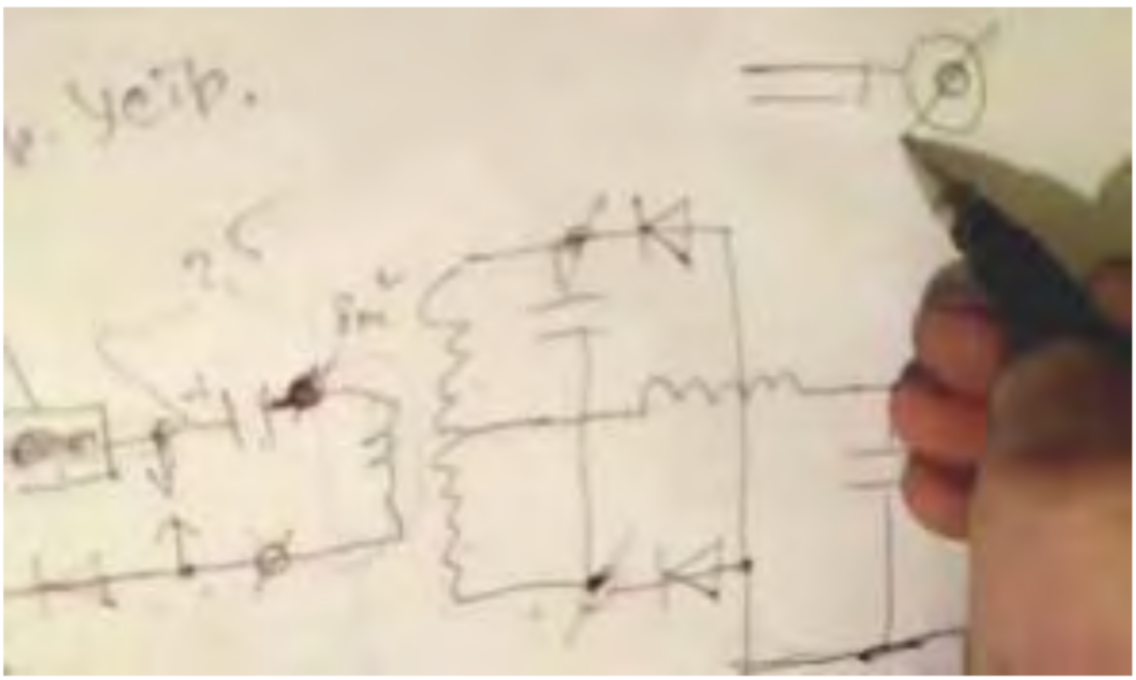


Figure 105: You will recall that Don Smith used a very thick cable but he reduced it to become a thin connection at each end. That thick-to-thin change causes a reflection of the wave. The secondary winding has LC resonance but the inductor depends on it's wave resonance length. See above.

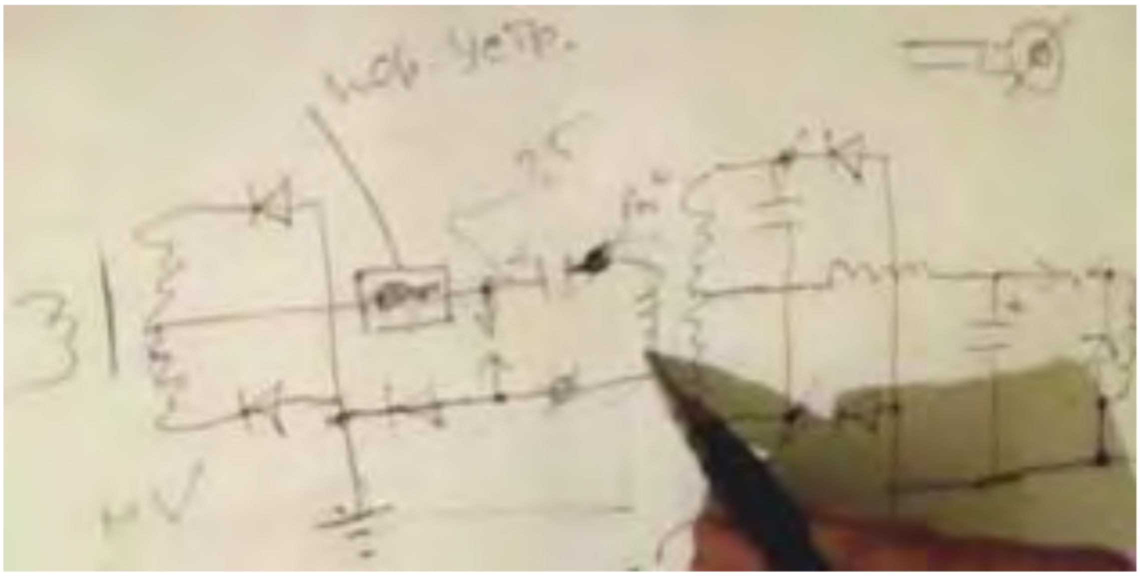


Figure 106: In fact, what we have here is a Tesla transformer, i.e. voltage, current. See above.

