Electric Motor Secrets

Part Two

Understanding the Lockridge Device

An Illustrated Lecture

by

Peter Lindemann, D.Sc.

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Introduction:

This publication was originally presented as a lecture and PowerPoint presentation to a live audience at the Renaissance Conference in Coeur d'Alene, Idaho, on November 14, 2010 at the Coeur d'Alene Resort conference facility.

This version of the material is derived from the images that were shown in the PowerPoint presentation and the talking point notes for the lecture. This material was reformatted as a single image on each page, with the original notes below. It is not a complete transcript of the lecture, which included the talking points and other extemporaneous comments at the time of delivery. It does include over 90% of the live comments delivered and over 95% of the technical details presented.

The purpose of this document is to provide a further study aid for those interested in learning the ideas presented in the lecture more thoroughly.

No table of contents is provided. The 87 images and commentary are simply presented in order.

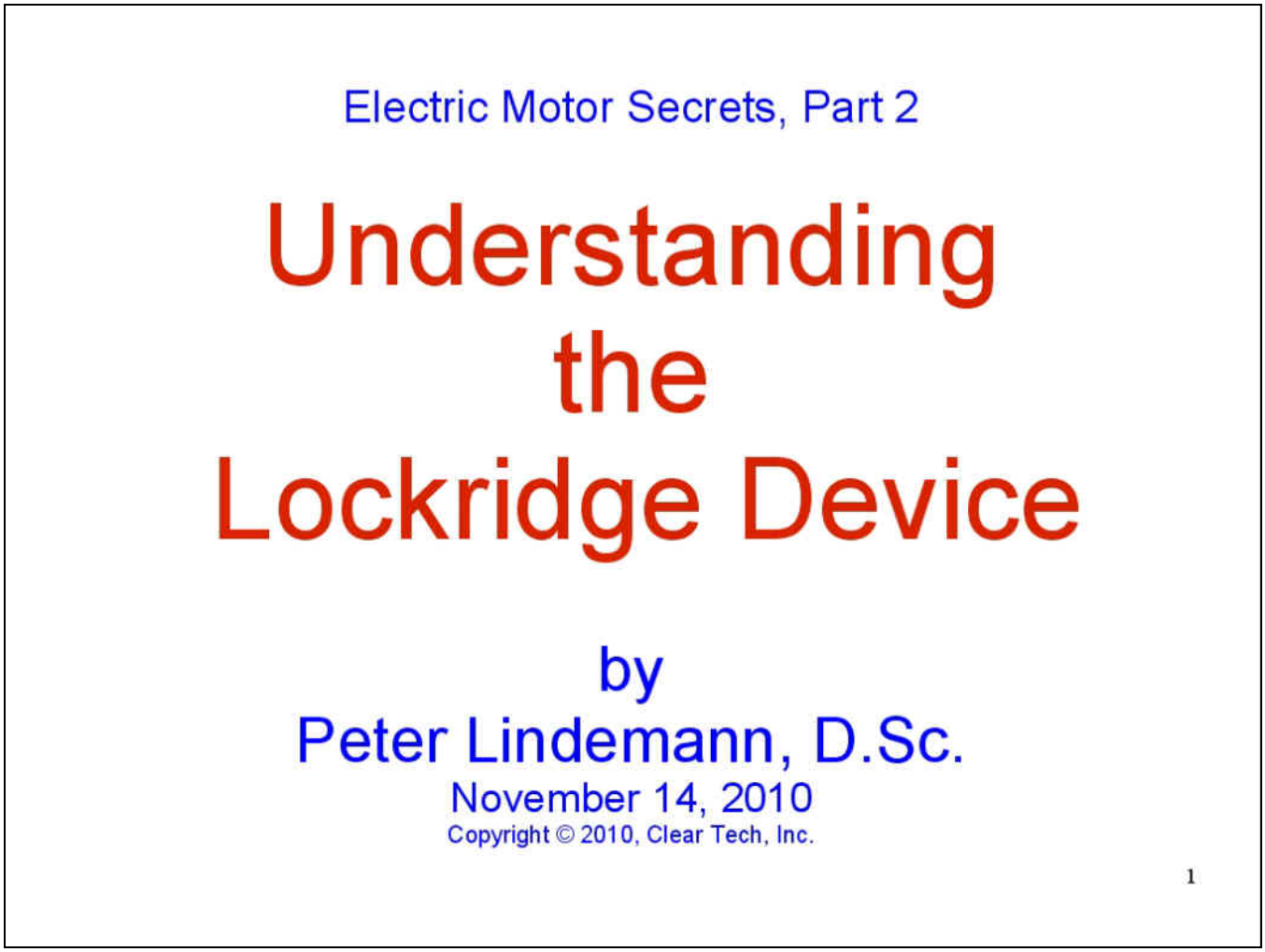
Introduction of the speaker by Aaron Murakami.

"Our next speaker has been involved in research, development, and education about free energy technologies for over 30 years. He was Science Advisor and a member of the Board of Directors at Borderland Sciences Research Foundation from 1987 through 1999, and a major contributor to their quarterly magazine, along with Tom Brown, Eric Dollard, Gerry Vassilatos, and Michael Theroux.

Over the years, he has worked closely with Bruce DePalma, Michael Knox, Trevor James Constable, John Bedini, and many other pioneers in the world of exotic energy technologies. He has published several books, lectures, and videos, including the popular Free Energy Secrets of Cold Electricity, Tesla's Radiant Energy, and Electric Motor Secrets.

He is also a founder of Clear Tech, Inc., Tesla Chargers and A & P Electronic Media.

It is my honor and privilege to introduce to you today,
Dr. Peter Lindemann."



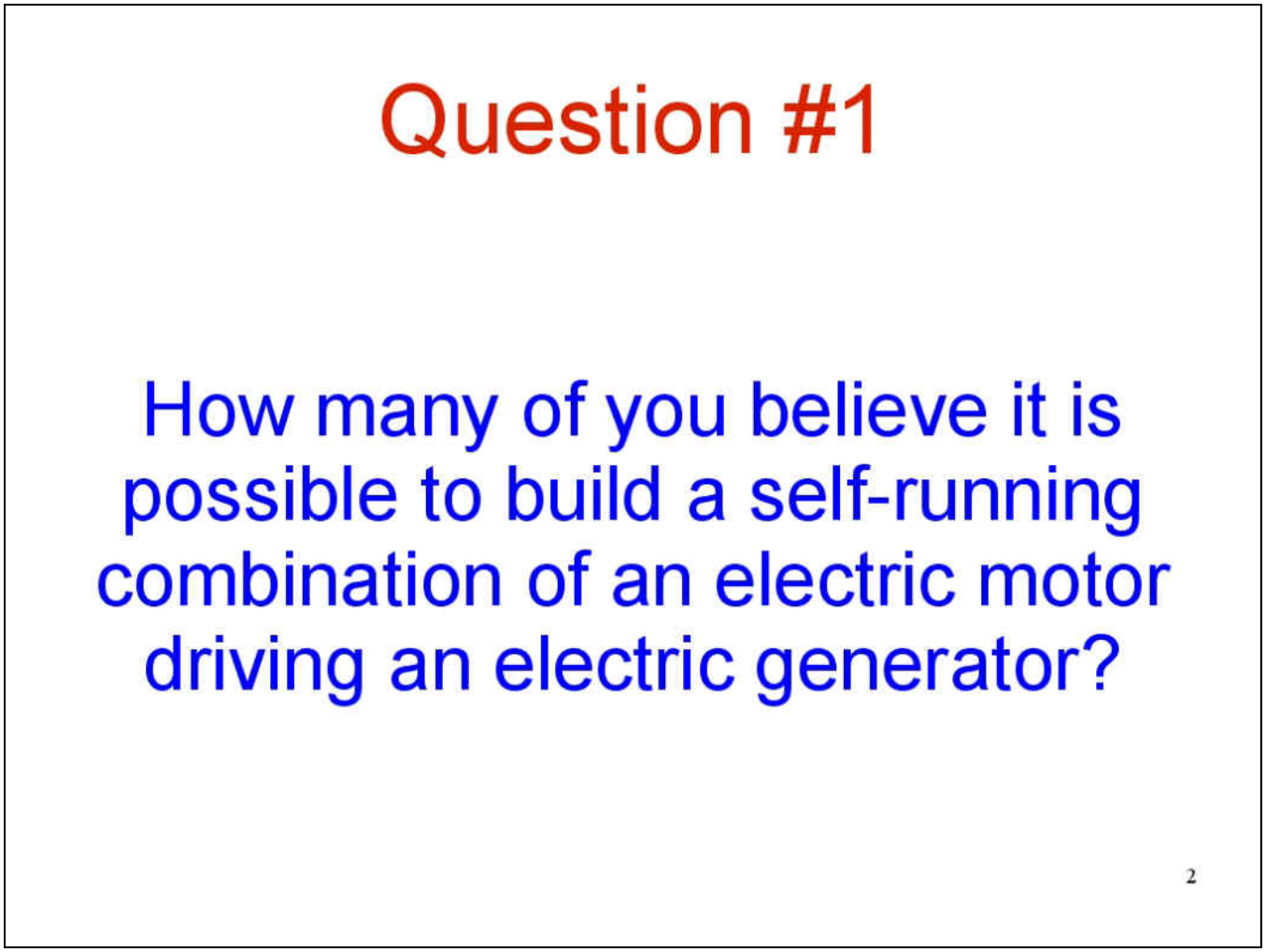
Thank you Aaron.

As many of you know, Aaron Murakami is one of the Founders and moderators of the Energetic Forum. He is also personally responsible for starting the entire Renewable Energy section of the forum. Many of you met on the Forum and have known each other only by your log-in IDs until yesterday. So, please help me thank Aaron for creating the most civil environment on the entire Internet for cooperative research on alternative energy topics. We all own him a great debt of gratitude.

Let's also thank Rick Friedrich, John Bedini, Gary Bedini, Tom Wylie, David Luke, Jeff Wilson, and all of the other people who have worked so hard behind the scenes to make this Conference happen.

And, thank you all for being here. I know many of you have travelled great distances and made significant financial sacrifices to be here today.

So, it is a great honour for me to share with you my presentation today, "Understanding the Lockridge Device". This material is a continuation from my 2007 DVD titled *Electric Motor Secrets*, so hopefully you have all seen that.



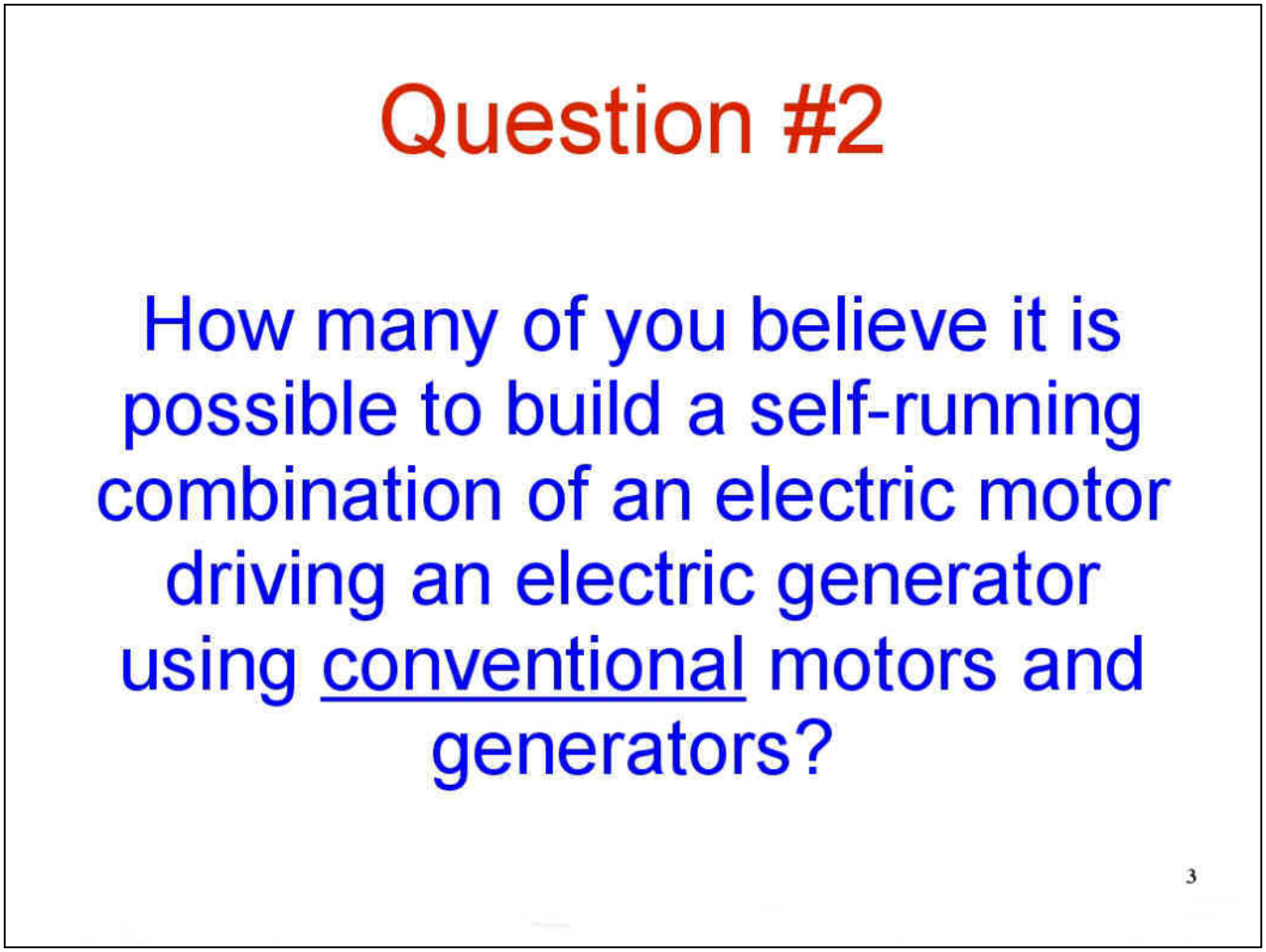
I'd like to begin with a brief survey.

(READ SLIDE)

Let's see a show of hands here.

I know this may seem like an odd question after yesterday's demonstrations, but I just want to see how many sceptics are still holding out here.

Looks like, not to many.... OK



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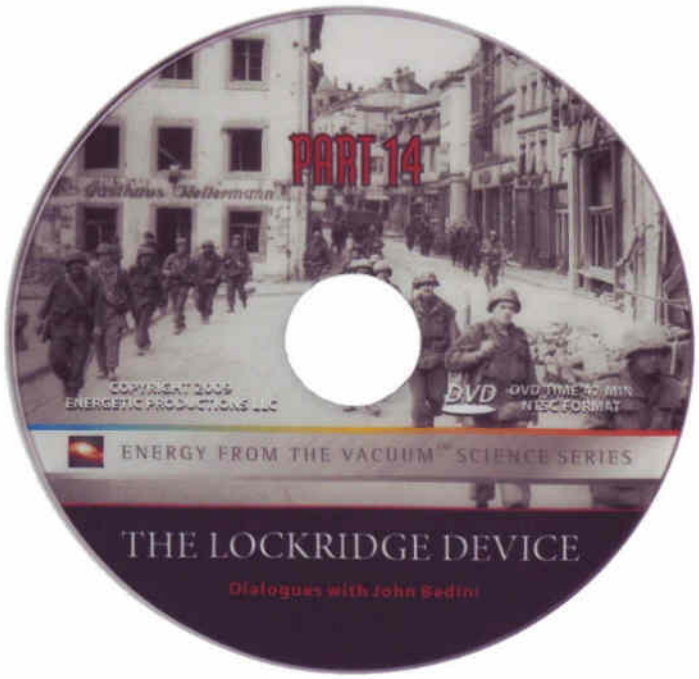
Again, let's see a show of hands here.

AHHH, this is a tougher question. I know for a long time, I did not believe this was possible, and I even said as much in my first *Electric Motor Secrets* film.

But as I continued to look into this, the evidence started strongly suggesting that it was possible. Of course, if this could be understood, then the whole "Search for Free Energy" would be a thing of the past.

So, this brings us to.....

The Lockridge Device



4

This DVD was released last year, in 2009. If you haven't seen it, you should, because it is the best evidence we have that a fully self-running machine was built by a brilliant engineer in Germany, near the end of World War II.

I'd like to give a special thanks to Tony Craddock for producing this film and to John Bedini for making this material available to the public.

As early as 2004, John introduced me to the story of this machine and we had many, long conversations about how it might operate.

So, here is the story again....

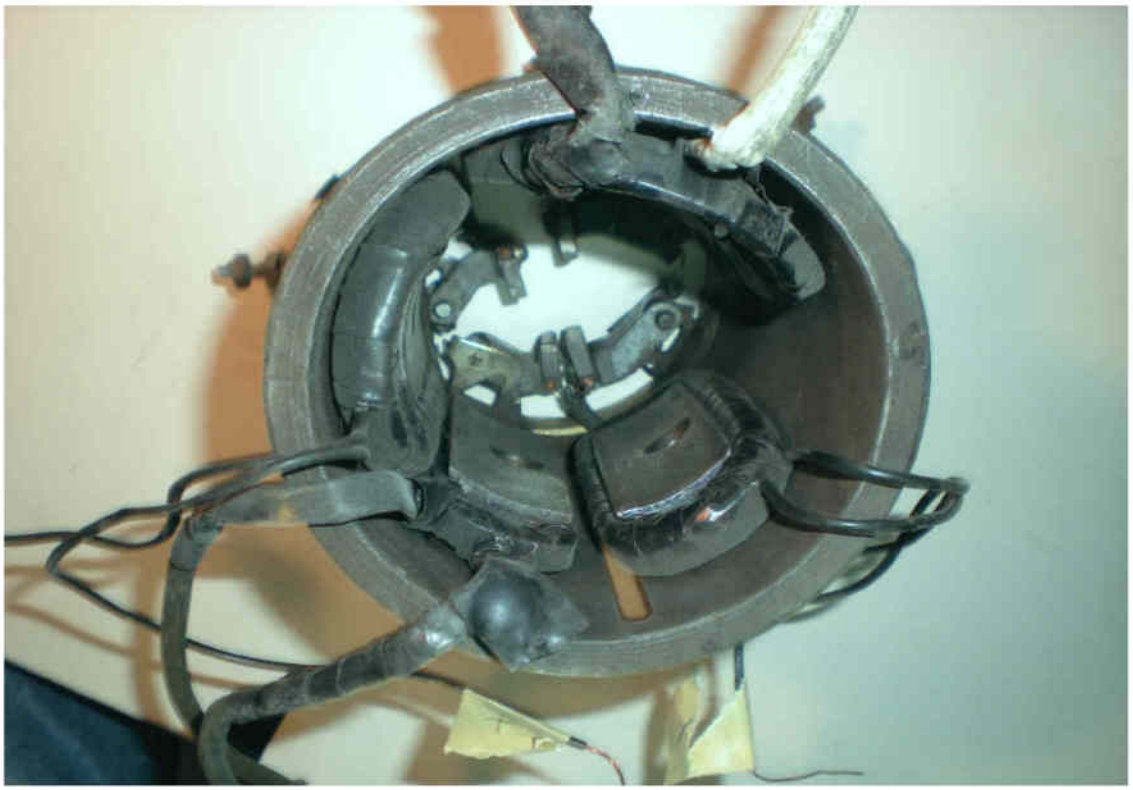
During clean-up operations after the end of World War 2, US soldiers were doing house to house searches throughout Germany, to make sure there were no more enemy combatants left. Germany had operated under "blackout" conditions at night for months, so the cities would not be easy bombing targets. Likewise, most utility services had been completely disrupted and fuel was also scarce.

This situation provided the inspiration for a brilliant engineer to provide himself a little bit of light in his own basement, with the windows totally shaded.

When the US soldiers reached this house, the machine was operating in the basement, running itself and lighting about 300 watts worth of light bulbs.

What you are looking at is the heart of the machine.

Lockridge Device: Coil Assembly



6

The machine was based on a Bosch Automotive Generator, most probably taken from the limited production Volkswagen of the era. The stator windings were modified and their positions in the housing were altered. Slots were machined in the housing to separate the magnetics into two halves. One part was re-dedicated to the motor operations and the other half was left as the generator. The windings on the armature were not modified. The commutator brush assembly was also modified to adjust for the new coil positions and the new motor functions.

The US soldier who found the machine was named Lockridge. Instead of turning the machine over to his superior officers, he crated it up and sent it home to himself. Once home, in Boise, Idaho, Lockridge back engineered the machine, built operational replicas throughout the 1950s, and sold them to weekend campers, to light there campsites. No working models survive today.