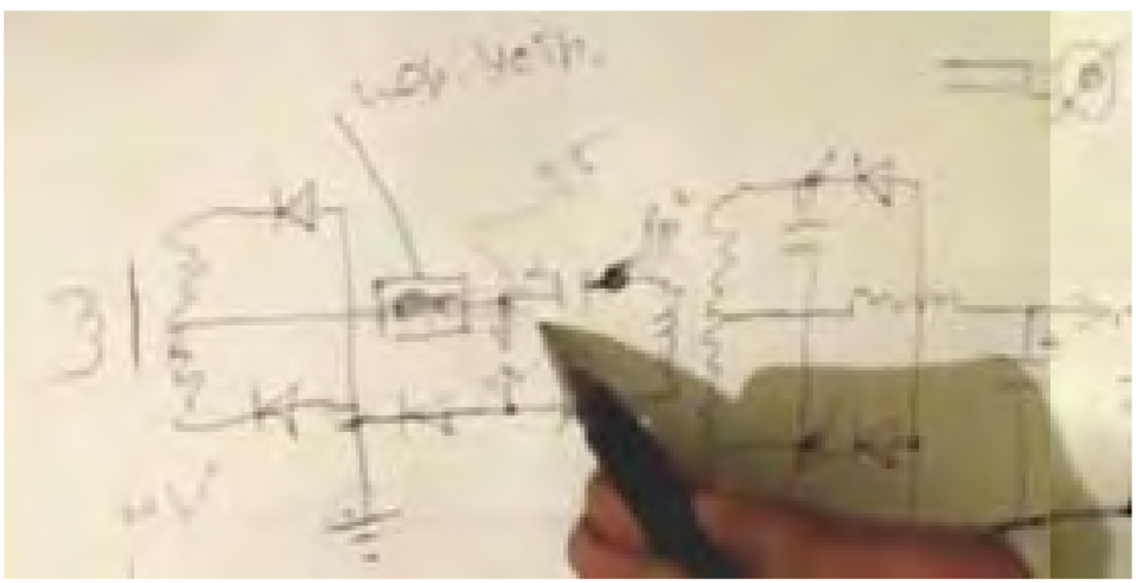


Figure 107: Ideally, you want to use a vacuum spark gap. See above.

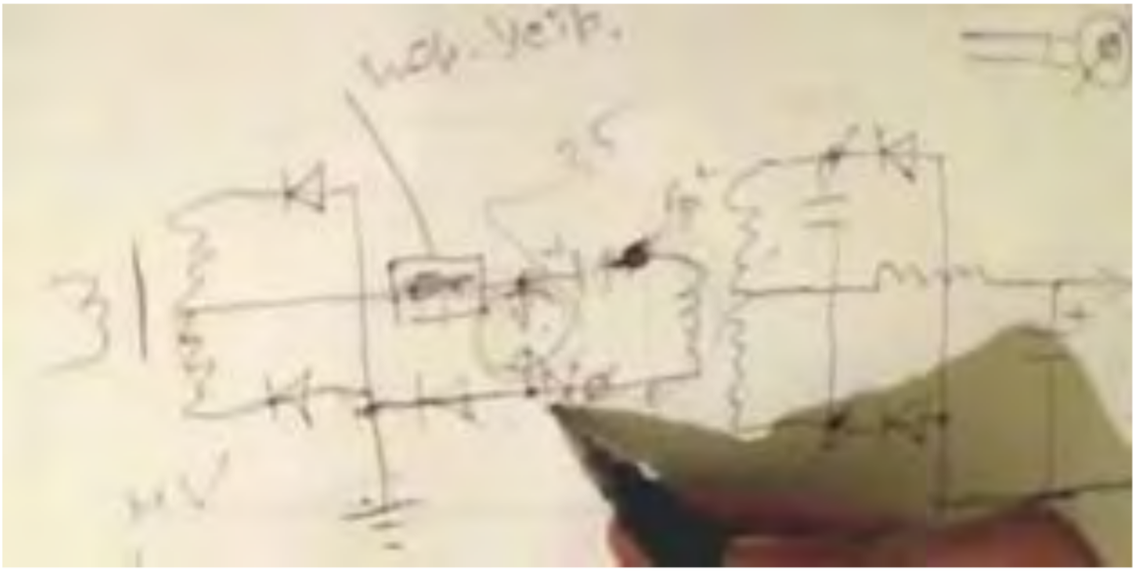


Figure 108: You can put a diode in series with the spark gap. See above.

we have done on the discharger. Take a look —the spark gap was lit up with a blue colour. See figure 109.

On the oscilloscope, we see dampened oscillations. See figure 110.