Lockridge Device: Research Notebook

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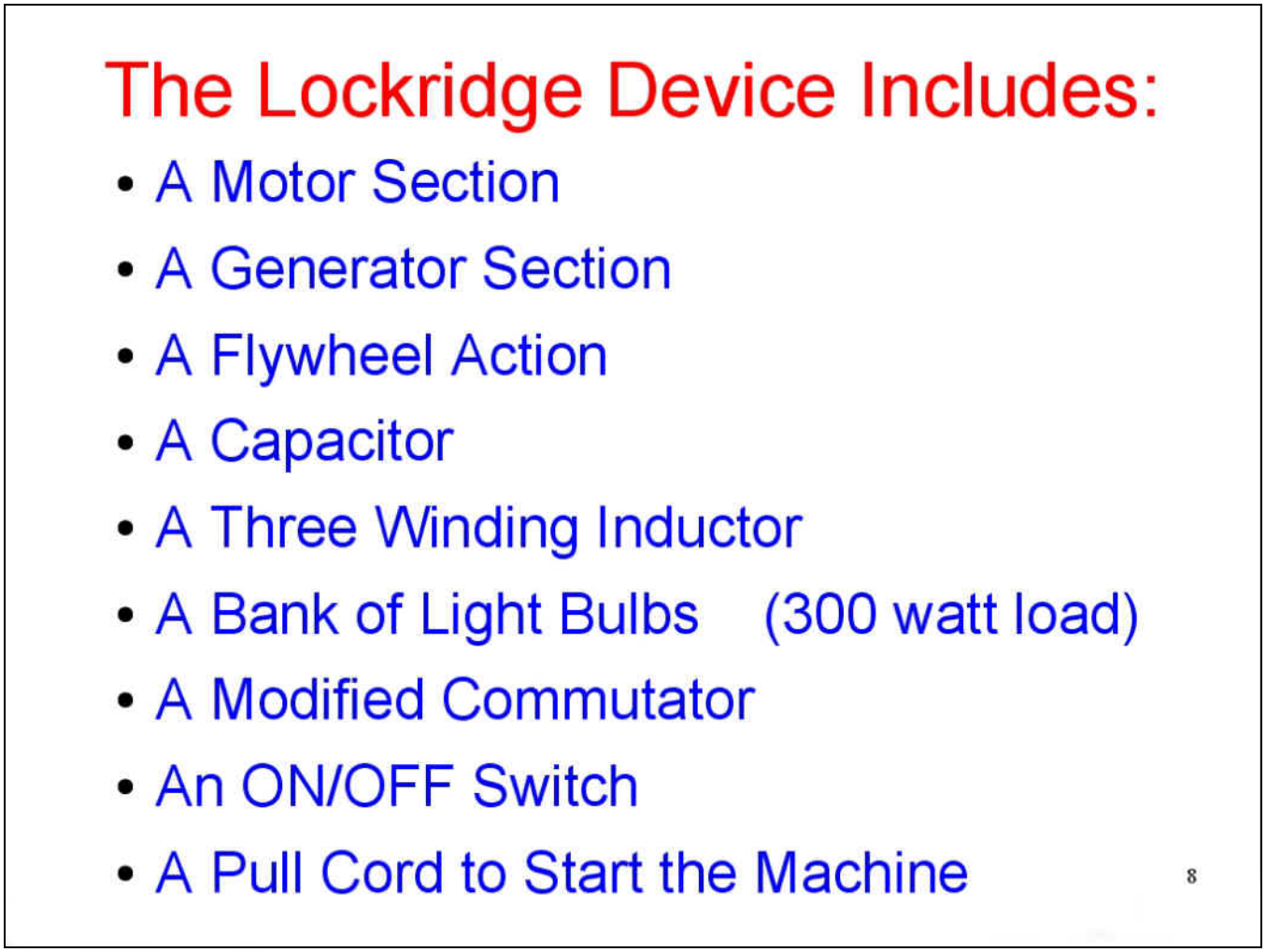
In 1980, another resident of Boise, and friend of John Bedini, started trying to piece all of the surviving information together. This notebook is what this person, who wishes to remain anonymous, gathered in his years of work.

The notebook represents an exhaustive search for facts, contacts, and eyewitness reports of the functions and appearance of the working machines. He never saw a working model, although he did find people who were known to have had working units at one point, but would not discuss their experiences with him.

30 years later, the trail of evidence is cold and most of the eyewitnesses have passed on. The remnants of the project were given to John in 2008.



So, here is what we know...

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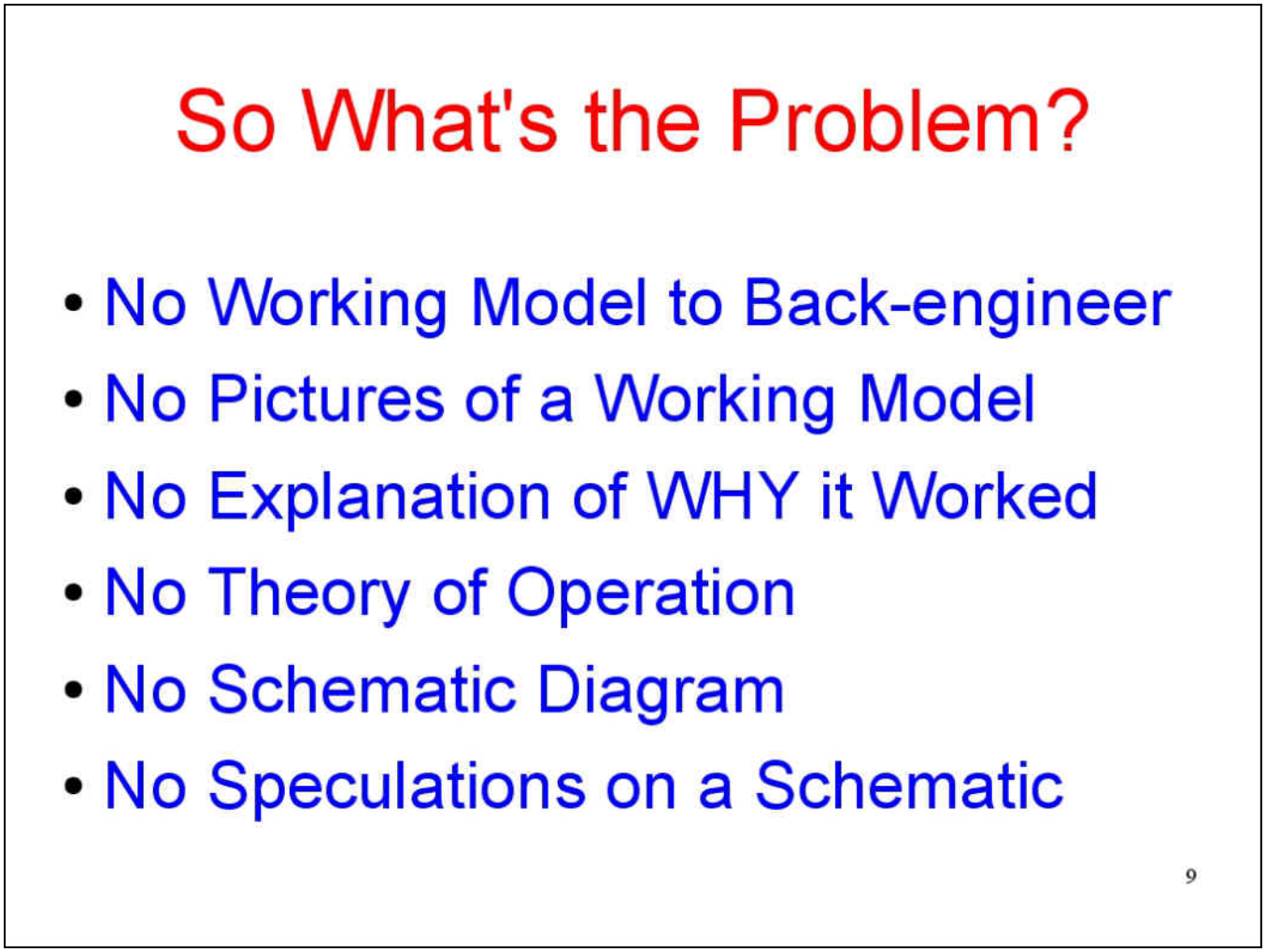

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So, we are missing a few important pieces.

Other Details…

- The Original unit was built from a Bosch 6 volt generator, probably from an early Volkswagen.
- Replicated units were built from a modified Delco-Remy 12 volt automotive DC Generator from the early 1950s, used in Chevys from 1937 to 1954.
- The case was machined to produce a slot that isolated the magnetic fields between the two sides of the machine (motor and generator functions).
- A framework was built up around the case to hold the tri-filar winding, 230 turns of #21 gauge wire.
- A hand-made capacitor was wound on top of the coil in the same frame, made from two sheets of copper, 30 feet long, with waxed butcher paper in between. 10

(READ SLIDE)

Final Details

- The stator consisted of four wound coils, two large and two smaller and were not configured symmetrically at 90 degree positions (as seen in the earlier photos).
- The rotor was not rewound.
- The commutator was modified to allow the motor to pulse once per revolution while still allowing the generator section to operate all of the time.
- The motor brushes were modified to touch only one commutator section at a time.
- The light bulbs seemed to be a part of the circuit and could not be replaced by any other load.

11

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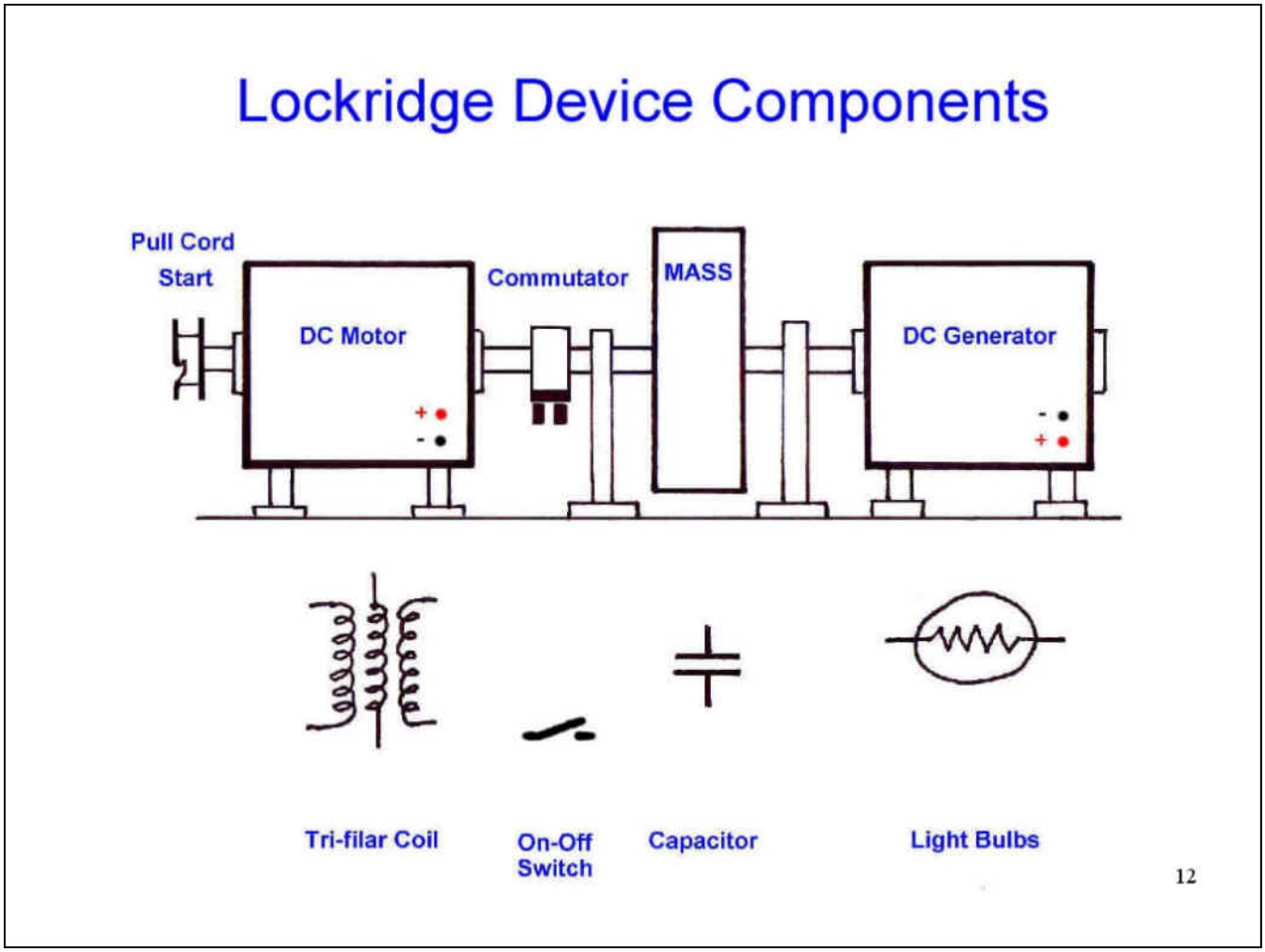

So, here again is the list of components for the Lockridge Device, but this time, in graphical form.

They are: (READ SLIDE)

We can see that the mechanical parts are all connected, but what we don't know is the rest of the circuit.

So, this is where our journey of discovery begins.....

Theory of Operation

- If the machine works, and we assume that it does, it must be getting its excess energy from somewhere.
- Since capacitors, coils, commutators, light bulbs and wire are poor candidates for this energy source, we must look at the motor and generator components.
- Normally, motors and generators based on Faraday's direct induction principles are not considered capable of OU operation.
- In my educational film *Electric Motor Secrets*, produced in 2007, I showed that the efficiency of electric motors could be increased by modifying their Back EMF behavior.
- So, the most promising theory of operation, from my point of view, is to explore the possibility of a low Back EMF motor operation in the Lockridge Device.

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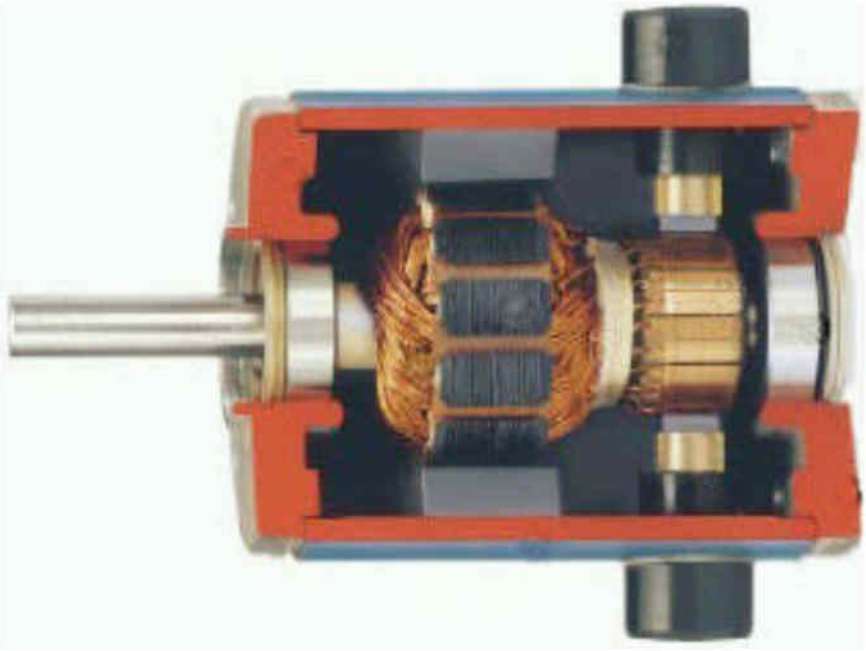
If we can prove out that possibility, then we are well on the way to understanding how and why the machine did what was reported.

DC Motor Cut-away View



14

There are more than a few people on the discussion threads who purport to understand what I mean when I say “lower the back EMF of a motor” but from their posts, I know they haven't got the first clue of what I mean.

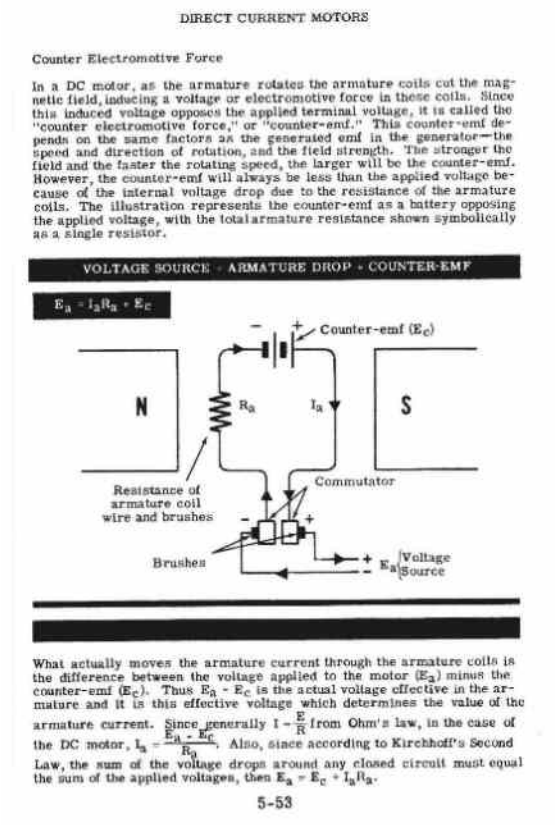
In order to avoid any confusion, I would like to review the exact motor topology that we are dealing with here.

The image here is a Cut-away View of a DC Motor. It has a wound armature, a brush commutator and a permanent magnet field.

This is the specific structure of machine we will be discussing for the entire lecture. The only variation we will also discuss is replacing the permanent magnets in the stator field with coils of wire to produce the stator field with electro-magnets.

This is the universal electro-mechanical machine because if you apply electricity to it, it rotates as a motor, and if you rotate it mechanically, it generates electricity.

Counter EMF Explained



DIRECT CURRENT MOTORS

Counter Electromotive Force

In a DC motor, as the armature rotates the armature coils cut the magnetic field, inducing a voltage or electromotive force in these coils. Since this induced voltage opposes the applied terminal voltage, it is called the "counter electromotive force," or "counter-emf." This counter-emf depends on the same factors as the generated emf in the generator—the speed and direction of rotation, and the field strength. The stronger the field and the faster the rotating speed, the larger will be the counter-emf. However, the counter-emf will always be less than the applied voltage because of the internal voltage drop due to the resistance of the armature coils. The illustration represents the counter-emf as a battery opposing the applied voltage, with the total armature resistance shown symbolically as a single resistor.

VOLTAGE SOURCE = ARMATURE DROP + COUNTER-EMF

$E_a = I_a R_a + E_c$

What actually moves the armature current through the armature coils is the difference between the voltage applied to the motor (E_a) minus the counter-emf (E_c). Thus $E_a - E_c$ is the actual voltage effective in the armature and it is this effective voltage which determines the value of the armature current. Since generally $I = \frac{E}{R}$ from Ohm's law, in the case of the DC motor, $I_a = \frac{E_a - E_c}{R_a}$. Also, since according to Kirchhoff's Second Law, the sum of the voltage drops around any closed circuit must equal the sum of the applied voltages, then $E_a = E_c + I_a R_a$.

5-53

Reproduction of page 53 in Section 5 of Basic Electricity by Van Valkenburgh, Nooger and Neville

First Edition 1954

15

In order to understand the phenomena of Back EMF, let's go to the text books, and see what they say.

(READ SLIDE)

The first thing I would like to point out is that in these old books, what I am calling “Back EMF” was referred to as “Counter EMF”. For the purposes of this lecture, you should consider these two terms to be identical, and that they both refer to the same phenomena.

Second, I would like to explain that I use these old books because I find their explanation of things to be much more insightful. In fact, the newer editions of this same book are significantly rewritten, and I do not recommend any edition other than the first.

So, let's begin....

Definition of Counter-EMF

DIRECT CURRENT MOTORS

Counter Electromotive Force

In a DC motor, as the armature rotates the armature coils cut the magnetic field, inducing a voltage or electromotive force in these coils. Since this induced voltage opposes the applied terminal voltage, it is called the "counter electromotive force," or "counter-emf." This counter-emf depends on the same factors as the generated emf in the generator—the speed and direction of rotation, and the field strength. The stronger the field and the faster the rotating speed, the larger will be the counter-emf. However, the counter-emf will always be less than the applied voltage because of the internal voltage drop due to the resistance of the armature coils. The illustration represents the counter-emf as a battery opposing the applied voltage, with the total armature resistance shown symbolically as a single resistor.

16

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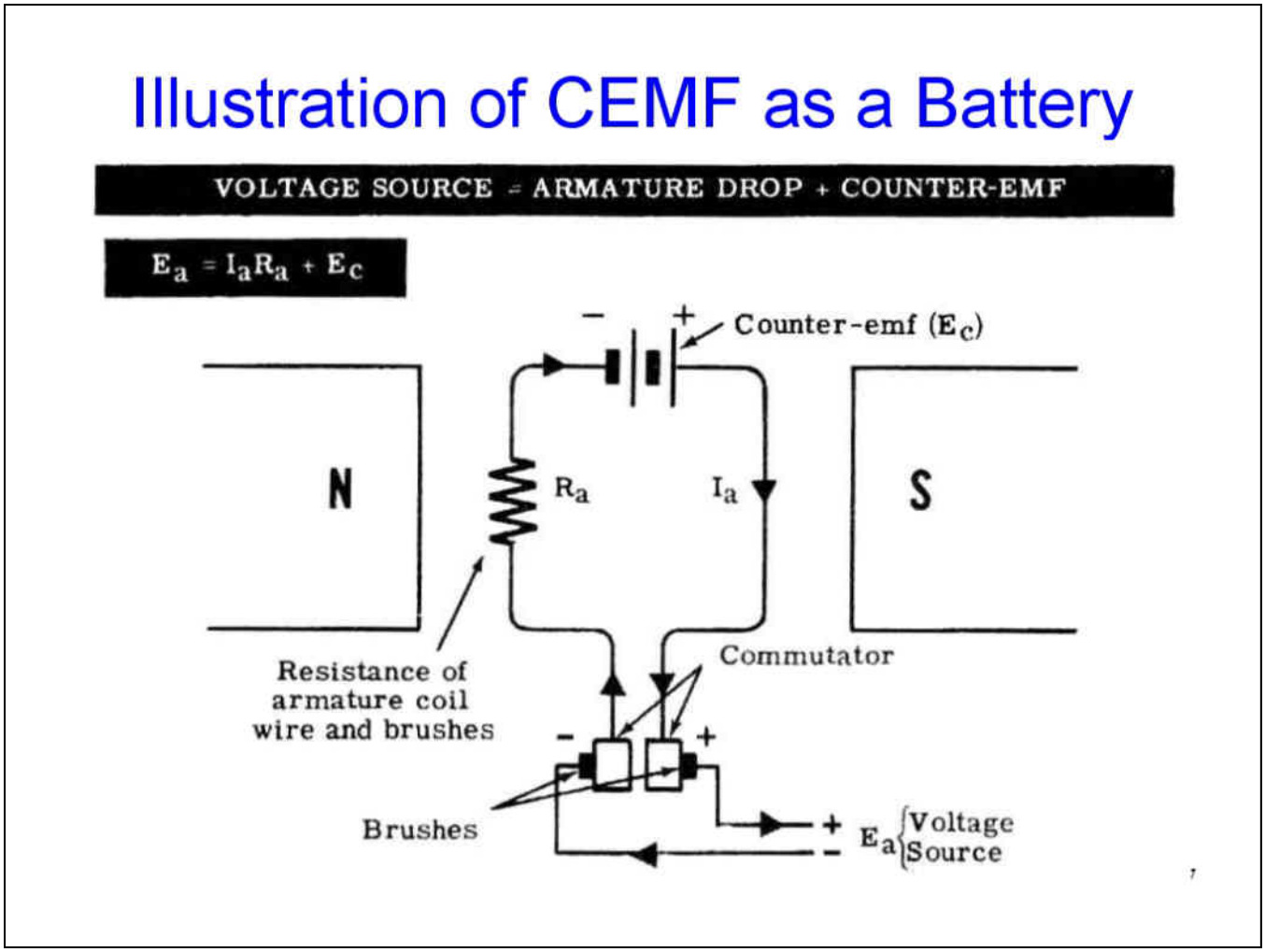

So here is the symbolic diagram of the structure just described.