There must be only one oscillation, and the remaining excess. The 5 extra vibrations short-circuit the secondary winding, and prevent it from operating normally. Ideally, this should be simple. See figure 111.

Clicking the inductor - capacitor recharges, but the current does not go back (it stops at zero).

Picture voltage “U”.
Picture current “I”. (See figure 111)

That is how such a process should be, but otherwise —buffeting vibration (need a hydrogen diode).

The isolation transformer is made up of rings (figure 112). The primary winding is 2 bifilar layers wound in one direction. The secondary winding is with wire which has

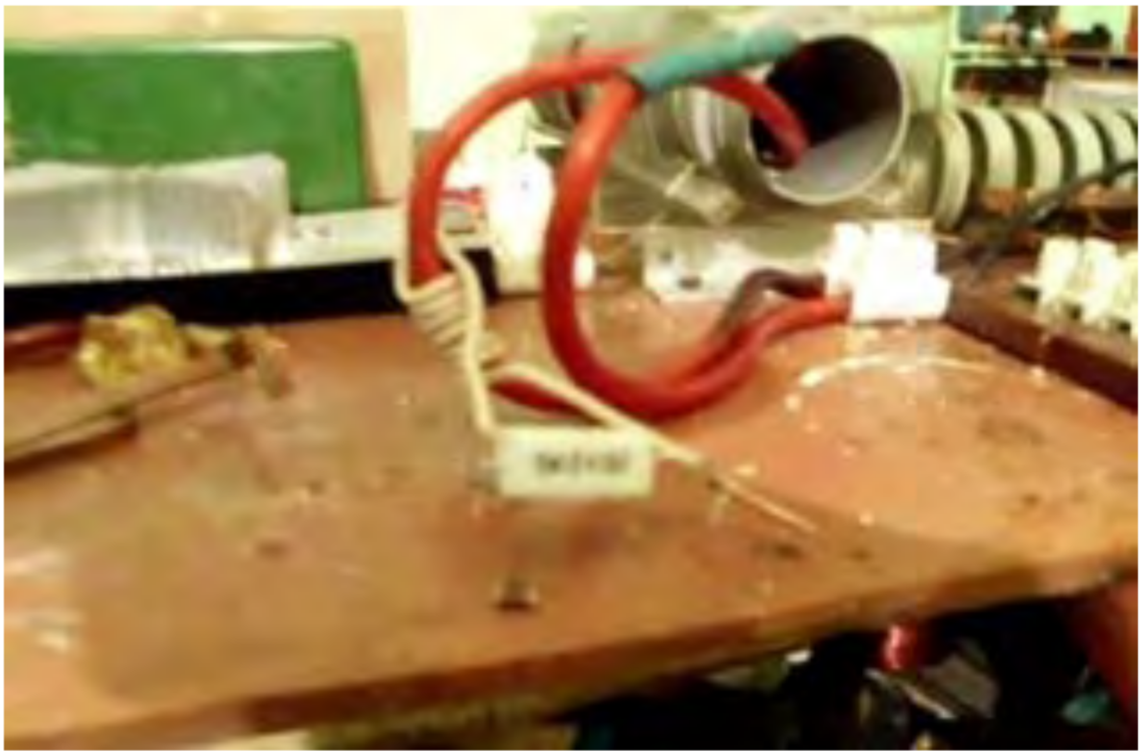


Figure 109: The diode must be able to withstand a reverse voltage of 10 to 20 kV. We ordered a hydrogen diode with power handling capacity of 120 watts. It's turn-on time is 0.1 ms, off time is less than 1 ms. We connected the current transformer using 24 ohm resistor. The result was a pure current transformer on the load, and without any interference. Let's see what we have done on the discharger. Take a look —the spark gap was lit up with a blue colour. See above.

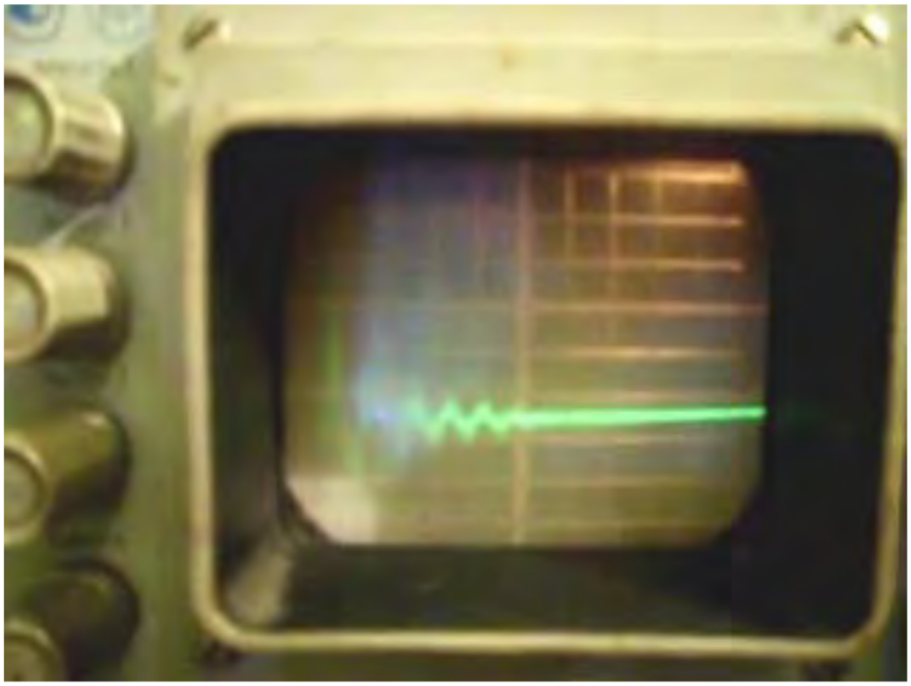


Figure 110: On the oscilloscope, we see dampened oscillations. See above.

Figure 111: Ideally, this should be simple. See above.

Figure 112: Isolation transformer. See above.

10 sq. mm. cross sectional area, but today we will rewind it. The screen is made of foil —ordinary Scotch tape. But the screening must not form a complete turn as it must not be a closed-loop. Here, aluminium Scotch tape is used. Now short-circuit the secondary winding, and enable the device. See figure 113.

We check with a screwdriver, and there is practically no output. If you add an anti-static barrier, i.e. gasket between the primary and shield. It should be made from a good insulator, such as PTFE. It is possible to use cellophane which, being like acrylic is also a very good insulator. I shorted outputs, so as not to clatter. If you remove the jumper, the coil is bursting with no load like this. (We hear a crash, and after 3 seconds it stops)
Sergey: We'll see what it was. (Blue spark coil pierced). See figure 114.

That's it! The experiment's completed. Blown diode bridge —Accident. Accidentally shorted to ground. Well, that's all. It is desirable, of course, to have a good ground connection. The threshold-limiting device is a choke. See figure 115.

What can I say? See figure 116.

Figure 113: The screen is made of foil —ordinary Scotch tape. But the screening must not form a complete turn as it must not be a closed-loop. Here, aluminium Scotch tape is used. Now short-circuit the secondary winding, and enable the device. See above.

Figure 114: We check with a screwdriver, and there is practically no output. If you add an anti-static barrier, i.e. gasket between the primary and shield. It should be made from a good insulator, such as PTFE. It is possible to use cellophane which, being like acrylic is also a very good insulator. I shorted outputs, so as not to clatter. If you remove the jumper, the coil is bursting with no load like this. (We hear a crash, and after 3 seconds it stops) Sergey: We'll see what it was. (Blue spark coil pierced). See above.

Figure 115: That's it! The experiment's completed. Blown diode bridge —Accident. Accidentally shorted to ground. Well, that's all. It is desirable, of course, to have a good ground connection. The threshold-limiting device is a choke. See above.

In principle, you can use the CISC module instead of a spark gap. In this circuit, the very sharp rise time of the driving waveform pulse fronts is not necessary, because the inductance is large.

If the transformer has an iron core, then the rate of charging of the capacitor will be very fast, at, for example, 50 Hz. At that low rate, you can omit the discharger. In Don Smith's design where a neon tube driver is used, a diode and even a diac can be used instead of a spark gap. It will even work with a direct connection. See figure 117.

Then the impulses are often, but with smaller amplitude. Naturally, the better, when we divide the frequency, i.e. for two of the primary pulse charges the capacitor of the secondary. See figure 118.

Then the amount of energy in the pulses is summed. See figure 119.

Here they are superimposed on one another, in a linear fashion (figure 120).