We see the stator field on each side, designated as the North and South pole pieces. (N and S)

We see the Voltage Source here leading to the brushes.

We see the commutator sections connected to the armature windings, shown as a single loop.

And we see the resistance of the armature windings and brushes represented as resistor R-sub-A.

We see the Counter EMF depicted as a battery that develops a voltage in opposition to the external supply.

And we see the current circulating in the armature winding referred to as I-sub-A.

Definition of Effective Voltage

What actually moves the armature current through the armature coils is the difference between the voltage applied to the motor (E_a) minus the counter-emf (E_c). Thus $E_a - E_c$ is the actual voltage effective in the armature and it is this effective voltage which determines the value of the armature current. Since generally $I = \frac{E}{R}$ from Ohm's law, in the case of the DC motor, $I_a = \frac{E_a - E_c}{R_a}$. Also, since according to Kirchhoff's Second Law, the sum of the voltage drops around any closed circuit must equal the sum of the applied voltages, then $E_a = E_c + I_a R_a$.

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(READ SLIDE)

Does everyone understand this? This is standard motor operation theory.

OK

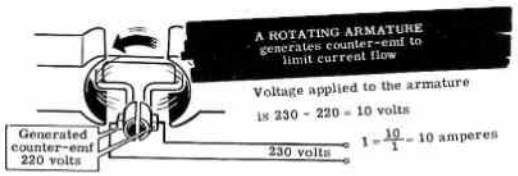
Counter-EMF Explained Further

DIRECT CURRENT MOTORS

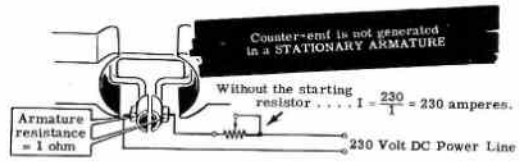
Counter Electromotive Force (continued)

The internal resistance of the armature of a DC motor is very low, usually less than one ohm. If this resistance were all that limited the armature current, this current would be very high. For example, if the armature resistance is 1.0 ohm and the applied line voltage is 230 volts, the resulting armature current, according to Ohm's law, would be: $I_a = \frac{E_t}{R_a} = \frac{230}{1.0} = 230$ amps. This excessive current would completely burn out the armature.

However, the counter-emf is in opposition to the applied voltage and limits the value of armature current that can flow. If the counter-emf is 220 volts, then the effective voltage acting on the armature is the difference between the terminal voltage and the counter-emf: 230 - 220 = 10 volts. The armature current is then only 10 amps: $I_a = \frac{E_t - E_c}{R_a} = \frac{10}{1} = 10$ amps.



When the motor is just starting and the counter-emf is too small to limit the current effectively, a temporary resistance called the "starting resistance" must be put in series with the armature, to keep the current flow within safe limits. As the motor speeds up, the counter-emf increases and the resistance can be gradually reduced, allowing a further increase in speed and counter-emf. At normal speed, the starting resistance is completely shorted out of the circuit.



5-54

Reproduction of page 54 in Section 5 of Basic Electricity by Van Valkenburgh, Nooger and Neville

First Edition 1954

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on the next page, the book explains this a little more.

Armature Resistance is Low

Counter Electromotive Force (continued)

The internal resistance of the armature of a DC motor is very low, usually less than one ohm. If this resistance were all that limited the armature current, this current would be very high. For example, if the armature resistance is 1.0 ohm and the applied line voltage is 230 volts, the resulting armature current, according to Ohm's law, would be:

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(READ SLIDE)

How Counter-EMF lowers Current

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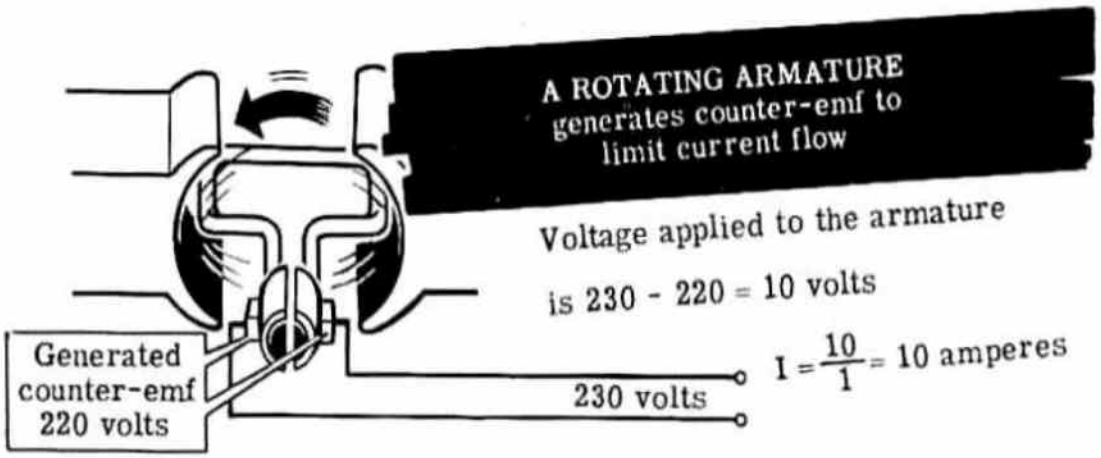

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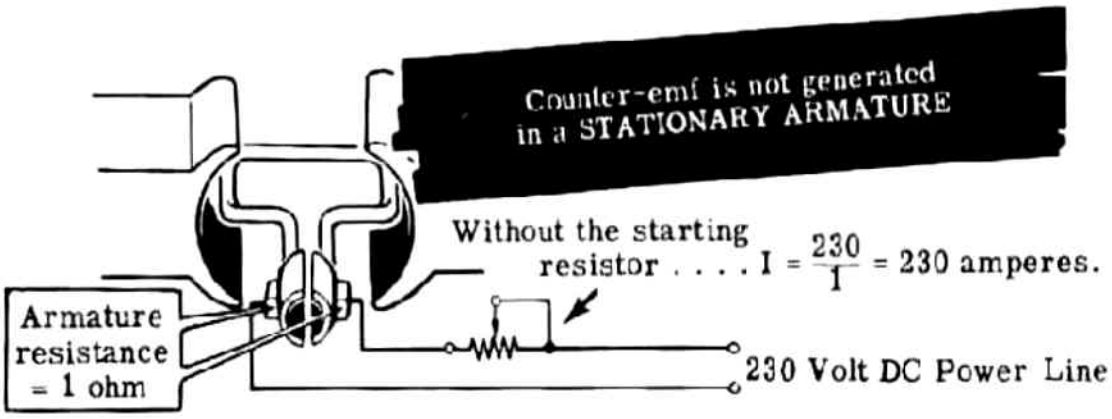
Counter-EMF at "Start-up"

When the motor is just starting and the counter-emf is too small to limit the current effectively, a temporary resistance called the "starting resistance" must be put in series with the armature, to keep the current flow within safe limits. As the motor speeds up, the counter-emf increases and the resistance can be gradually reduced, allowing a further increase in speed and counter-emf. At normal speed, the starting resistance is completely shorted out of the circuit.



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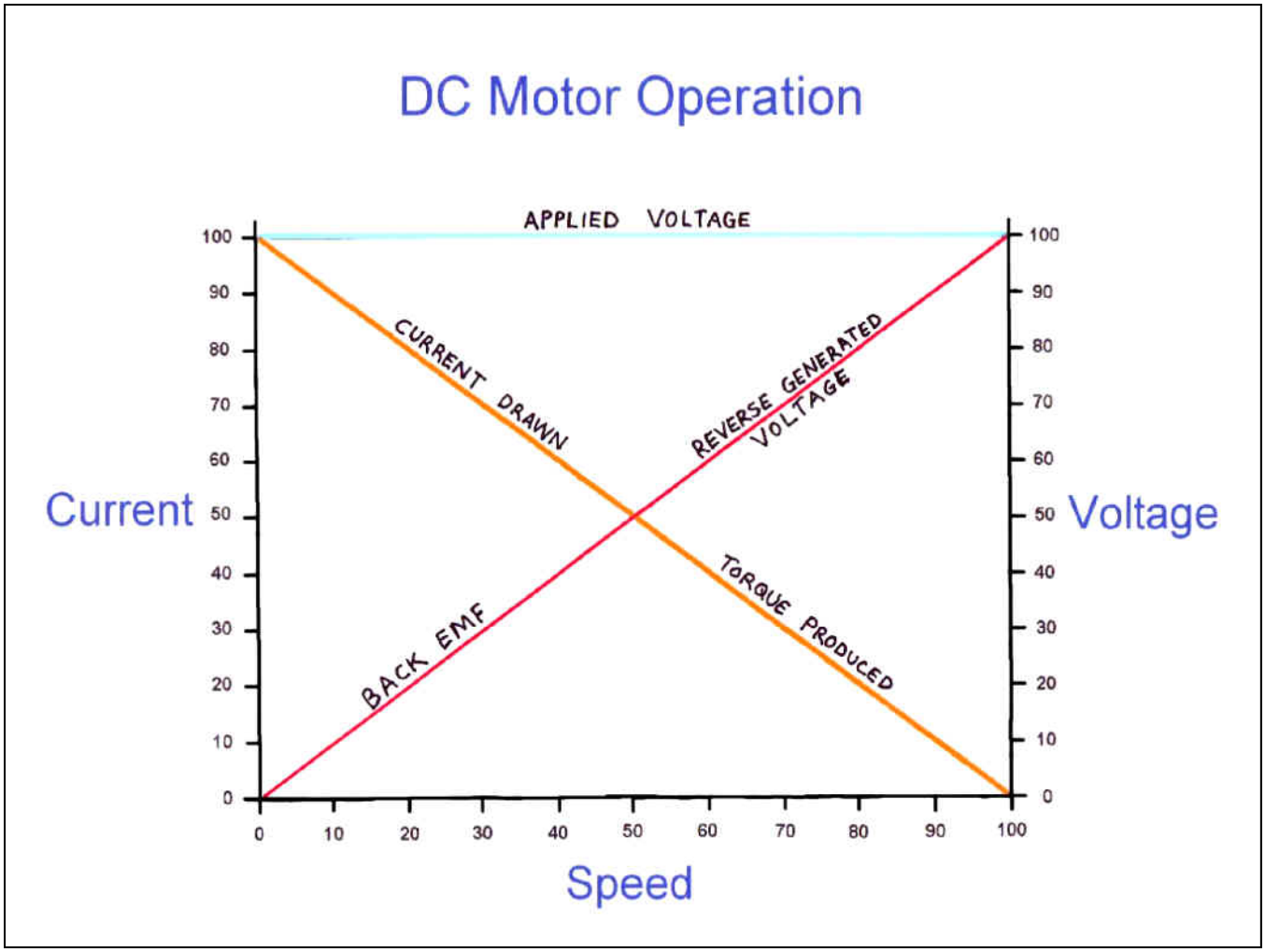


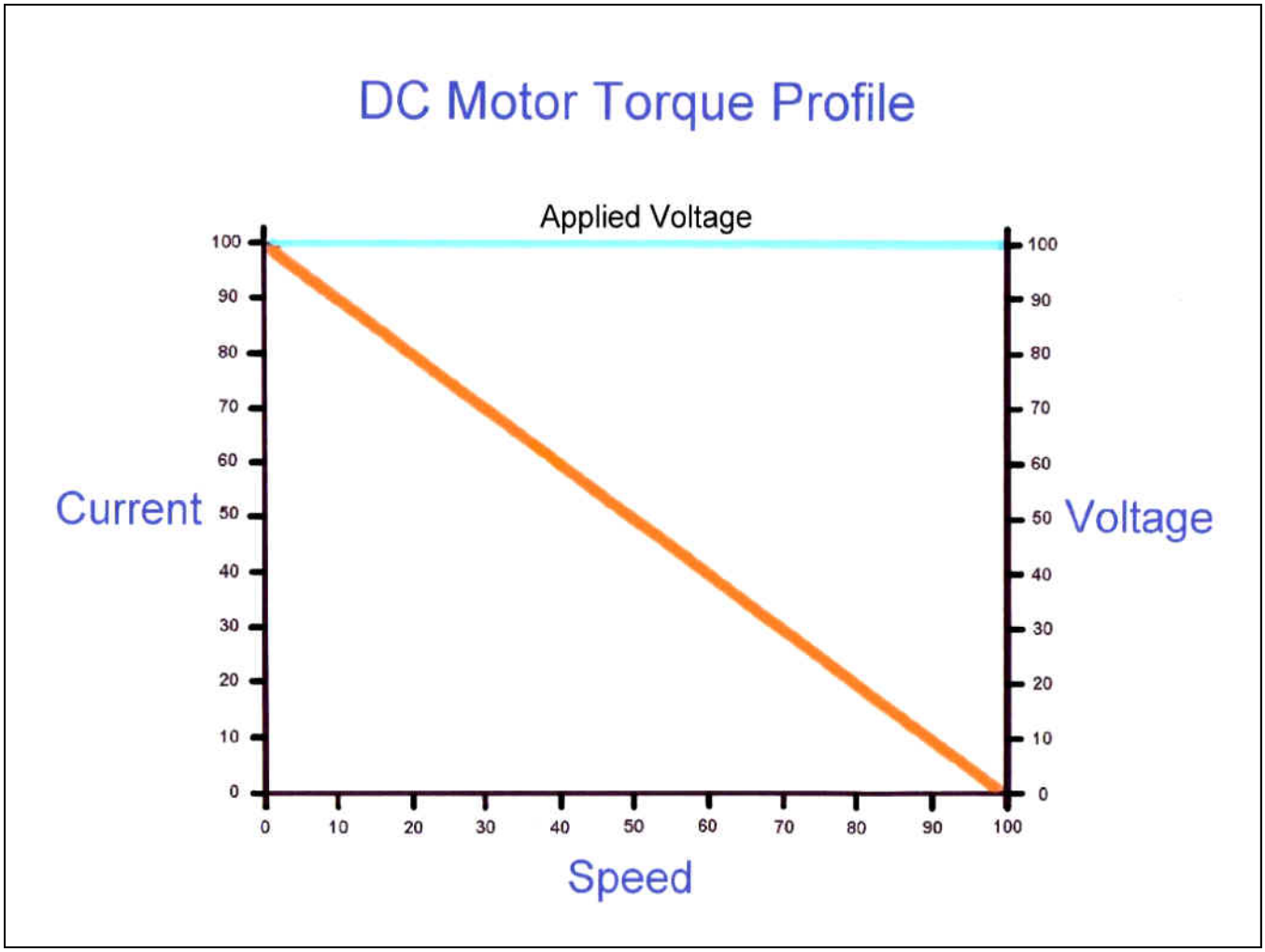
So, here is a graph that depicts what we just read.

All units on the sides of the graph are shown as percentages of generalized maximum values. Ignoring loss mechanisms, we are just looking at functions and relationships here.

With a steady Applied Voltage, (light blue line across the top) the current is the highest when the speed is the lowest.

As speed increases, the Back EMF starts rising and the current starts dropping.

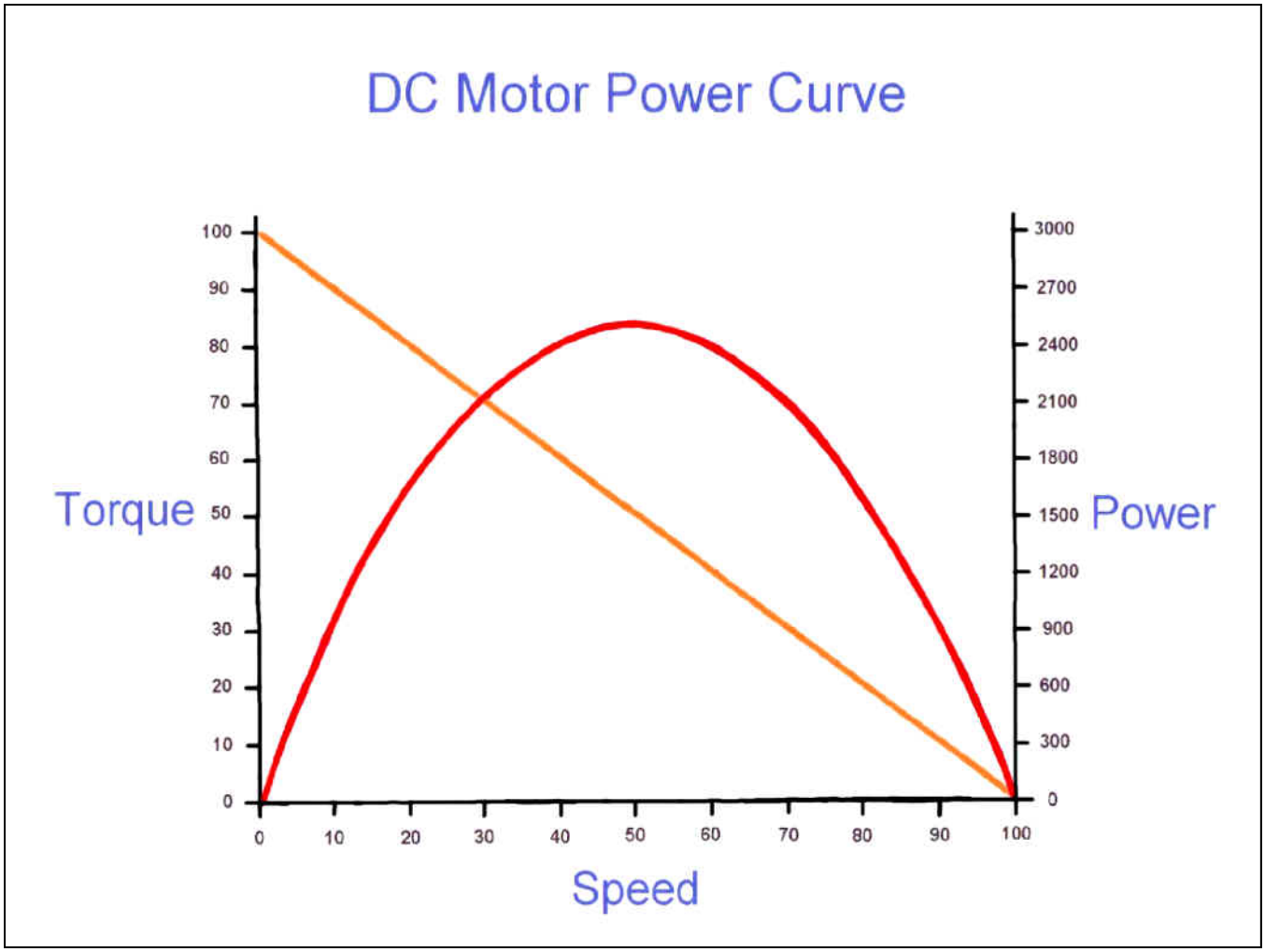
At the maximum speed, the Back EMF is the highest and the current drawn by the motor is the lowest.



Here is the graph that depicts the torque produced by the machine. With a steady Applied Voltage, the torque produced follows the same characteristics as the Current.

So, torque begins at maximum and drops as speed increases until the torque produced is insufficient to cause any further acceleration.

This point then defines the "Top Speed" for that Applied Voltage.



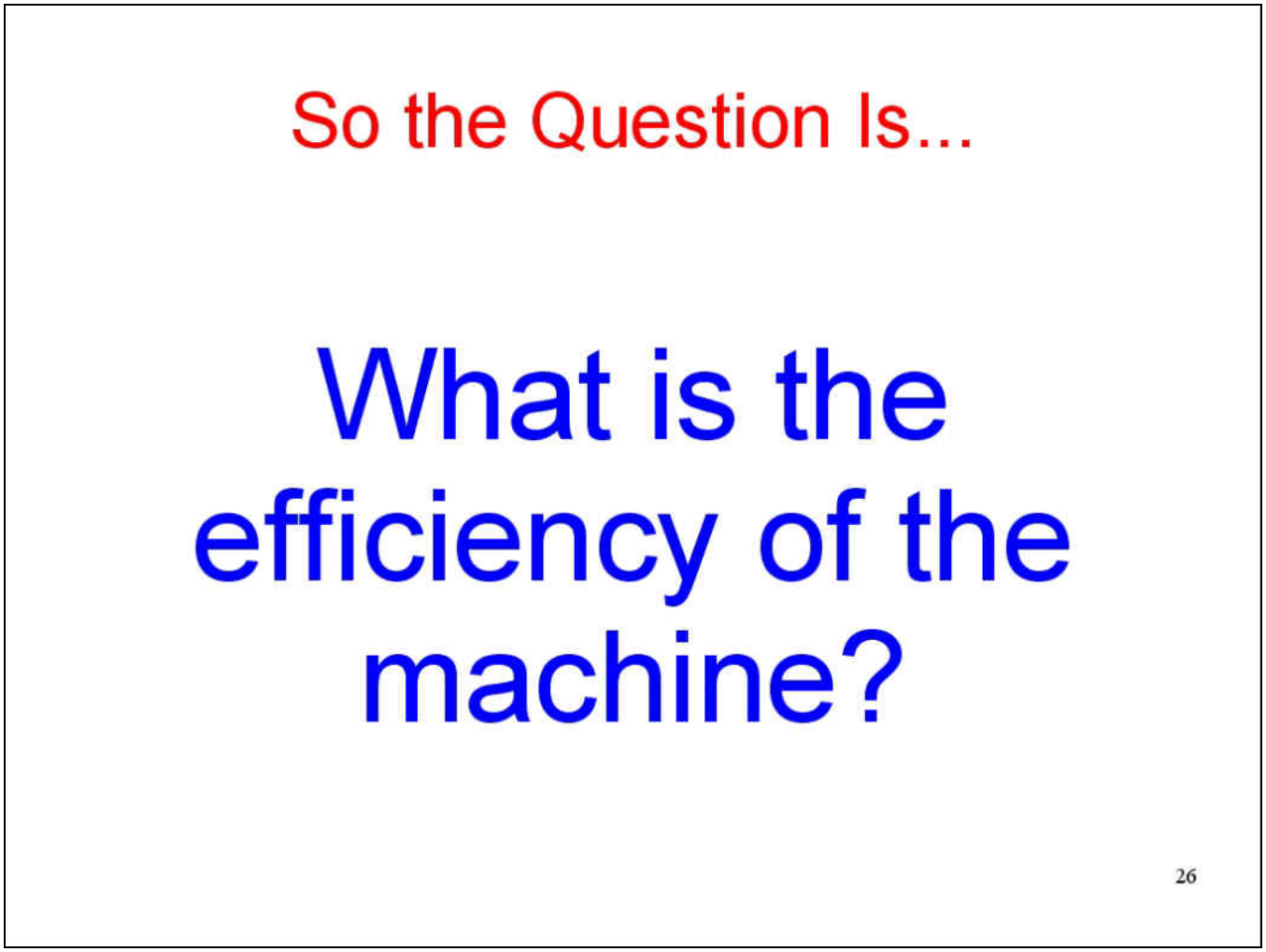
The mechanical energy produced by the machine is seen as the Red Bell Curve.