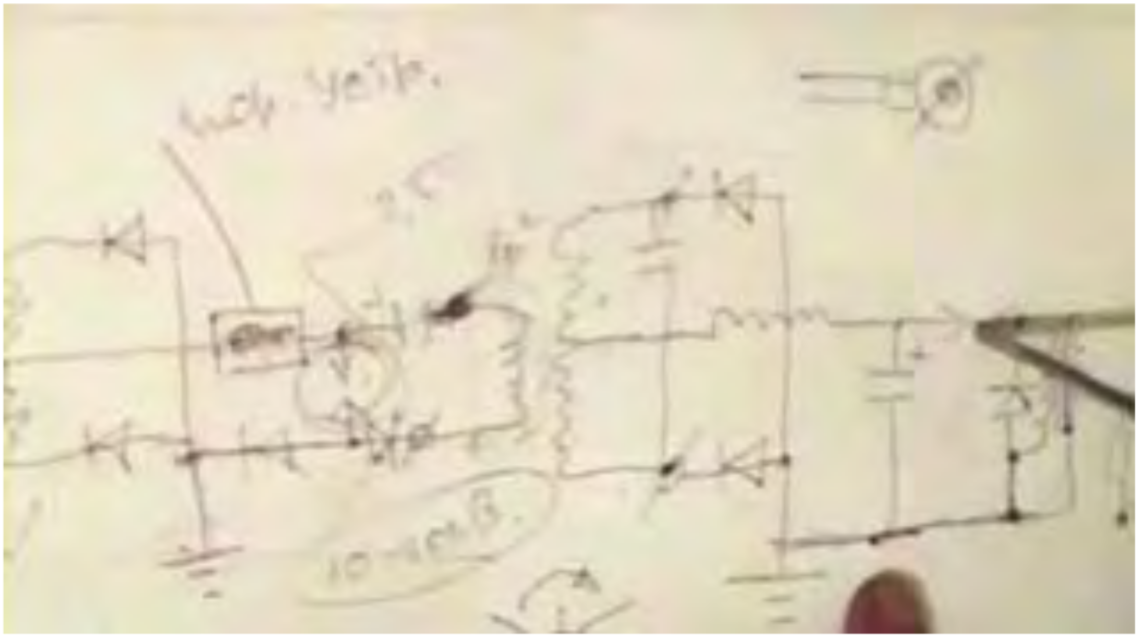


Figure 116: What can I say? See above.

$$C = Q/U \quad end \quad U = Q/C$$

where, C is capacitance, Q is charge and U is voltage.

The capacitance is a constant. If we increase the number of charging pulses per second, then because the secondary coil at resonance increases the amplitude of the pulses, we get increased power. At 5 times more power, because there are 5 times the number of charging pulses passed to the capacitor, we get a squaring of the voltage-energy. That is an energy increase of 25 times.

Raising the spark frequency by, say a factor of 10, will give an energy gain of a factor of 100. See figure 121.

Well, I'm telling you, place a spark gap here in order to —INTERRUPT. Otherwise, the inductor will not be able to speed up and pass more pulses into the capacitor. See figure 122.

Gentlemen! Make it and test it. See figure 123.

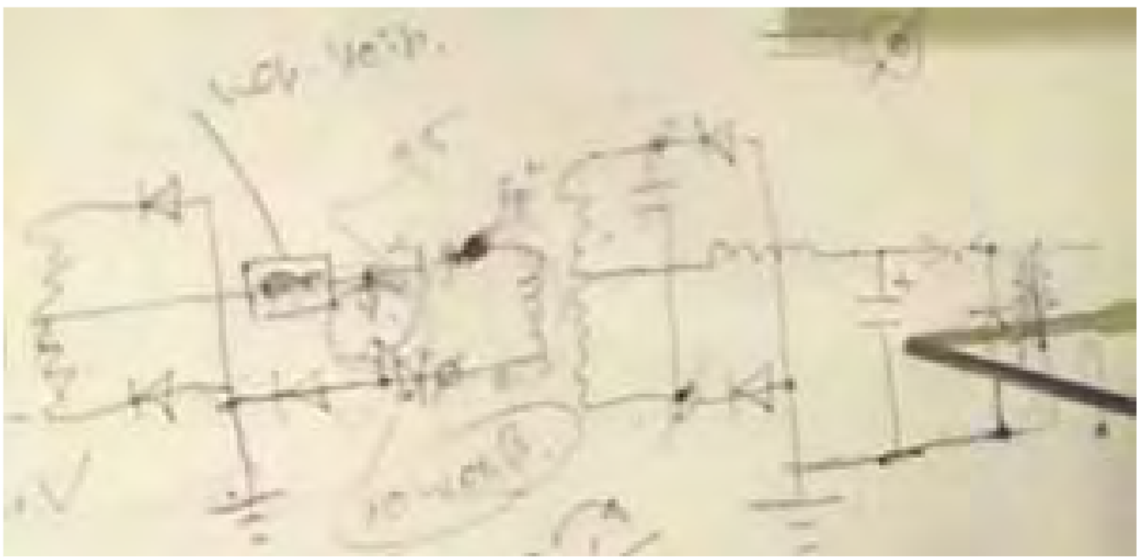


Figure 117: If the transformer has an iron core, then the rate of charging of the capacitor will be very fast, at, for example, 50 Hz. At that low rate, you can omit the discharger. In Don Smith's design where a neon tube driver is used, a diode and even a diac can be used instead of a spark gap. It will even work with a direct connection. See above.