Since Power is the cross-product of both speed and torque, we can see that the Power Peaks when the speed is ½ of the unloaded idle speed, and the torque is equal to the value produced when ½ of the maximum current is drawn.

This is also the point at which the Back EMF is reduced to ½ of its maximum value, as seen on the previous graph.

This Power Peak is also referred to as the 100% rated Speed for the 100% rated Torque.

We can also see that any further loading of the machine past this point reduces the power output and the motor's performance rapidly decays towards stall, maximum current draw, over-heating and destruction of the motor if it is not saved by some fuse blowing or other circuit breaker.



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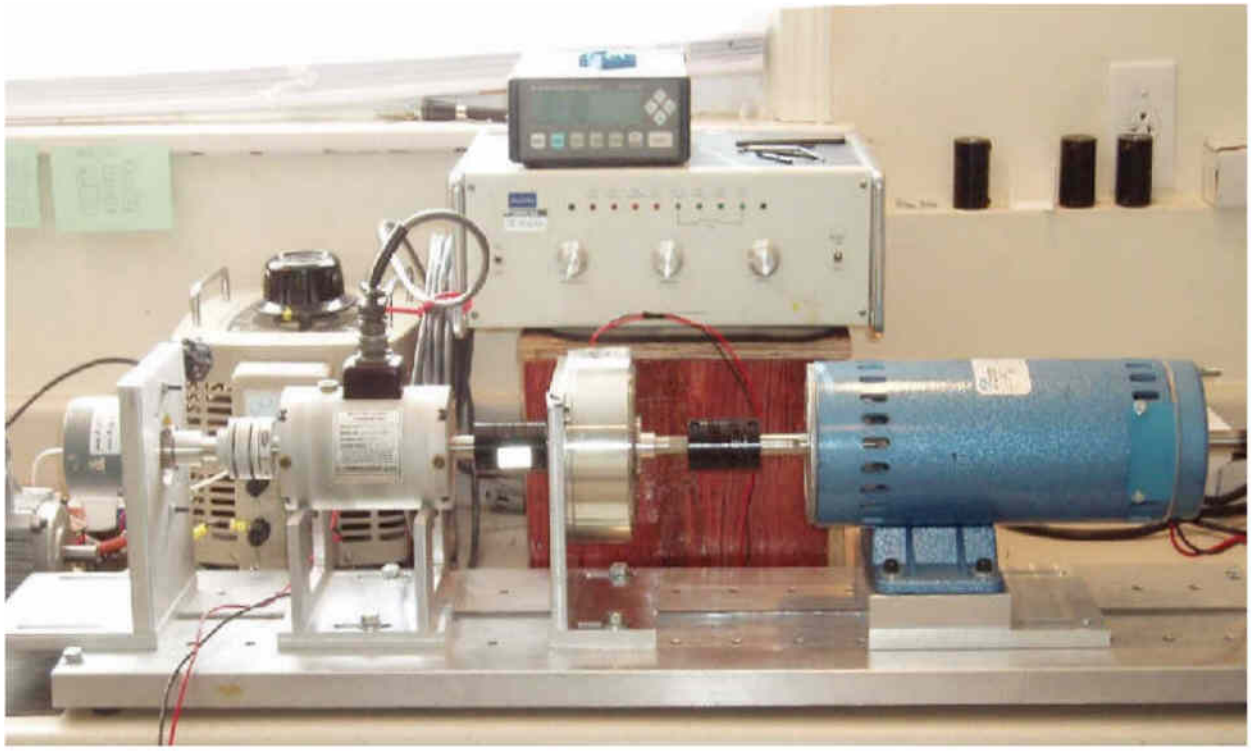
Instrumented Dynamometer Test



We are told that the best way to determine the efficiency of the machine is just to connect it to an Instrumented Dynamometer and run the test.

By comparing the electrical input, measured in Watts, as the cross product of Volts and Amps, to the mechanical output, measured in Horse-power, as the cross product of the torque and speed, we can determine the efficiency by direct measurement.

Efficiency..... by the Book

Where: 1 Hp = 550 Ft-Lbs/sec = 746 Watts

$$\frac{\text{Mechanical Energy Output}}{\text{Electrical Energy Input}} = \text{Efficiency}$$

Example:

$$\frac{634 \text{ Watts}}{746 \text{ Watts}} \times 100 = 85\%$$

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Losses..... by the Book

1) Electrical Power Losses include resistance of the primary rotor and secondary stator windings, generally referred to as the Copper Loss, and calculated as I^2R.
2) Magnetic Power Losses include energy dissipated as HEAT in the iron core of the motor, and field strength losses as the magnetic field crosses the air-gap between the stator and the rotor.
3) Mechanical Power Losses include bearing Friction, air resistance as the rotor turns, brush friction against the commutator, and more air resistance if the motor turns its own cooling fan.
4) Stray Losses include harmonic distortion of the power flow through the motor under load, flux crowding in the core material, and other magnetic leakages.

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(READ SLIDE)

So, this is what we were all taught, and not surprisingly, its all true!!

None of this is the problem.

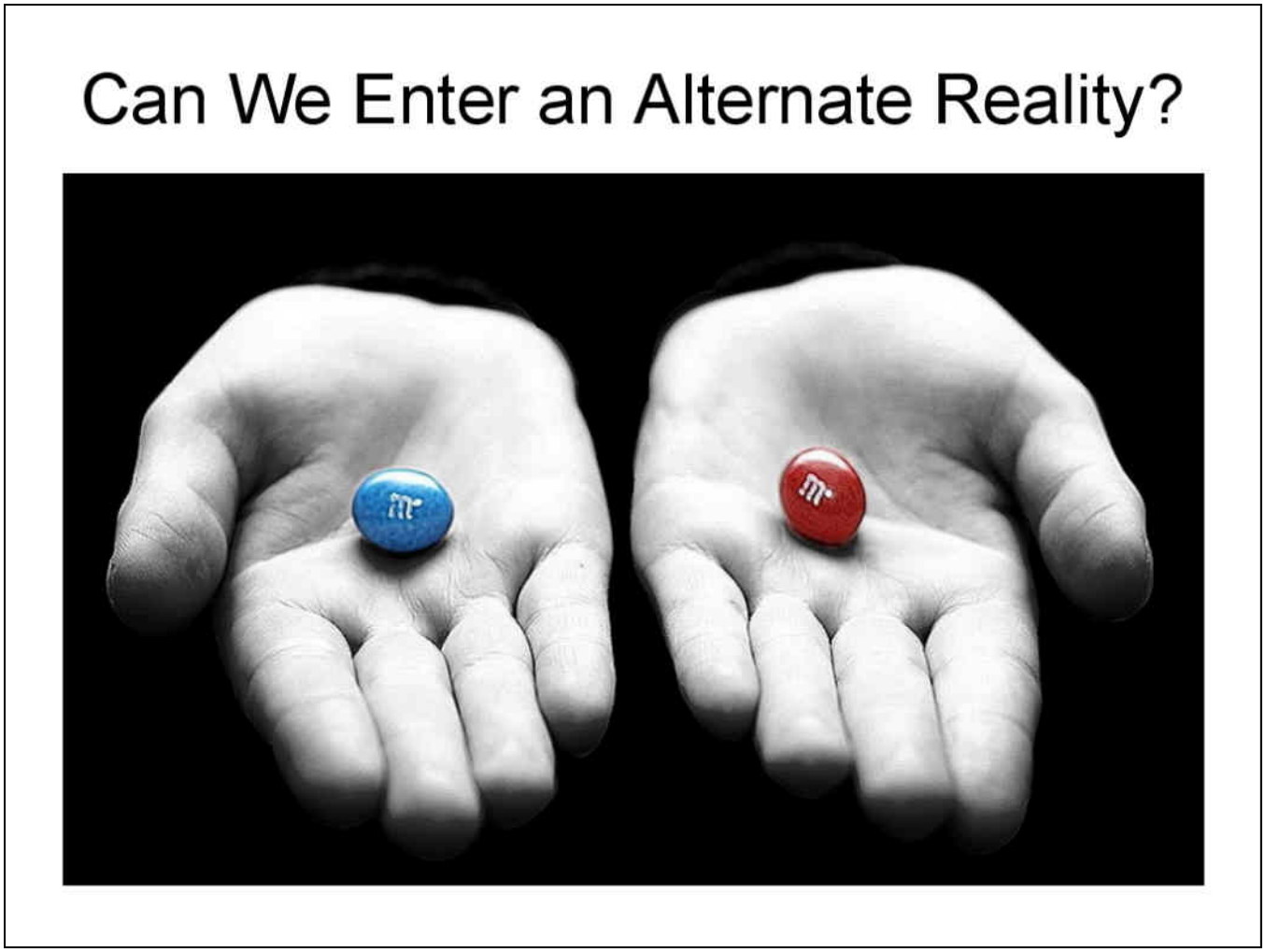
The problem is that we have all been subjected to a sort of Mass Hypnosis characterized by a selective omission of information. This is what I call "The New York Times" version of how the motor works.

In other words, we have only been told the equivalent of

"All the news that's fit to print".

While this version of the understanding of how electric motors work has satisfied the vast majority of engineers for the last 180 years, it has also forced many brilliant people to accept some remarkably stupid answers for otherwise insightful questions.

So, today, we must ask... how do we wake up from this intellectually deadened state of consciousness?

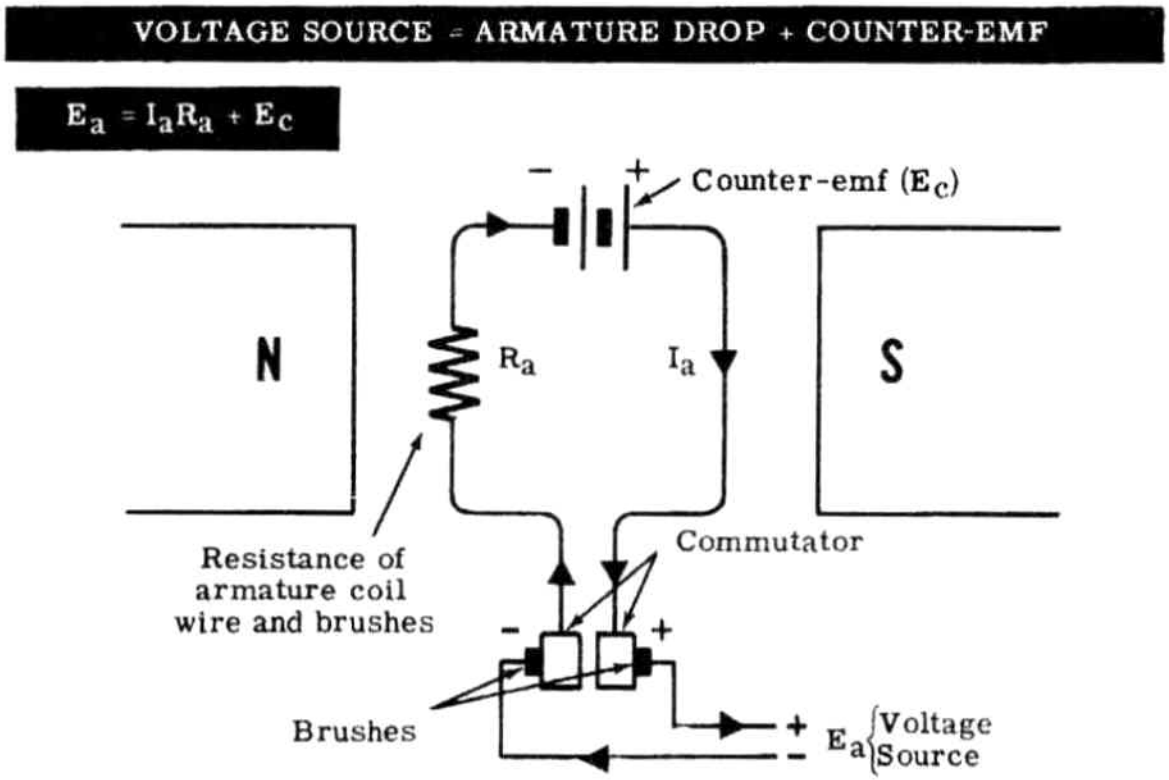


So, to wake you from this long imposed Trance State, I offer you a simple remedy. That remedy is the Psychotropic Effect of imagining yourself eating a Red M&M. And, lucky for you all, we just happen to have an unlimited supply of imaginary Red M&Ms, right here in the room.

Close your eyes, and imagine a Red M&M in your hand. Now place the Red M&M in your mouth and feel the hard, candy shell. Then, let the chocolate melt on your tongue and feel that soothing, yet mild release of imaginary endorphins in your brain. Just let that little moment of enjoyment and relaxation adjust your perception, so you can finally see what has always been, right before your eyes.

3-2-1....wake up and open your eyes.

Illustration of CEMF as a Battery



So, now that we have cleared our minds, let's take a closer look at the nature of Back EMF and try to understand what it really is.

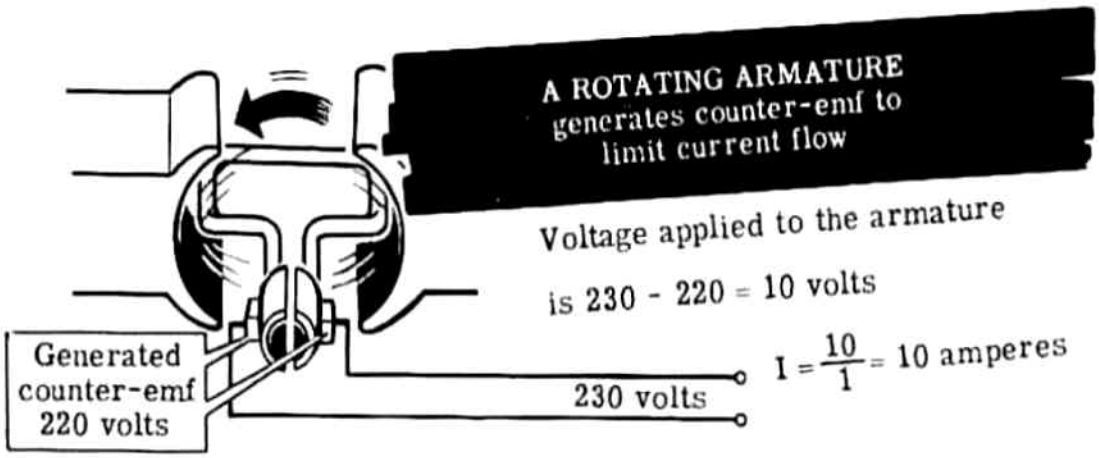
In this slide, which I showed you before, the Counter EMF is depicted as a Battery who's voltage is applied in opposition to the external supply.

This reverse voltage is generated by the machine as it rotates, and is presented as a normal function of the machine.

How Counter-EMF lowers Current

However, the counter-emf is in opposition to the applied voltage and limits the value of armature current that can flow. If the counter-emf is 220 volts, then the effective voltage acting on the armature is the difference between the terminal voltage and the counter-emf: 230 - 220 = 10 volts.

The armature current is then only 10 amps: $I_a = \frac{E_t - E_c}{R_a} = \frac{10}{1} = 10$ amps.



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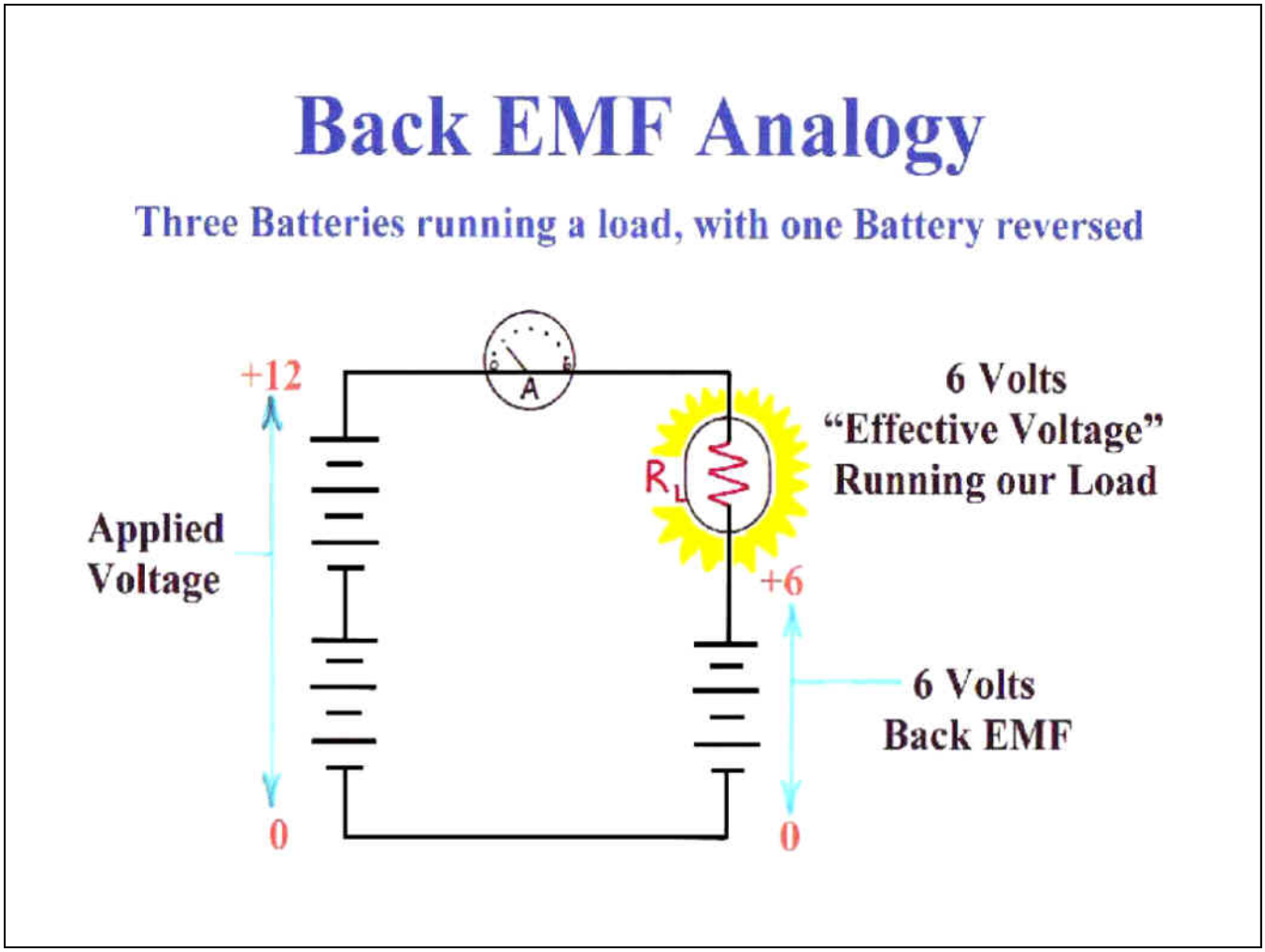
In this slide, which I also showed you previously, we can clearly see that the Back EMF is the primary function of the motor that limits the flow of current.

The implication here is that the Back EMF is nothing more than a mathematical abstraction used to calculate the effective voltage, which in turn allows us to calculate the current flow value in relation to Ohm's Law.

From the way the book teaches it, the Back EMF has no other characteristics worth mentioning.

In other words, the Back EMF is not involved in the calculations of the efficiency of the motor, and since it is only a voltage, it is not involved in any real power dissipation. The question is, are these assumptions true?



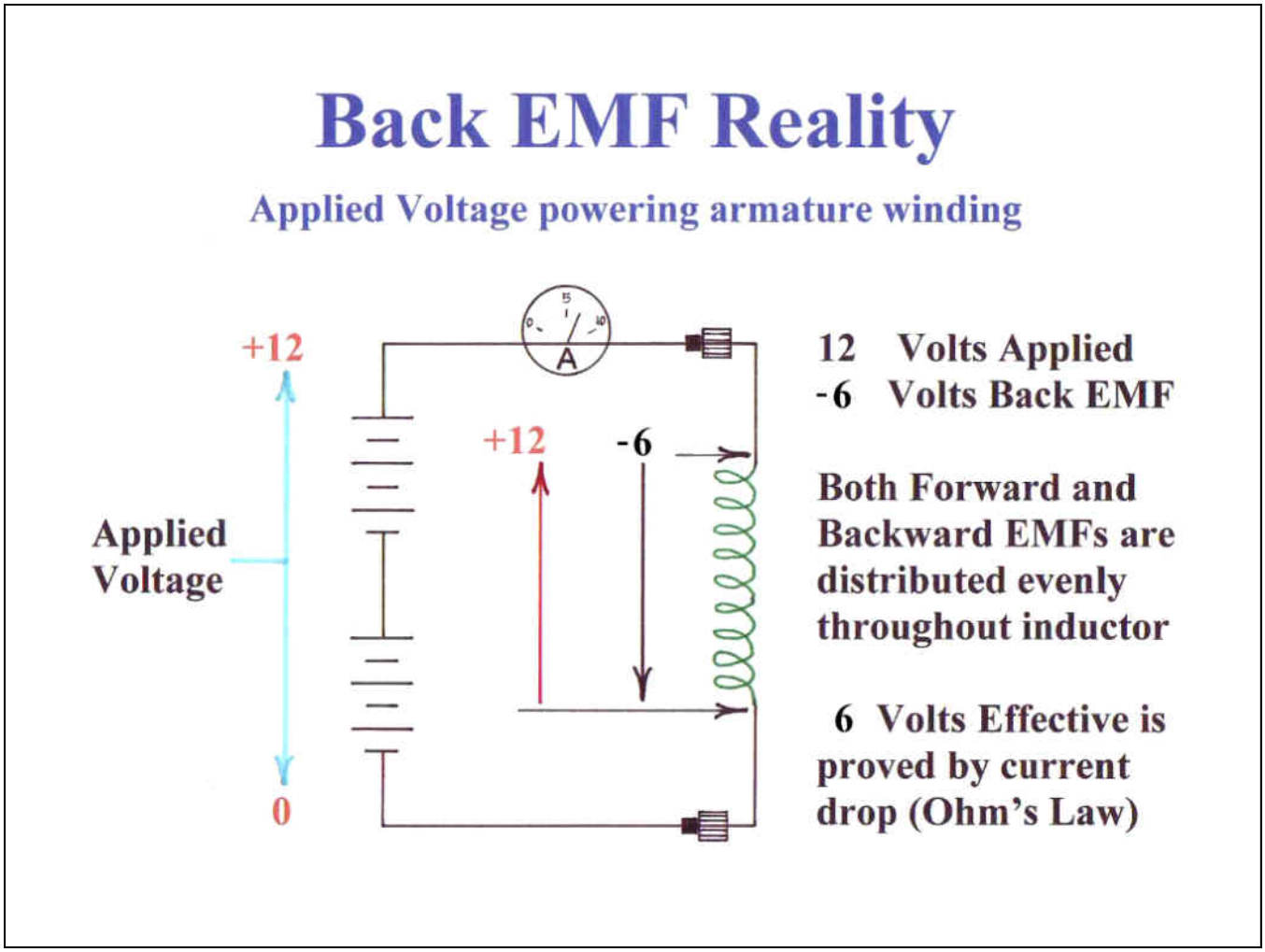
Let's look at a real circuit put together like the Back EMF example and see what actually occurs.