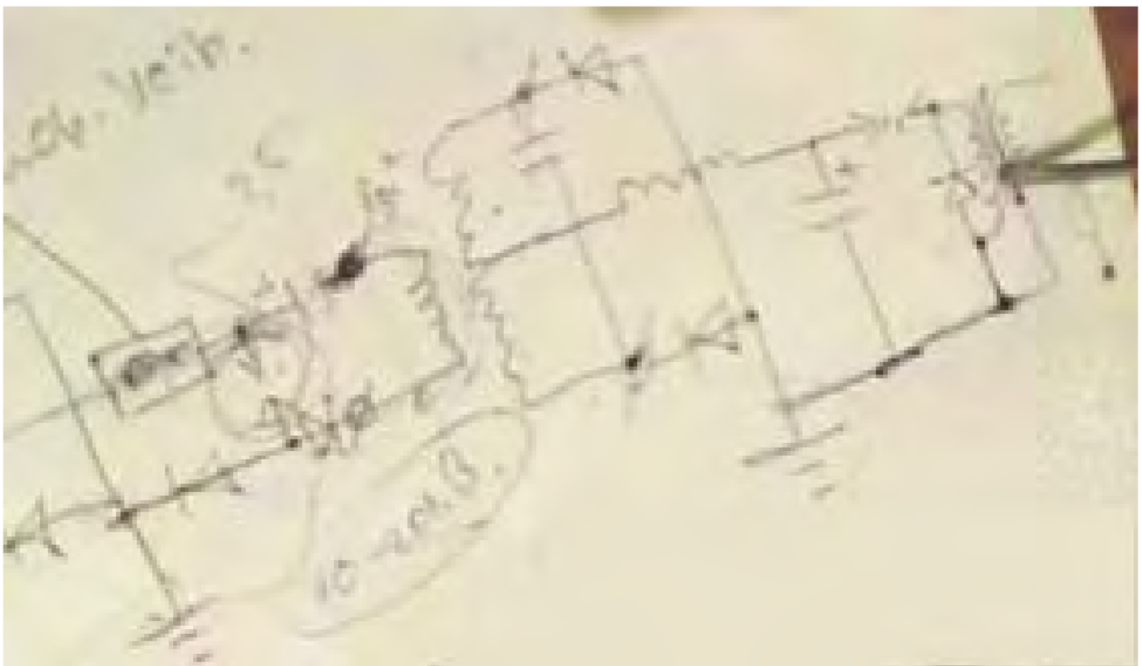


Figure 118: Then the impulses are often, but with smaller amplitude. Naturally, the better, when we divide the frequency, i.e. for two of the primary pulse charges the capacitor of the secondary. See above.

Figure 119: Then the amount of energy in the pulses is summed. See above.

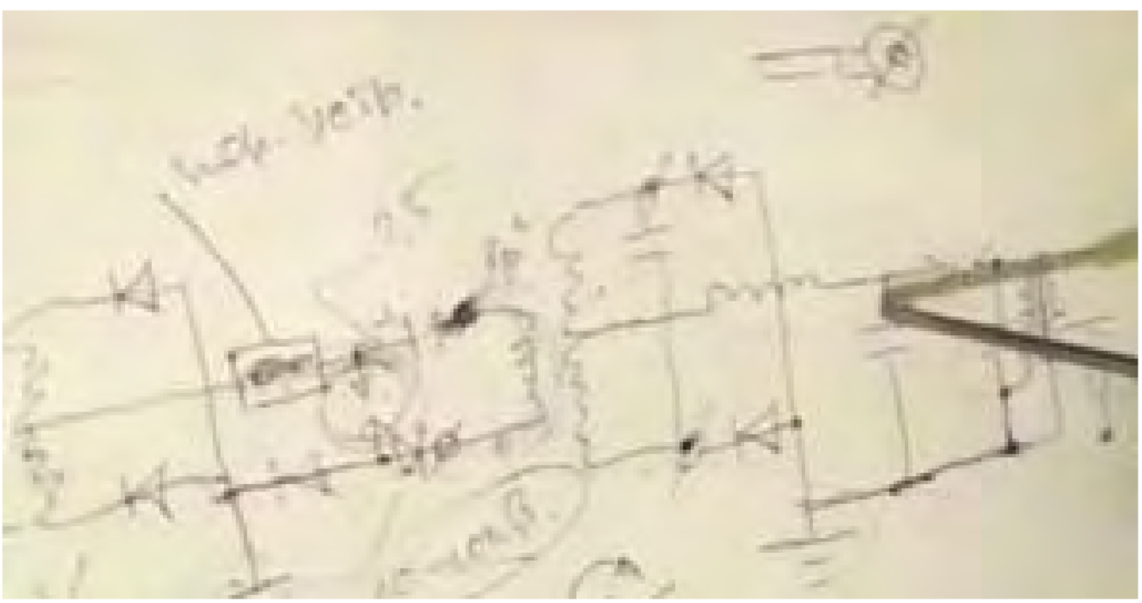


Figure 120: Here they are superimposed on one another, in a linear fashion. See above.