Here we have a 12 volt power supply on the left that will act as our Applied Voltage, and we have another 6 volt battery on the right that will act as our Back EMF. We also have a load resistor R-sub-L symbolized as a little light bulb and a current meter.

If the resistance of R-sub-L is ONE OHM, and the Back EMF is 6 volts, then we can calculate the current flow in the circuit at 6 amps, according to Ohm's Law.

With that calculation made, we can see that with an Applied Voltage of 12 volts and a current flow of 6 amps, 36 watts will be dissipated at the light bulb and another 36 watts will be dissipated charging the 6 volt battery, for a total of 72 watts dissipated from the supply.

So, this is the first indication that the Back EMF may not be merely a mathematical abstraction, or "just a voltage", but may represent a location in the circuit where real power is dissipated or stored.



This is the same example again, but this time I have drawn it more like the motor structure.

If we assume that the total resistance from brush to brush, through the armature winding here, is ONE OHM, and the speed of the motor is sufficient to produce 6 volts of Back EMF, then we can see that the system will draw 6 amps of current, like our previous example.

But now we have a problem. We can see that the external power supply is providing 12 volts at 6 amps, or 72 watts, but the dissipation of power in the motor winding can only account for 36 watts, measured as the effective voltage times the current.

The question has to be asked, what happened to the other 36 watts? We are told that the "effective voltage" is just a mathematical abstraction, and to ignore it. The problem is, that the machine behaves as if these conditions are very real. So this is the first anomaly we encounter.

We know we must apply 72 watts to run the motor, but it is vitally important to understand if it only takes 36 watts to produce the motor torques, while the other 36 watts simply disappears into the machine and produces no other beneficial effects.

Kirchhoff's Second Law

"The sum of the voltage drop's around any closed circuit must equal the sum of the applied voltages."

Applied Voltage – Back EMF = Effective Voltage
(No formula is actually given for this statement)

$$E_a - E_c = E_e$$

Applied Voltage = Back EMF + Armature Current times the Armature Resistance

$$E_a = E_c + I_a R_a$$

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So let's review Kirchhoff's Second Law again.

(READ first part of SLIDE)

If we follow the formula given in the book, then the Applied Voltage minus the Back EMF equals the Effective Voltage. What is interesting is that the book describes this in words, but never actually introduces the mathematical term for the Effective Voltage..... E-sub-e, here shown in blue.

In the Second Equation, we know from Ohm's Law that E=IR, so the IR symbol is in fact the Effective Voltage.

The question is: Why does the book refuse to introduce a symbol for the Effective Voltage in the equations?

Now I'm no math wiz, but I can do Arithmetic and simple Algebra. So what's the problem here?

Kirchhoff's Second Law Simplified

Voltage Rise #1 = Voltage Drop #1 + Voltage Drop #2

$$E_a = E_c + I_a R_a$$

Applied Voltage = Back EMF + Effective Voltage

Voltage Rise #1 = (-Voltage Drop #1) + Voltage Drop #2

Voltage Rise #1 = Voltage Rise #2 + Voltage Drop #2

So, let's simplify this a little.....

If we just think of the Source Voltage as a place were the Voltage Rises and the Load as a place where the Voltage Drops, we might be able to understand this. Maybe.

For Kirchhoff's Second Law to remain true, then the Applied Voltage must equal the Back EMF plus the Effective Voltage, as stated.

The problem is, in the actual machine, the Back EMF is NOT a place were the Voltage Drops, but a place where the Voltage Rises to Counter the Applied Voltage.

So, if we subtract a Yellow M&M from both sides of the equation, we get this.....

Kirchhoff's Second Law Simplified

Voltage Rise from the external supply - Voltage Rise from the internally generated Voltage = Voltage Drop across the armature

$$E_a - E_c = E_e$$

Applied Voltage - Back EMF = Effective Voltage

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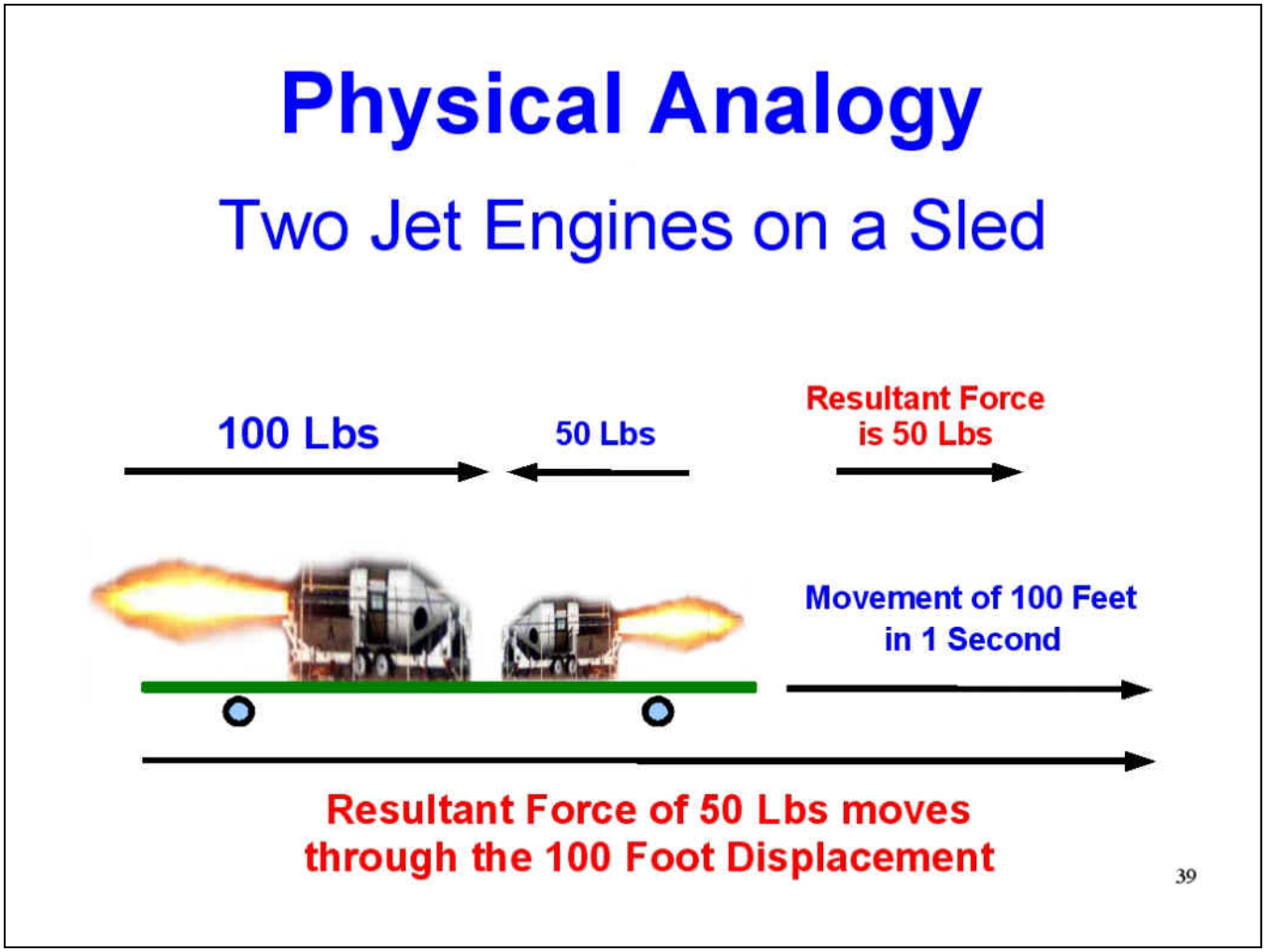
So, Kirchhoff's Second Law is correct, it's just that the Back EMF is a Voltage Rise originating on the opposite side of the equation from the Applied Voltage.

From our previous analogy with the battery and the light bulb, we saw evidence that the Back EMF acted as a location in the circuit where a portion of our Applied Power was Dissipated and therefore, it was not available to light the light bulb, or in our real case, produce mechanical energy in the motor.

I believe this hypothesis is also supported by the equations we have just reviewed.



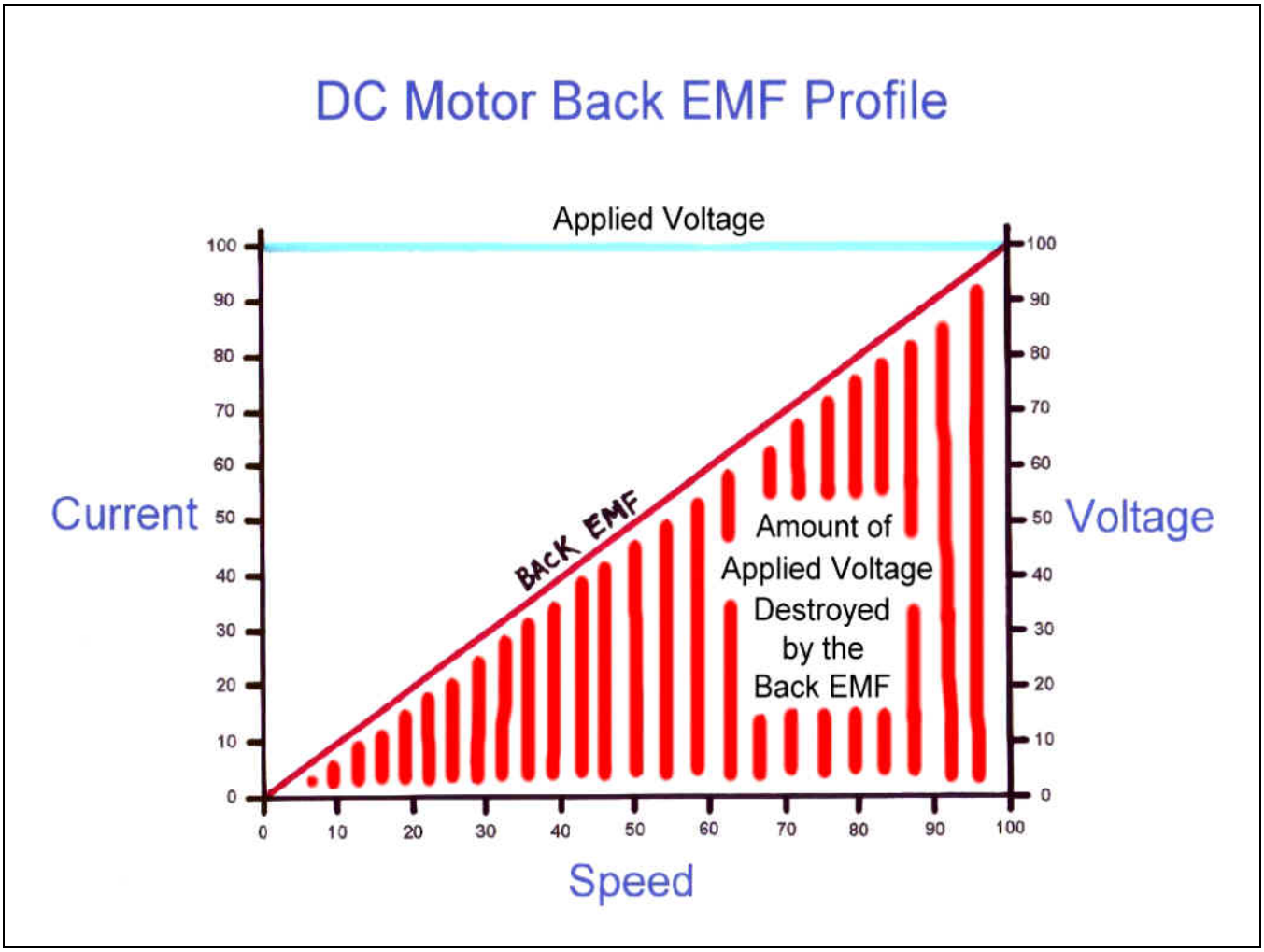
So let's look at one more Physical Analogy to try to sort this out, once and for all.

(READ SLIDE)

So, if the 100 LB thrust jet represents our Externally Applied Voltage, and the 50 LB thrust jet represents our Internally generated Back EMF, then the Resultant Force represents our Effective Voltage.

Now we can see that to move the sled 100 Feet forward our big jet has to supply 10,000 ft-lbs of work to accomplish 5,000 ft-lbs of results because our little jet has negated the other 5,000 ft-lbs of work right on the sled.

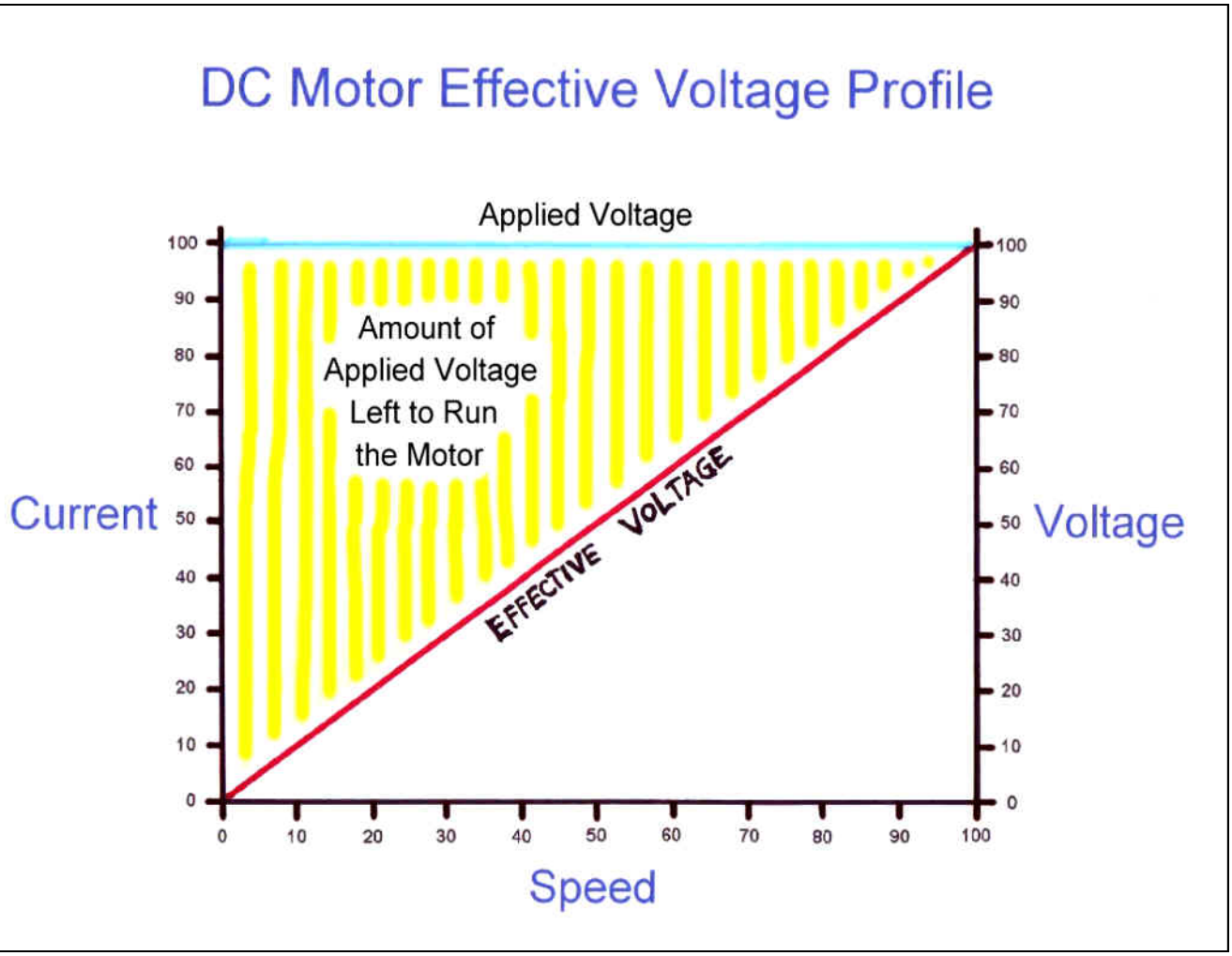
Apparently, this analogy also supports our hypothesis and suggests that ½ of the power supplied to the motor produces all of the mechanical effects and the other ½ of the power is negated by the Back EMF.



So, just to review, here is a diagram of the Back EMF profile of one of our Permanent Magnet Field DC Motors.

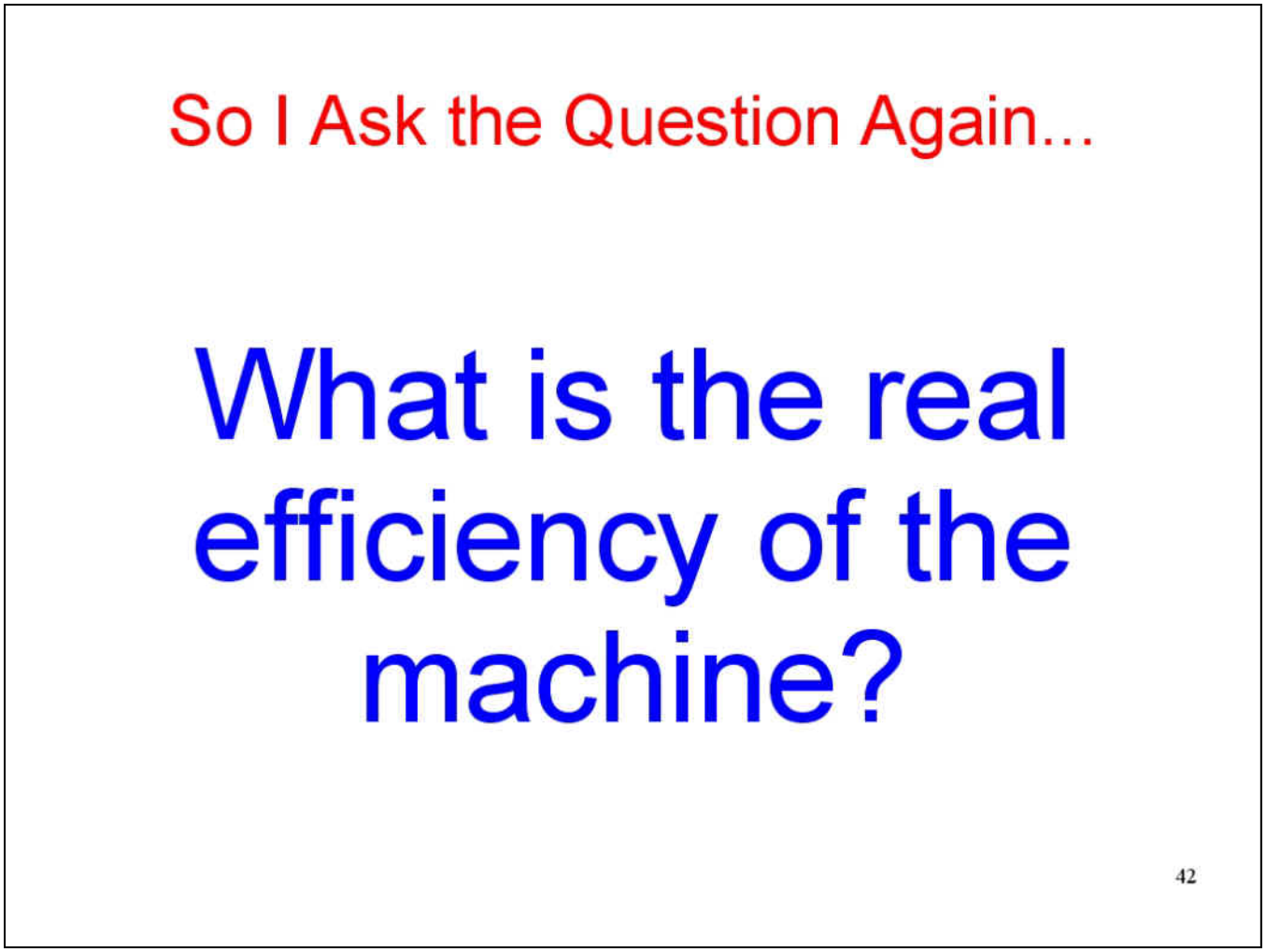
As we have seen before, for any given Applied Voltage, the Back EMF rises as the speed increases. The Back EMF is the least at start-up and maximum at the full, unloaded speed.

Maximum power is produced when the speed and the current draw are at 50% values, and this is also where the Back EMF is approximately 50% of the Applied Voltage.



Conversely, this is the diagram that depicts the Effective Voltage Profile. It is what is left when the Back EMF is subtracted from the Applied Voltage.

So, we can see that Kirchhoff's Second Law is correct, at any speed a vertical line may be drawn down from the Applied Voltage value, and we can see how much of the energy is available to run the motor and how much of the energy is dissipated by the Back EMF.


So I Ask the Question Again...
What is the real efficiency of the machine?
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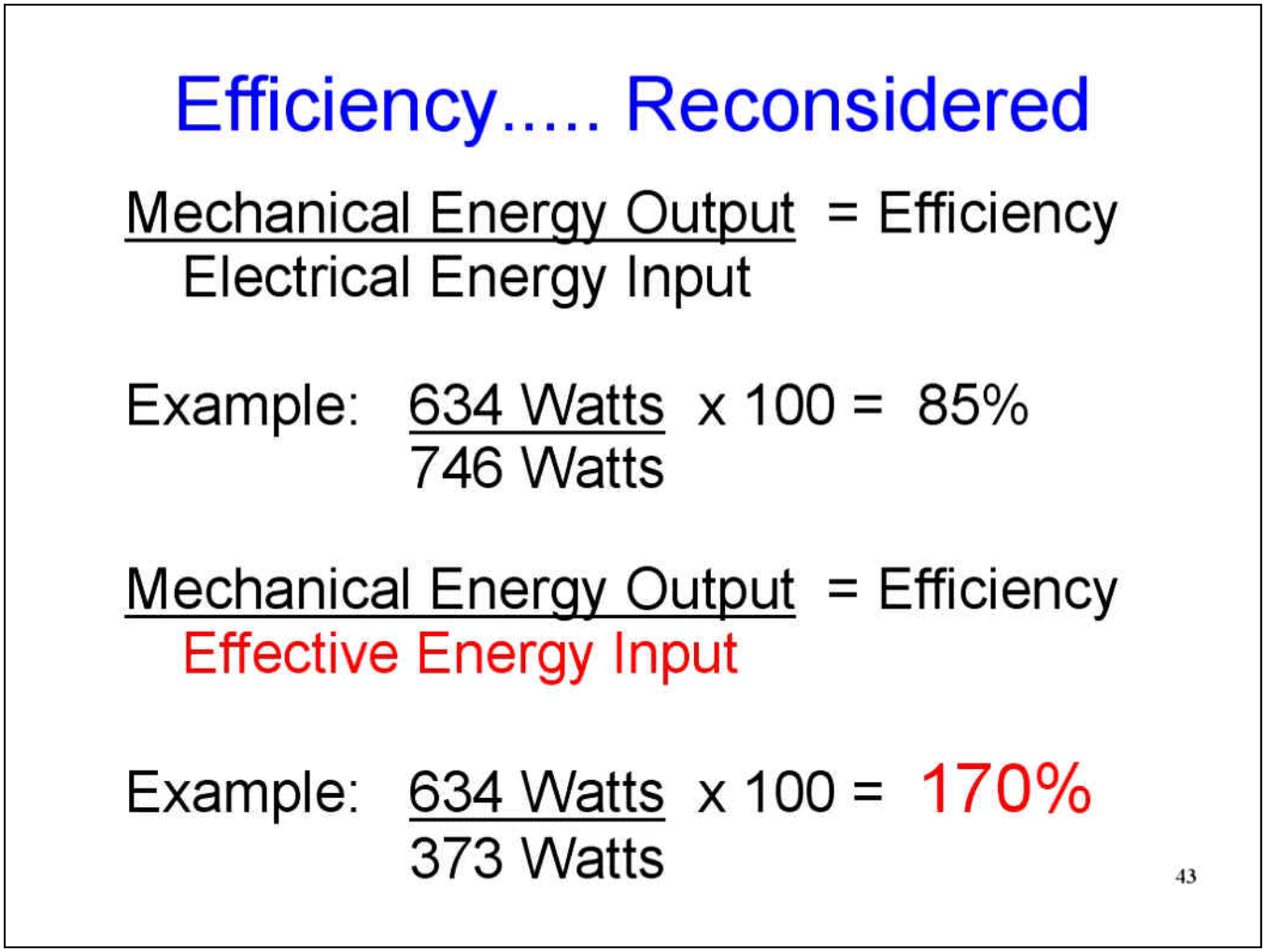

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At this point, we know we can't operate the machine to get this kind of performance out of it, but it is important to understand the possibility that the machine has always behaved this way, and that the Back EMF has always been the largest LOSS MECHANISM in the machine, and that it is the actual function of the Back EMF that masks this energy economy.

If this is all true, there must be other evidence of it to consider, and there is.....

Summary of Motor Operations

If all real loss mechanisms are ignored for the moment, the Motor appears to be 200% efficient.
That is, if electricity is applied to the motor, it produces both mechanical force and electricity in inverse amounts.
The over-all economy of the machine is:
ONE IN = TWO OUT
in varying proportions.

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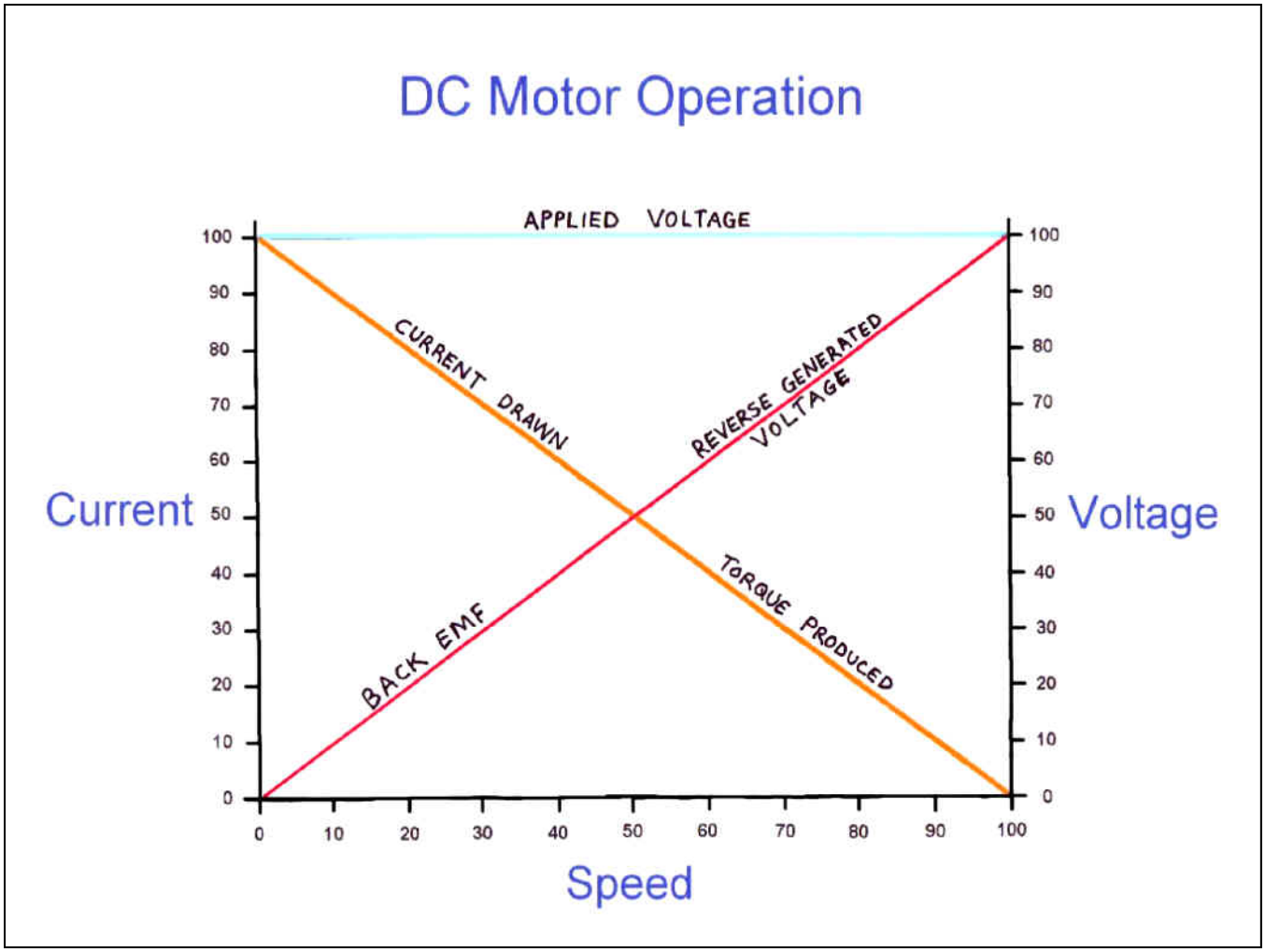

That is the real meaning if this graph.

The machine is always a motor and always a generator, regardless of which of these functions may be defined as our preferred output at any given moment.

When the machine is run in the middle of its operational window, the motor function maximizes it's mechanical energy production when the generator function is only negating 50% of the applied electrical input power.

But even this analysis leads to the erroneous conclusion that the machine is converting electrical energy into mechanical energy at some known rate.

Summary of Generator Operations

The Generator efficiency example is easier to understand.

A Mechanical Input produces both a Positive Electrical Output and a Negative Mechanical Output

Again, One In = Two Out

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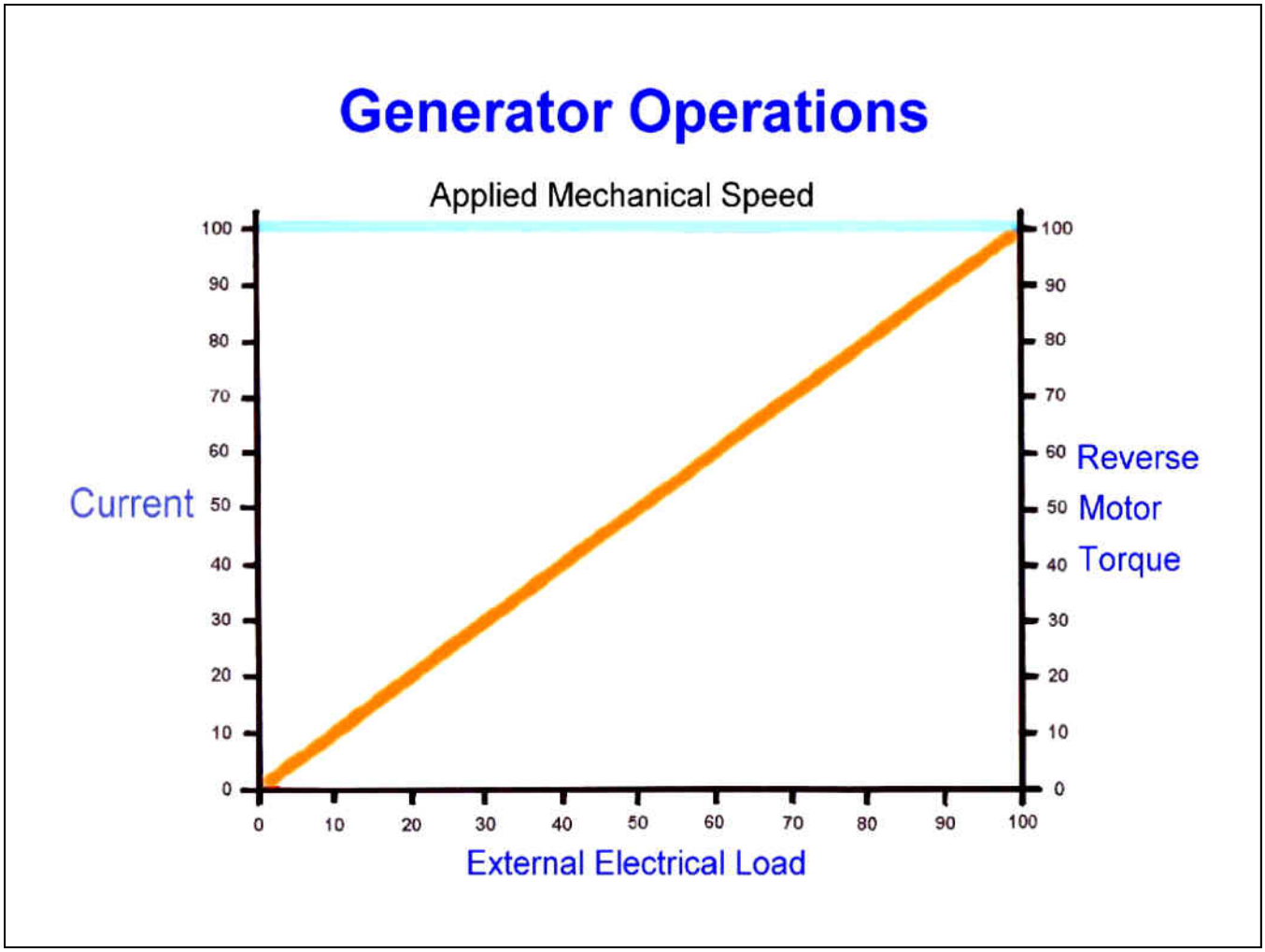

Here is a graph showing the Generator Operations. At any given applied mechanical speed, the production of current to power external loads is in direct proportion to the activation of the reverse motor torque which makes the generator harder to turn.

Summary of Generator Operations

In the generator example, it is easier to see, because the reverse torque on the shaft (activation of the Motor Function) demonstrates that mechanical energy is being produced in the machine in addition to the electrical energy output running the external load.

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Real Machine Operations

So, the efficiency of the machine is always 200% efficient, minus the real losses.

The operator puts one amount of energy into the machine, either electricity or mechanical energy, and the machine produces two outputs, one electrical and one mechanical, and both of these outputs are of proportional magnitude.
In the generator mode they are directly proportional, and in the motor mode the are inversely proportional.

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How is This Possible?

The machine produces motor operations when the magnetic field of the stator pushes against the magnetic field of the rotor.

Magnetic fields can be measured in either Gauss or in “ampere-turns”.

In other words, torque in the machine is produced ONLY by the movement of currents, irrespective of potentials.

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Where the Law is Broken!

We were all taught that the machine CONVERTS electrical energy into mechanical energy, and that this mechanical energy production can only happen in a circuit location where current is moving through a “voltage drop”.

This is apparently not true!!

The tell-tale behavior is most easily seen when the machine is operated as a generator. When a current flow is established through an external load, it still energizes the reverse torque production inside the generator in the windings where the voltage is rising!

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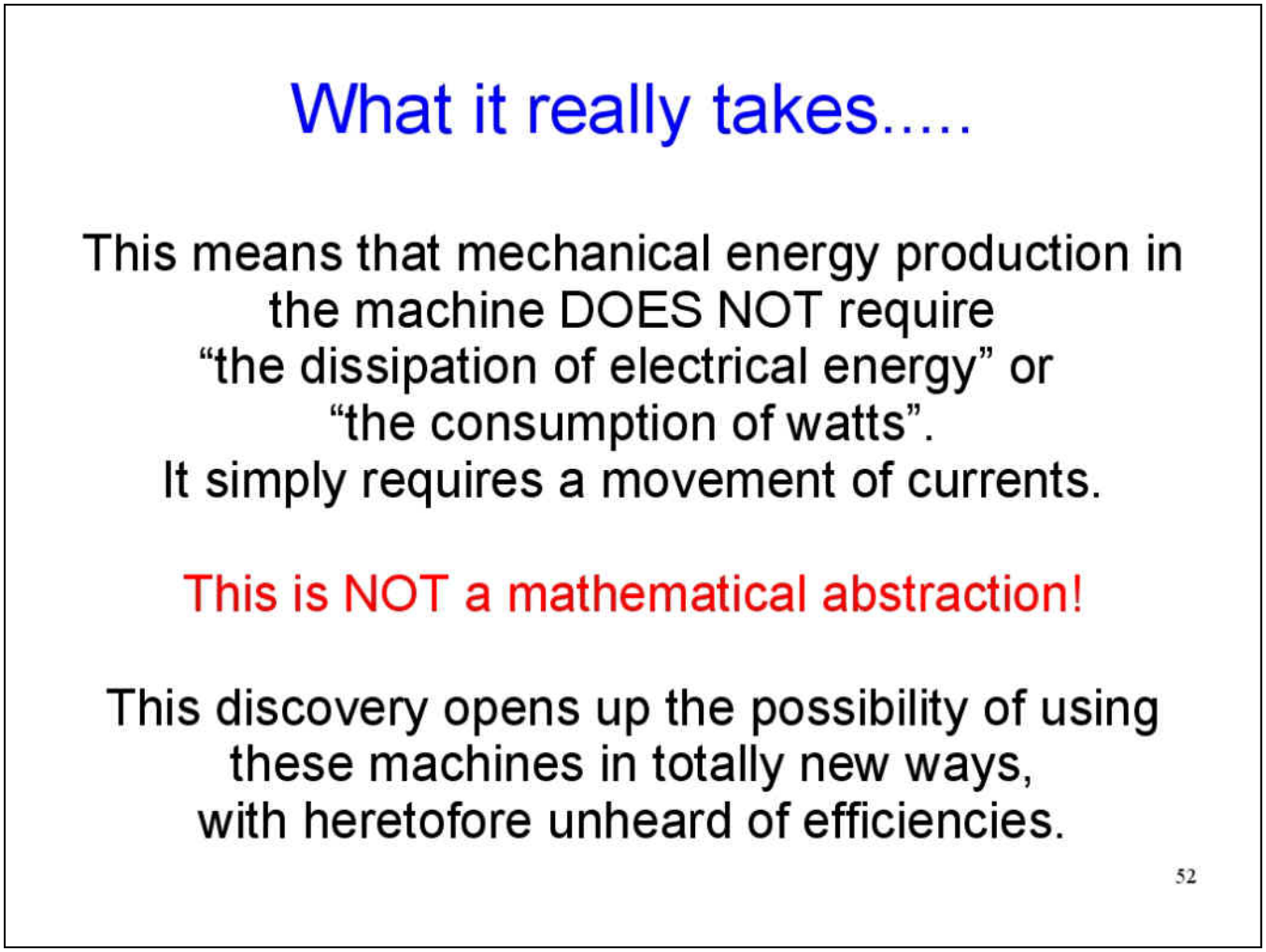
This clearly establishes the 2 for 1 benefit of the machine. The flow of current can not only power external loads, like light bulbs and heaters, but it also activates the reverse Motoring Functions of the generator and produces mechanical energy directed against the driving force.



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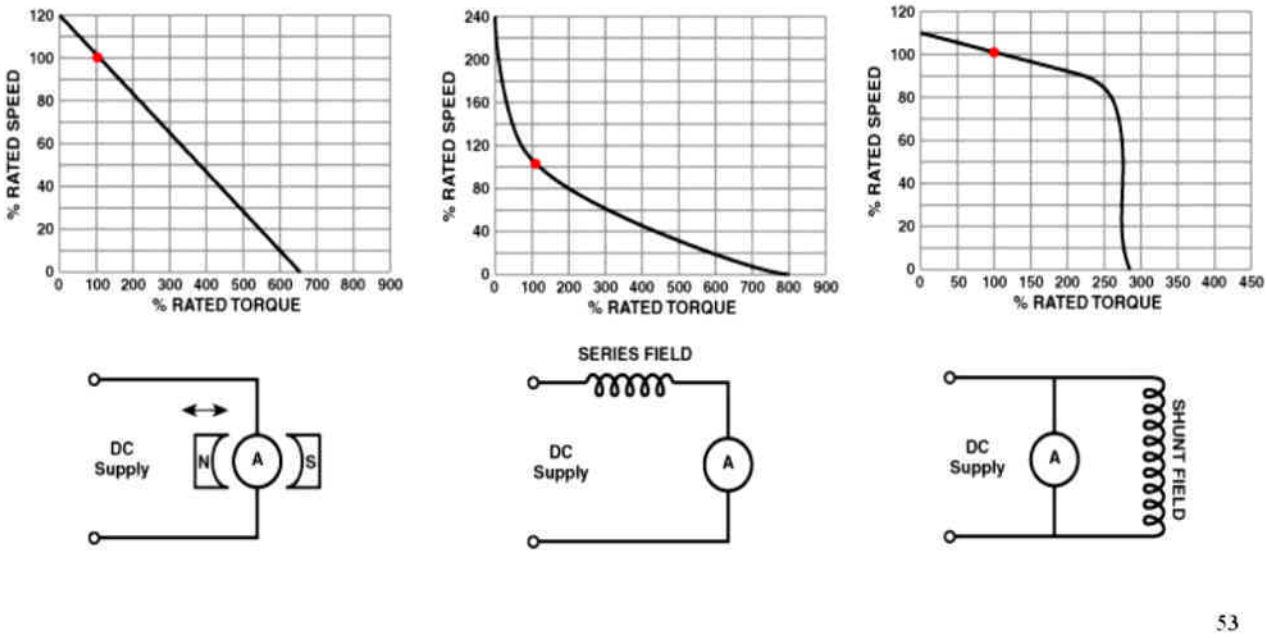
This is why regenerative electric motors can produce mechanical energy AND recover most of their electrical energy inputs.

John Bedini has been showing motors like this for years, but Ed Gray and Bob Teal were showing motors that behaved this way as early as the 1970's.