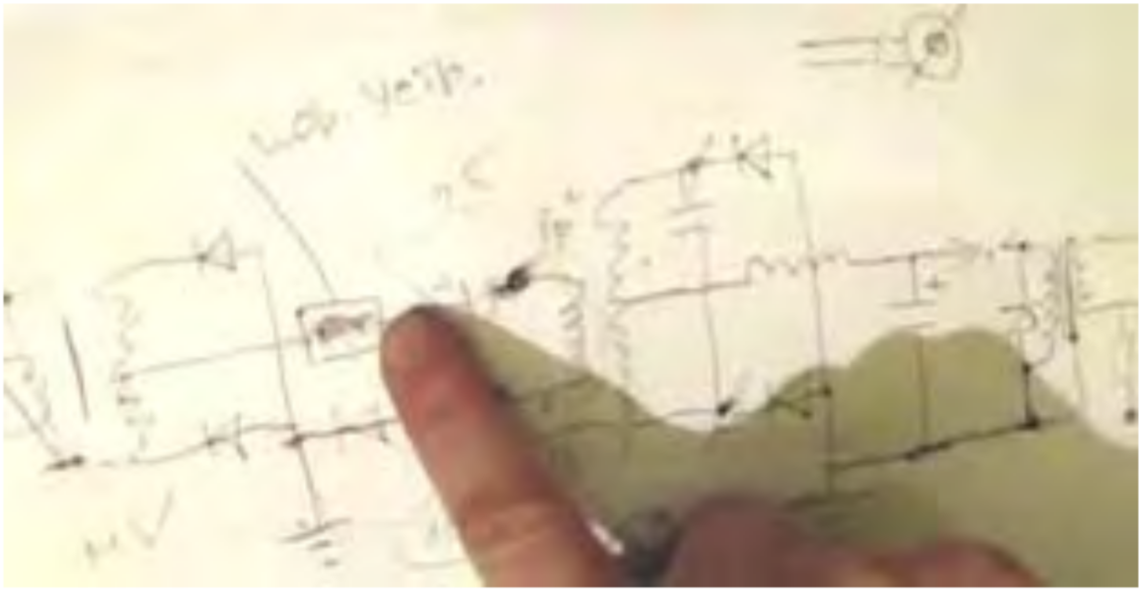


Figure 121: Raising the spark frequency by, say a factor of 10, will give an energy gain of a factor of 100. See above.

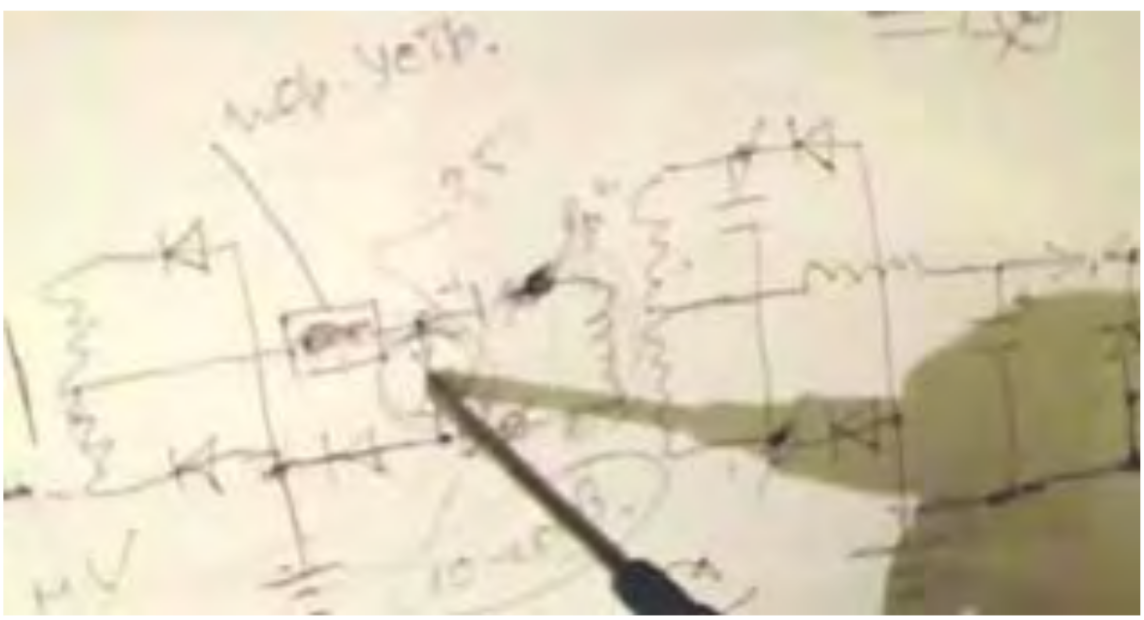


Figure 122: Well, I'm telling you, place a spark gap here in order to —INTERRUPT. Otherwise, the inductor will not be able to speed up and pass more pulses into the capacitor. See above.