Torque Charts for DC Motors

Charts from Motor Manufacturer, Baldor Electric Company



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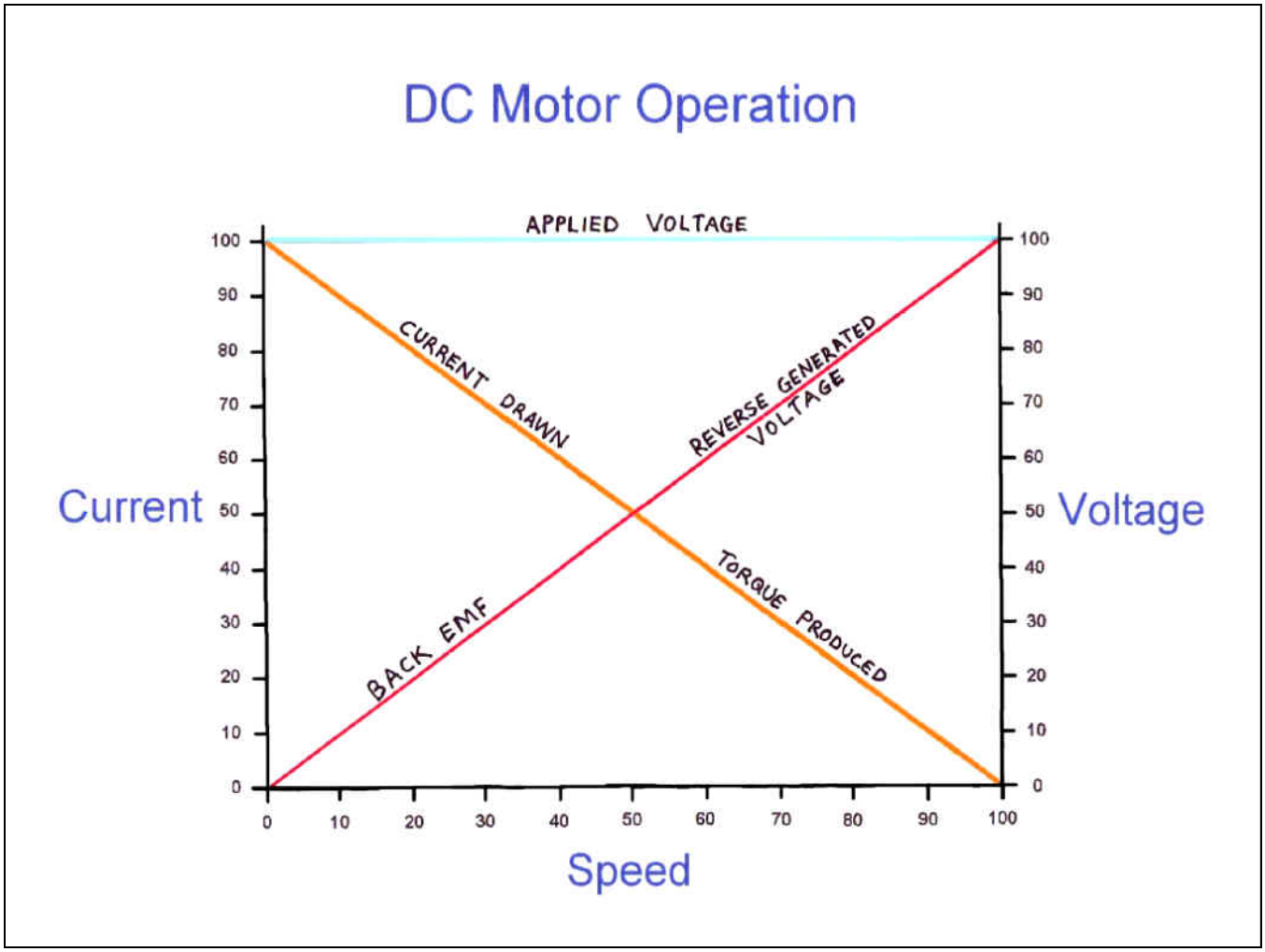
Here, finally, is my last piece of evidence for your consideration. These are the standard, published Torque Charts for three styles of DC motors, published by Baldor Electric Company.

The RED DOTS are the points where the graphs cross at the 100% rated speed and torque, which represent the peak of the power bell curve.

Now notice the torque values as the motors slow down. At start-up the Permanent Magnet field motor produces 650% of its rated torque. The Series field motor produces 800% of its rated torque. And even the Shunt field motor produces 275% of its "maximum" rated torque.

So, the books say the motors produce significantly higher torques as the Back EMF drops!



So, here is our boring little drawing again, and now we can see what it really means. The machine is always both a motor and a generator.

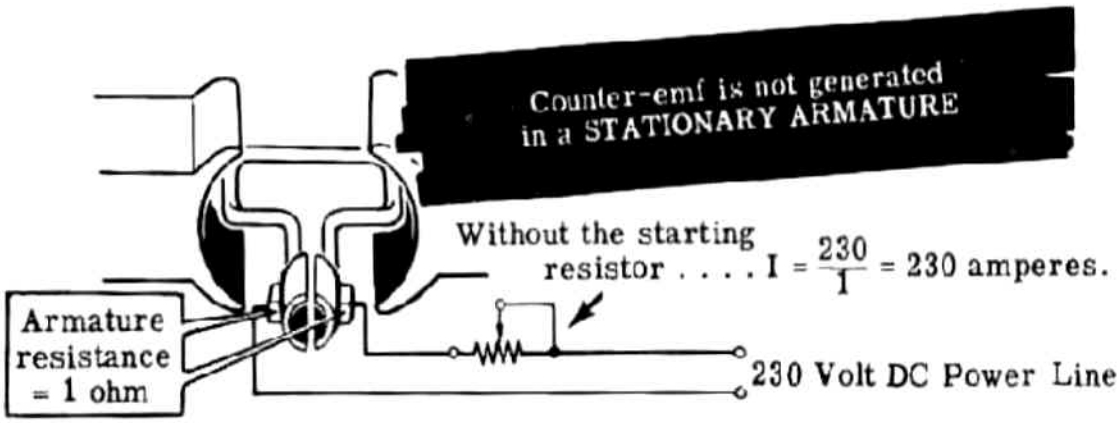
The Orange Line represents the Motor Functions of the machine and the Red Line represents the Generator Functions of the machine. The Motor functions follow the current while the Generator functions follow the speed.

Remarkably, we are always told to avoid operating the machine where the motor functions predominate, and run it as a motor where the generator functions predominate. It's no wonder that they behave poorly!

So now we can see where we want to run this machine as a motor, over here, on the left side of the graph where the Back EMF is low.

Counter-EMF at "Start-up"

When the motor is just starting and the counter-emf is too small to limit the current effectively, a temporary resistance called the "starting resistance" must be put in series with the armature, to keep the current flow within safe limits. As the motor speeds up, the counter-emf increases and the resistance can be gradually reduced, allowing a further increase in speed and counter-emf. At normal speed, the starting resistance is completely shorted out of the circuit.



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So here is the book again telling us to keep the currents low when the Back EMF is low. They recommend using a Resistor to perform this function.

The more interesting question is; how can we run the motor in this "low Back EMF zone" safely at high speed?

The answer is simple: we discharge a high voltage capacitor into the motor periodically, such as, once per revolution and we store the momentum with a flywheel.

Tesla's Method of Conversion

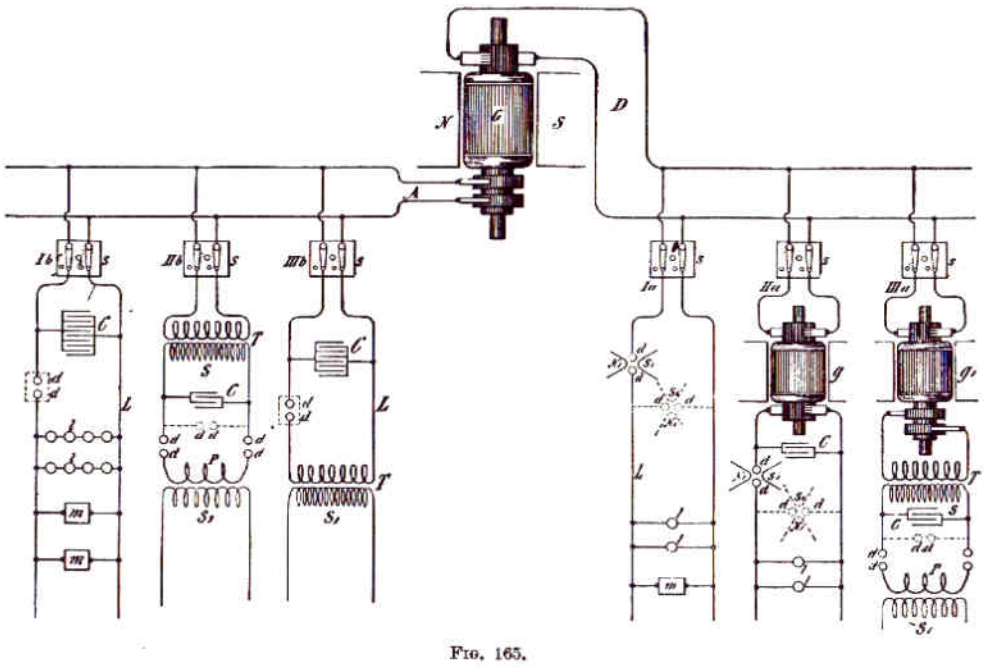

FIG. 165.

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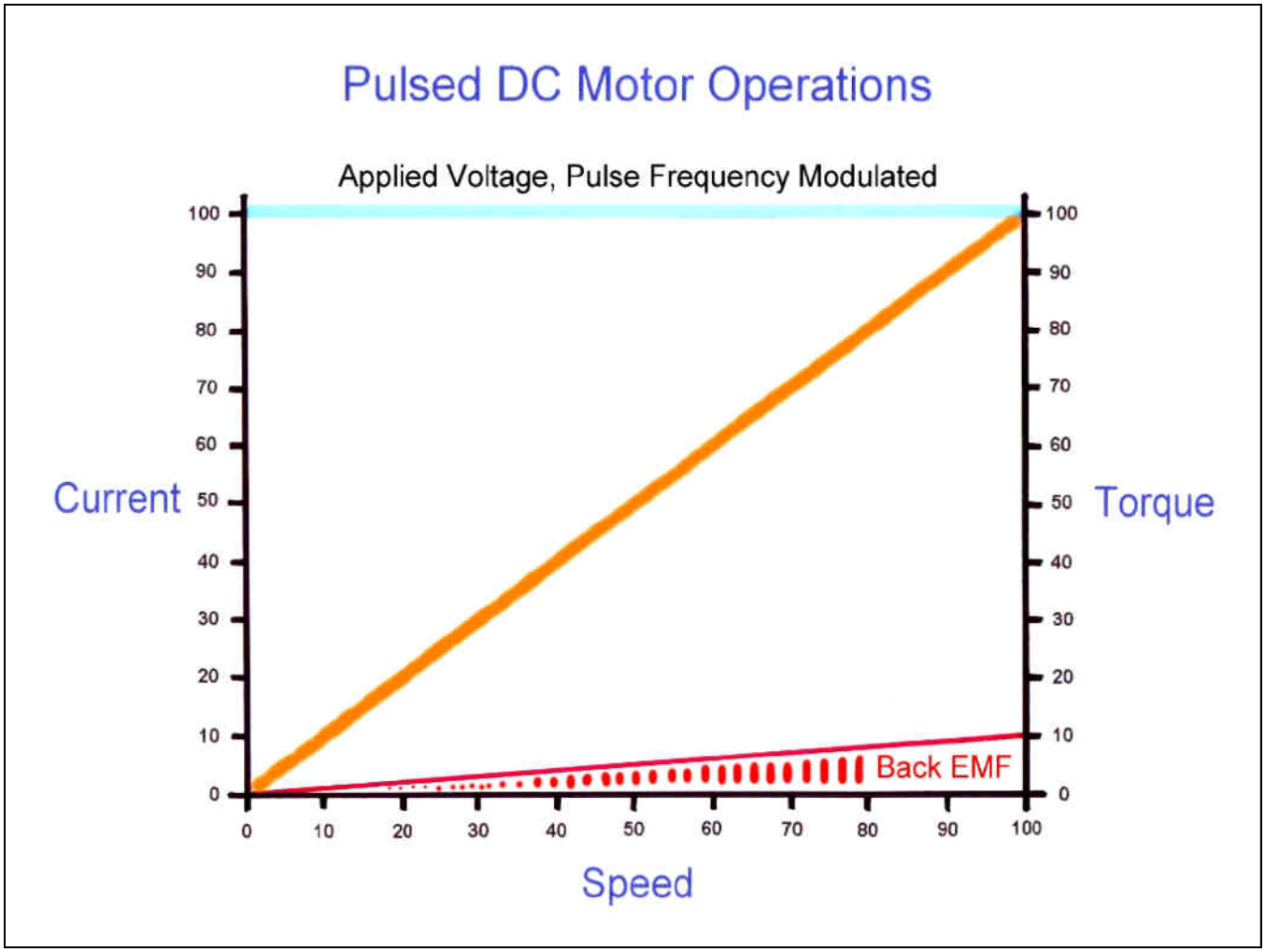
Not surprisingly, this process was developed by none other than Nikola Tesla and is the one of the many applications of his “Method of Conversion”.

We can see the process in example #1 where the generator charges a capacitor, which is then discharged through a circuit controller and into a motor (little box with an "M" in it).



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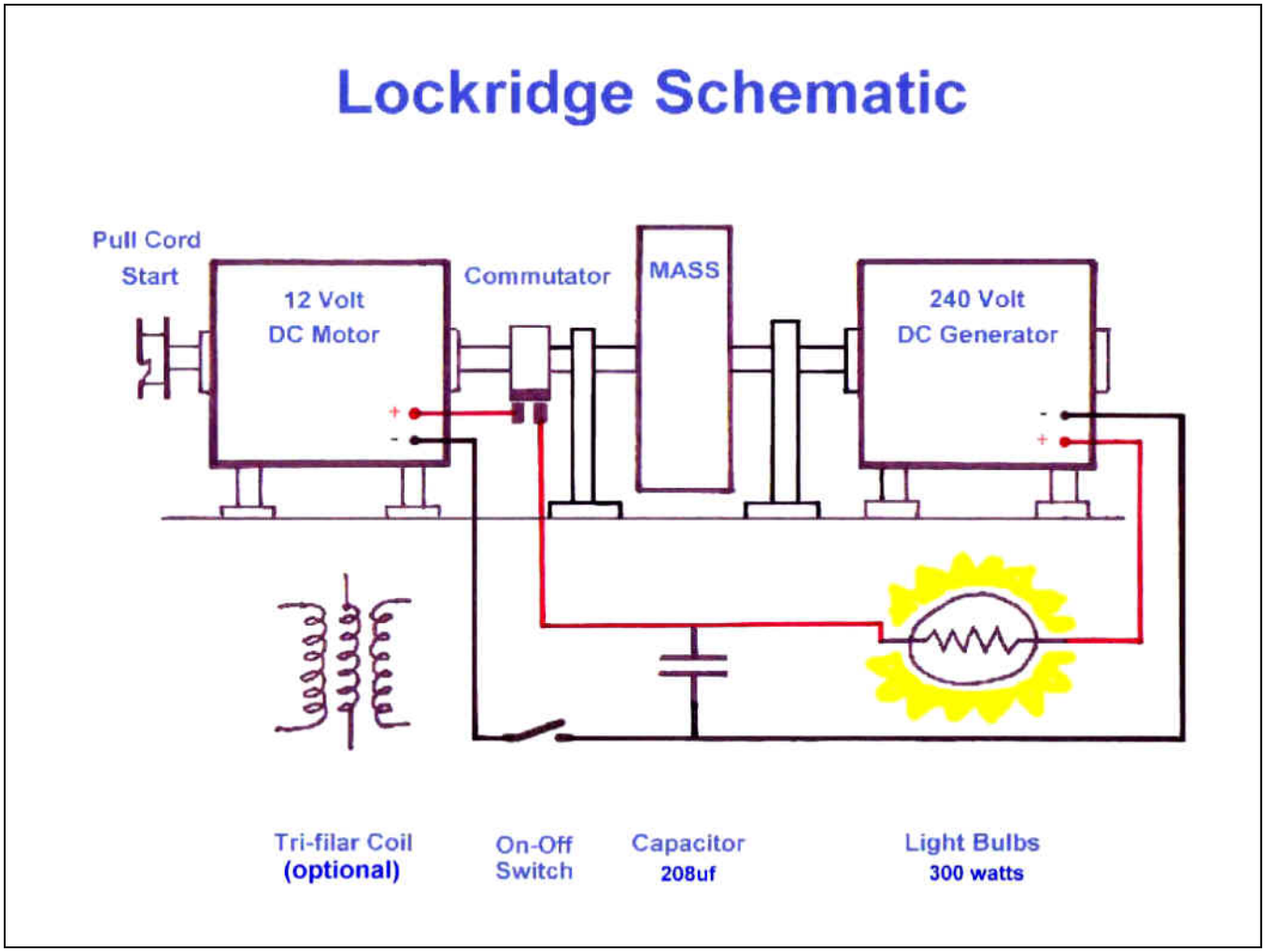
In a motor designed to run on one capacitor discharge per revolution, the average current consumption goes up with speed, as does the torque production.

As long as the capacitor is charged to a voltage that exceeds the back EMF by at least a factor of 10, you will always be able to put 90% of your applied currents through the machine to produce torque.

The faster the motor turns, the more power it produces. Finally, we see a way to operate the machine that allows the motor functions to be fully expressed without the generator functions getting in the way.



Now that we understand the theory of why an ordinary electric motor may be able to produce excess mechanical energy, we can get back to the Lockridge Device. Here is my proposed circuit.

(READ SLIDE)

All of these conditions can be met by operating a motor, designed for low voltage – high current operations, on high voltage capacitor discharges at one discharge per revolution.

The currents are high, but limited in duration, so the machine will not overheat while producing high torque pulses. The input voltage is always 10 to 20 times higher than the Back EMF, so the output is biased toward mechanical energy production and away from internal, electrical energy losses.

Motor Operations:

Issues:

1) Armature must be low impedance, capable of passing hundreds of amperes.
2) Field winding must be high impedance, in order not to dissipate too much current.
3) Capacitor Discharges should not over-saturate core material with magnetic flux.

Options:

1) Primary candidate for this motor is a DC Shunt motor, like an automotive starter from the 1960s.
2) Field Windings can be re-wound for higher voltage operation, or fitted with a series resistor.
3) Solenoid and engine engaging mechanism would need to be removed.

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Automotive Starter for a 1965 Chevy 283

O'Reilly's Auto Parts, Part Number: 03-0236X

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This replacement starter motor costs $40.00 at O'Reilly's Auto Parts Stores.

Automotive Starter: Interior View
Low Impedance Rotor
Wound Stator Coils
1960's Vintage

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This is the construction of such a motor. Notice the very large wire in the armature, the large commutator section, and wound field coils.

Commutator Operations:

Issues:

1) The function of commutator is to run the motor on one capacitor discharge per revolution.
2) The commutator must be protected from unnecessary wear and from arcing during capacitor discharges.

Options:

1) External Commutator can be fitted with two brushes and a single contact point on the wheel.
2) Internal Commutator inside the motor can be modified to perform this function.
3) Creative options include disconnecting all but two windings on the armature and triggering the capacitor discharge with an SCR after the brushes are safely engaged.

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Generator Operations:

Issues:

1) Since there is no battery in the system, the Generator must be able to produce electricity just from rotation, to charge the capacitor.
2) Upon discharge of the capacitor, the extremely high back-emf of the Generator must be "reduced" to manageable levels.

Options:

1) The self-starting function of the generator suggests the presence of a Permanent Magnet Field, or a partially magnetized core material and a "self-excited" field winding.
2) The current limitation necessary to reduce the the breaking effect of charging the capacitor can be supplied by a resistor or an inductor.

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½ HP 180 Volt DC Generator 2500 RPM

General Electric Model 5BPA56KAG10B, permanent magnet motor

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If this machine is spun faster than the 2500 RPM rating, it will produce higher than rated voltages.

Capacitor Operations:

Issues:

1) The Capacitor is the primary device that stores the energy from the generator and supplies it to the motor.
2) While the Original Lockridge Device capacitor was hand wound around the generator, this feature is not required for the system to operate.
3) The Capacitor is the total "load" for the Generator, so it must be rated above the maximum voltage the generator will produce.

Options:

1) Capacitor should be placed close to the motor and the commutator elements, and connected with wire capable of carrying high currents.
2) The Capacitor must be capable of rapid discharge, similar to a "photo-flash" type.

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Capacitor Calculations:

Assumptions:

1) Machine will turn at 3000 RPM
2) Generator will produce 240 Volts DC at speed
3) Light Bulbs need 300 Watts

Conclusions:

3000 RPM = 50 RPS
Capacitor discharges once per revolution or,
in this case, 50 times per second
300 Watts = 300 Joules per Second
300/50 = 6
Each Capacitor Discharge must deliver 6 Joules

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Capacitor Calculations Continued:

Formula for Energy Stored in a Capacitor: $E = \frac{1}{2} CV^2$

Energy (in Joules) = one half Capacitance (in Farads) times Voltage squared

$6 = \frac{1}{2} C \times 240^2$ $12 = C \times 57{,}600$ $C = \frac{12}{57{,}600}$

C = 0.0002083 Farads

C = 208 Micro-Farads

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So, this is an example of how to determine the capacitor values.

Example of Capacitor, Mallory 225 uf, 250 vdc Capacitor is 1" in diameter, and 3" long

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Light Bulb Operations:

Issues:

1) The "light bulbs" serve the function of limiting the initial current surge from the generator immediately after the capacitor discharges.
2) They run on a "saw-tooth" wave whose true RMS voltage should not exceed their rated maximum.

Options:

1) Filament style light bulbs can be run directly in this position (CFLs probably won't work).
2) In the original Lockridge Device, the light bulbs probably ran from one of the "tri-filar windings" while one of the other windings was in the circuit between the generator and the capacitor.
3) A step-down transformer could be in this position to run a large quantity of LEDs.

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On-Off Switch Operations:

Issues:

1) On-Off Switch allows the unit to be turned OFF when it is running.
2) Placement of switch in the circuit can control other starting features, as well.
3) Starting the machine requires rotating the motor/generator while the switch is ON.

Options:

1) Placement of the switch before the capacitor prevents the capacitor from charging when OFF.
2) Placement of the switch after the capacitor prevents the capacitor from discharging when OFF.

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Tri-filar Coil Operations:

Issues:

1) The Tri-filar Coil functioned as an impedance matching component between the generator, motor and load.
2) In the Original Lockridge Device, it allowed the use of the Delco-Remy Generator, while making the least modifications possible.
3) It's construction was three strands of #21 wire, twisted together, and wrapped around the generator housing 230 times.

Options:

1) Choose components that are matched well, and ignore it.
2) Use it to match components you have.