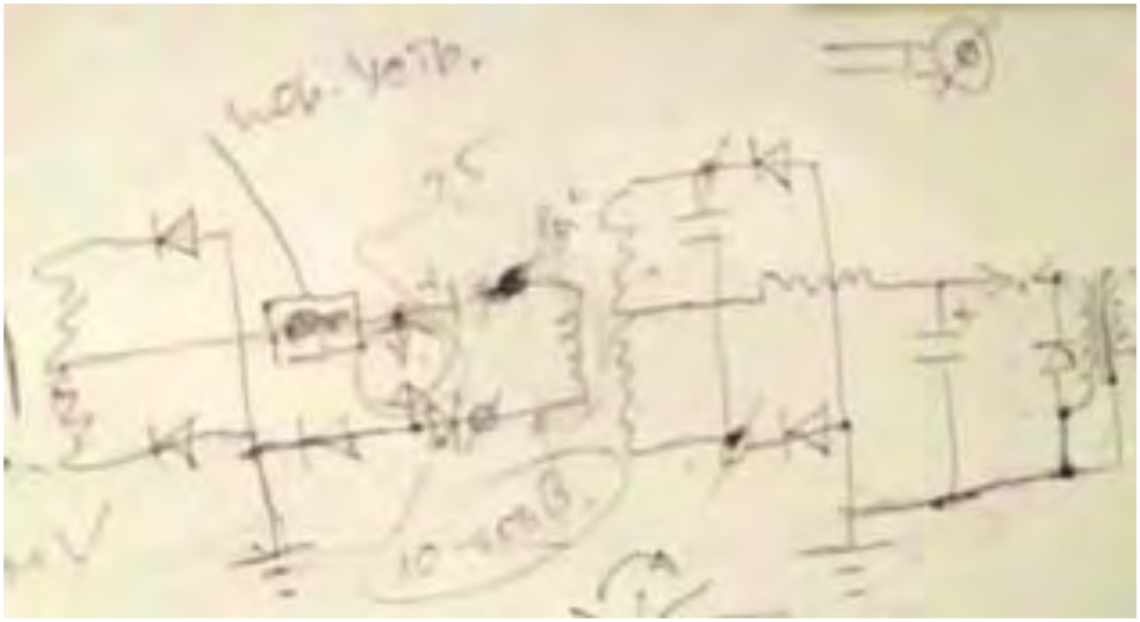


Figure 123: Gentlemen! Make it and test it. See above.

References

[1] Kelly, P. J. (2020). Practical Guide to 'Free-Energy' Devices. Version: 34.8, Release date: 24 January 2020. Last Visited on 18 February 2022. [Online]. Available: https://www.researchgate.net/publication/358710193_Practical_Guide_to_'Free-Energy'_Devices_Version_348.

[2] Kelly, P. J. (2017). Practical Guide to 'Free-Energy' Devices. Version: 32.1, Release date: 24 July 2017. pp.2—I-14. Last Visited on 19 February 2020. [Online]. Available: http://www.free-energy-info.co.uk/indexOct2018.html.

[3] Kelly, P. J. (2020). Practical Guide to 'Free-Energy' Devices. Version: 34.8, Release date: 24 January 2020. pp.1-1. Last Visited on 18 February 2022. [Online]. Available: https://www.researchgate.net/publication/358710193_Practical_Guide_to_'Free-Energy'_Devices_Version_348.

[4] Kelly, P. J. (2020). Practical Guide to 'Free-Energy' Devices. Version: 34.8, Release date: 24 January 2020. pp.I-26 —I-27. Last Visited on 18 February 2022. [Online]. Available:

https://www.researchgate.net/publication/358710193_Practical_Guide_to_'Free-Energy'_Devices_Version_348.

[5] LaViolette, P. A. (2012). Subquantum Kinetics —A Systems Approach to Physics and Cosmology. 4th ed. Starlane Publications, Niskayuna, New York. Last visited on 18 February 2022. [Online]. Available: https://etheric.com/subquantum-kinetics-4th-edition/.

[6] LaViolette, P. A. (2022). Subquantum Kinetics —A Systems Approach to Physics and Cosmology. 5th ed. Starlane Publications, Niskayuna, New York. Last visited on 2 April 2022. [Online]. Available: https://etheric.com/product/subquantum-kinetics-5th-edition-ebook/.

[7] Pulver, M. and LaViolette, P. A. Stationary Dissipative Solitons of Model G. International Journal of General Systems, Vol. 42, No. 5, May 2013, 1—24. Last visited on 18 February 2022. [Online]. Available: https://starburstfound.org/downloads/physics/model_g.pdf.

[8] Darrer, B. J. and LaViolette, P. A. (2020). "Explanation of Model G in Subquantum Kinetics". Researchgate. Last Visited on 18 February 2022. [Online]. Available:
https://www.researchgate.net/publication/342393172_EXPLANATION_OF_MODEL_G_IN_SUBQUANTUM_KINETICS.

[9] Wikipedia, "Coefficient of performance," This page was last visited on 18 February 2022. [Online]. Available:
https://en.wikipedia.org/wiki/Coefficient_of_performance.