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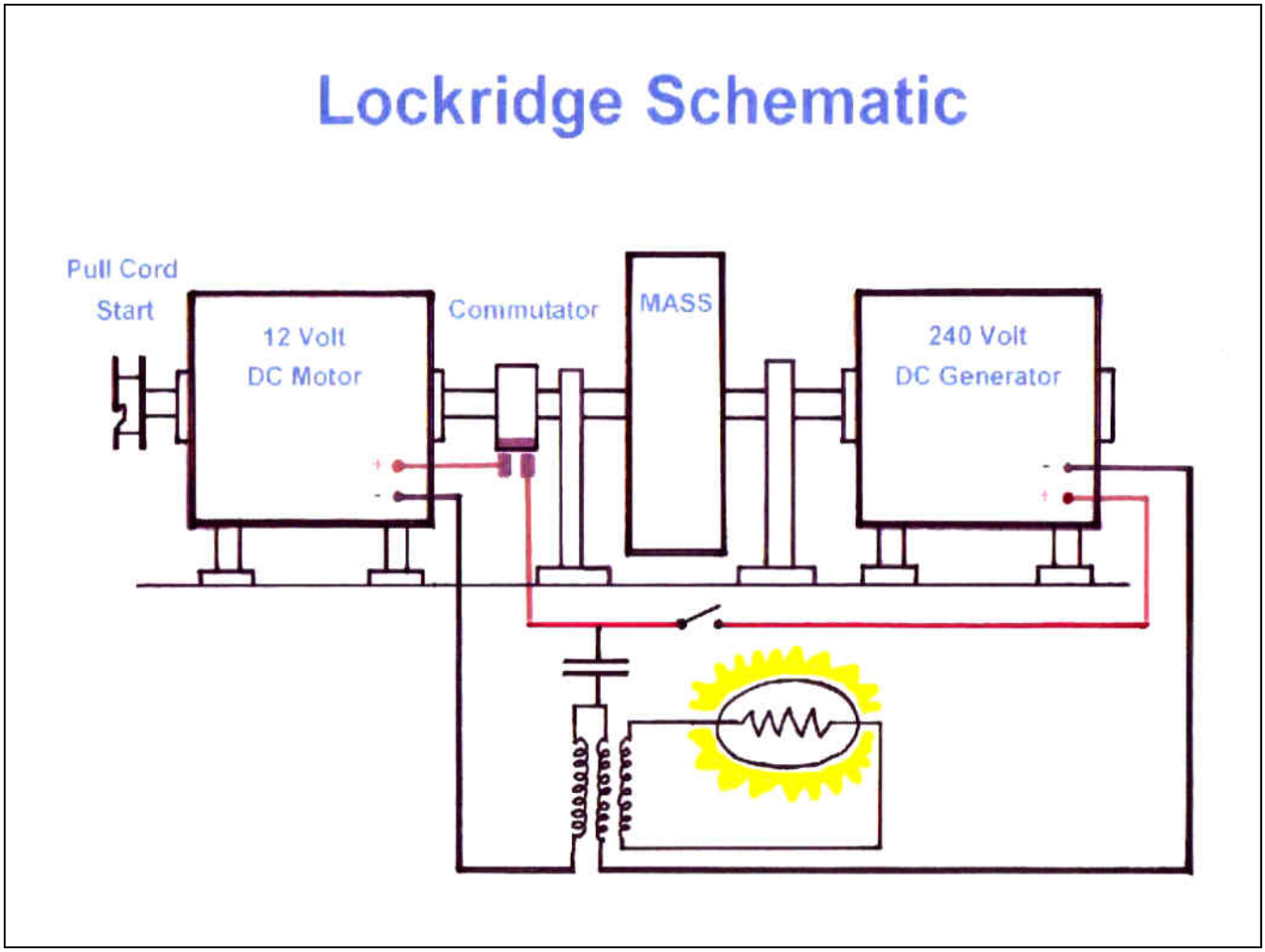
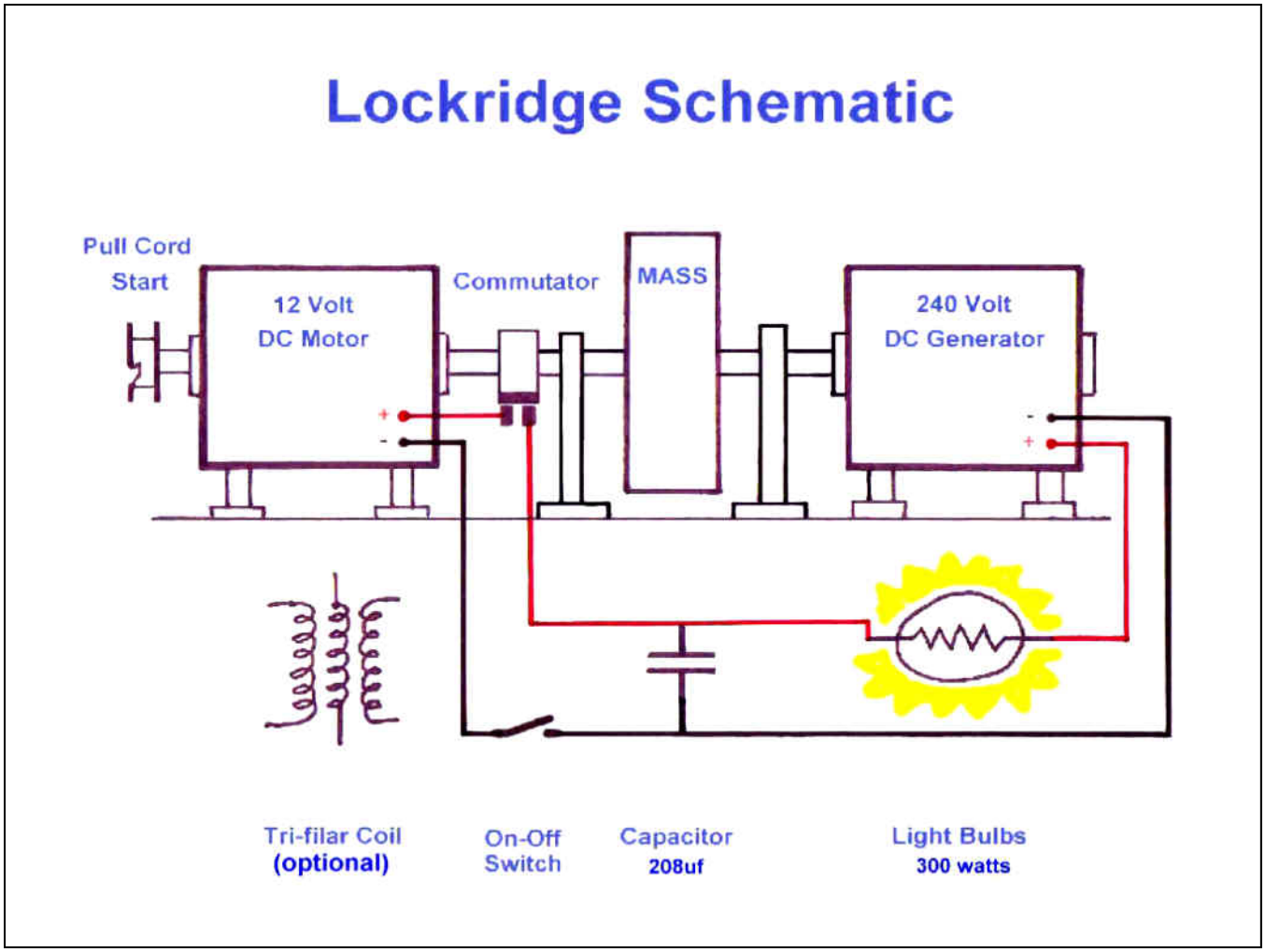
(READ SLIDE)



This is the most likely schematic for the Lockridge Device. Think of this more as a block diagram, showing the relationship of the component parts.



But I prefer this simplified version.

Now some of you may be saying ....this looks familiar..

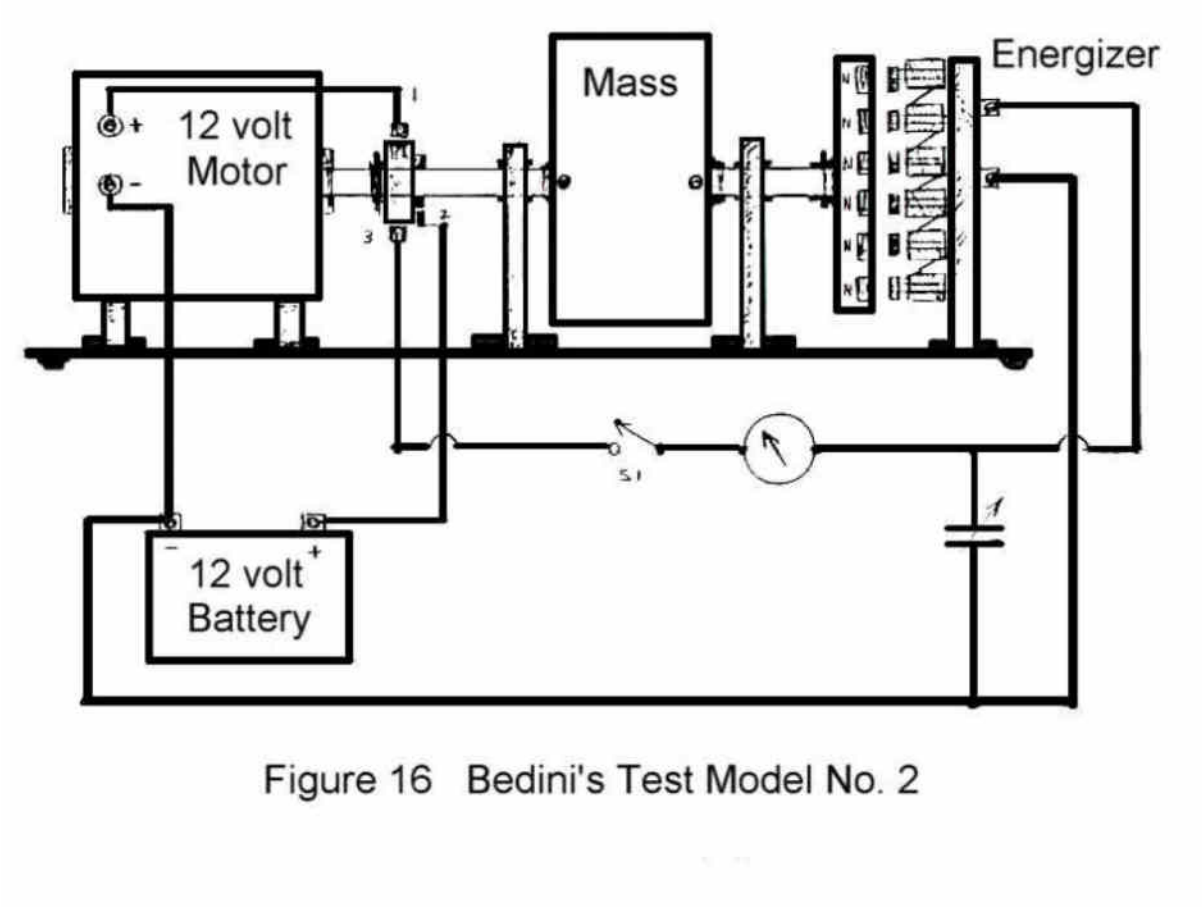


Figure 16 Bedini's Test Model No. 2

And it is!

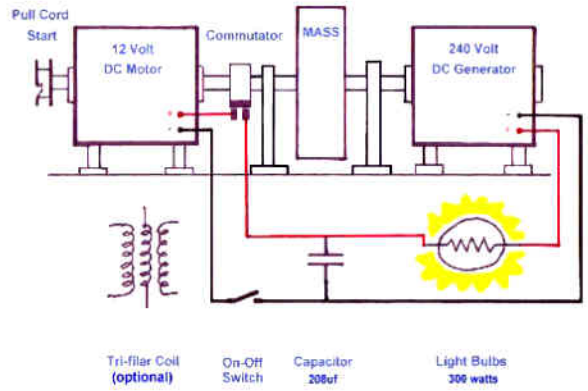
Here is the drawing from John Bedini's booklet, published in 1984, titled Free Energy Generator.

Here we see an electric motor, a flywheel, a magneto style generator, a capacitor, a battery and a special commutator.

The battery pulsed the motor once per revolution and the capacitor discharged into the battery once per revolution.

Comparison: Lockridge - Bedini

Lockridge Schematic



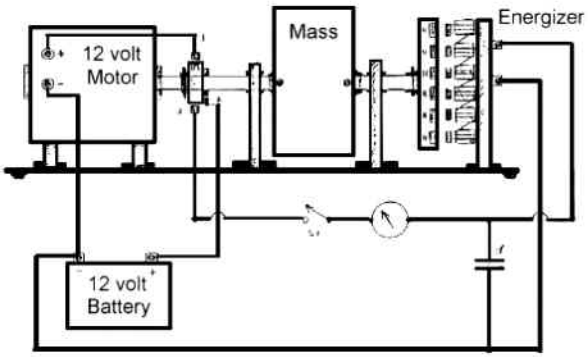


Figure 16 Bedini's Test Model No. 2

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As you can see, the machines are extremely similar.

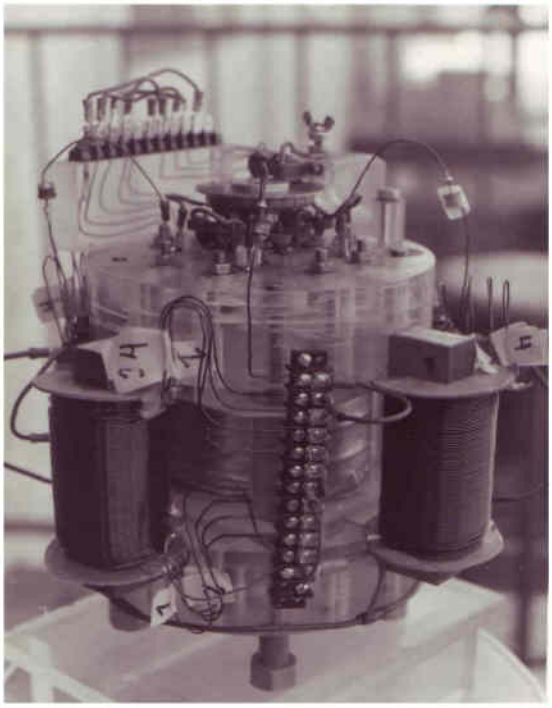
The Lockridge Machine used a torque enhanced motor driving an ordinary generator to run itself and light some light bulbs.

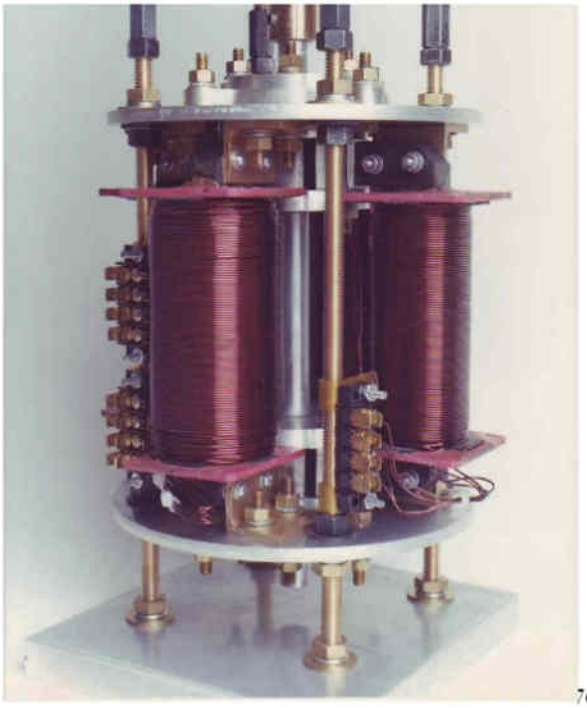
The Bedini Machine used an ordinary motor driving a drag reduced generator to run itself and produce excess charge in the battery.

For those of you who are finally catching on, there are obviously dozens of arrangements that work.

Any design that allows for a torque enhancement in the motor or a drag reduction in the generator, or both, will allow for a working combination.

Regenerative Attraction Motor and a Flux-Gate Generator (1983)





Here are two machines built in Santa Barbara, California in 1983. They were designed by me and built by Michael Knox, for our company Unifield Dynamics, Inc.

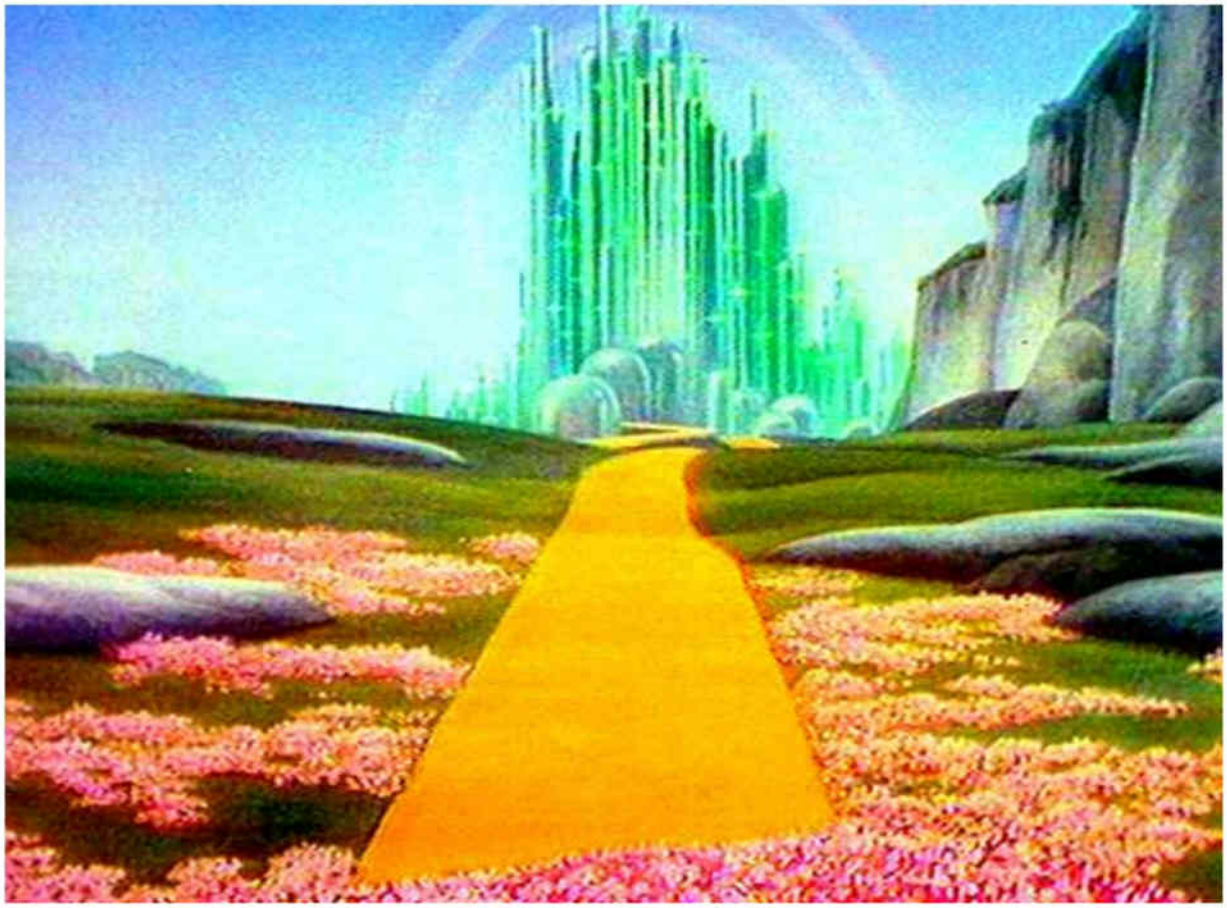
The machine on the left was a regenerative magnetic attraction motor and the one on the right was a mechanical magnetic gating transformer.

These machines were built from our own resources, but when the company failed to raise more capital, the project collapsed before a fully self-running combination could be demonstrated.

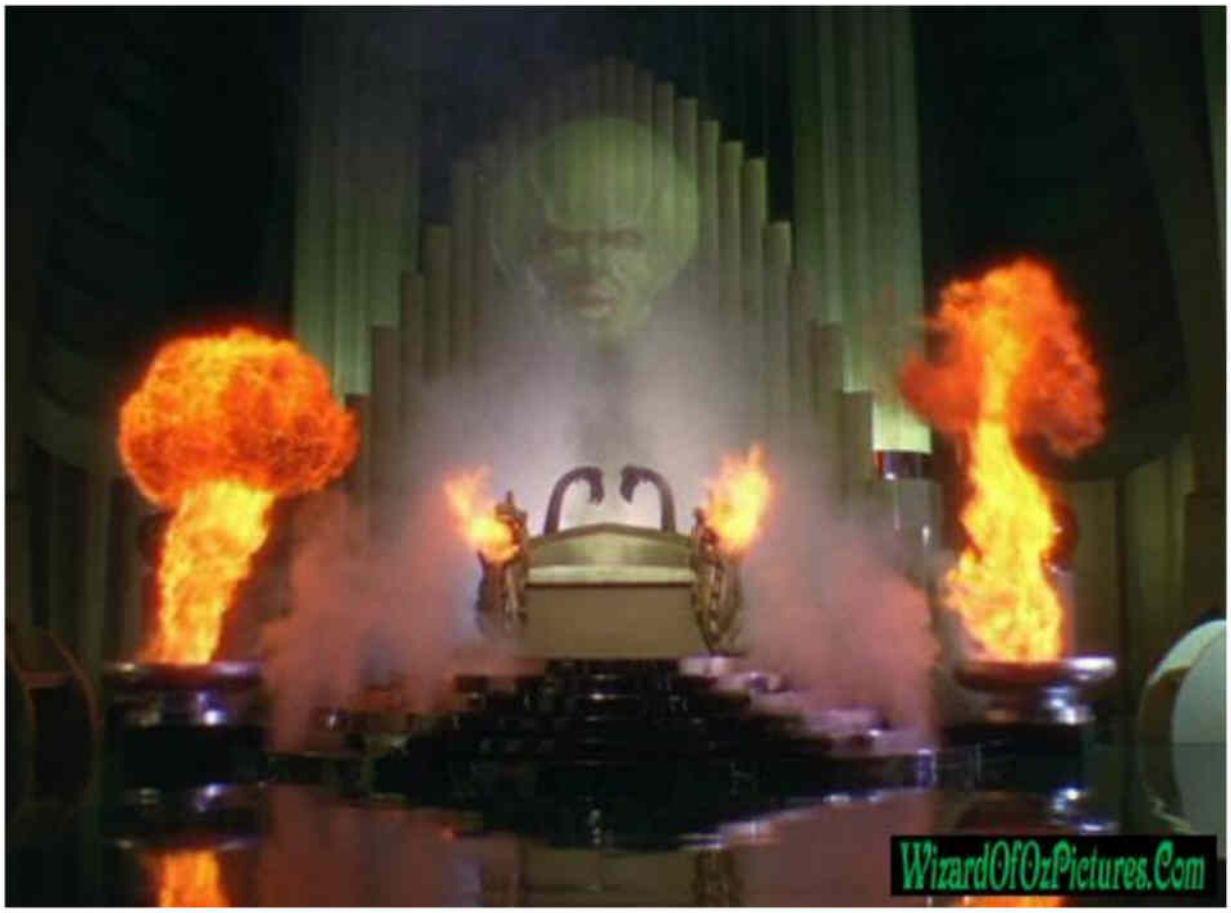
Of all of the machine combinations that can perform this magic trick, the Lockridge or Bedini type Device is the easiest to make.

In closing, I'd just like to say.....

For each of us, our interest in science started innocently enough....



We were all inspired by the great halls of academia and told we could reach its heights if we studied hard and passed our tests.....

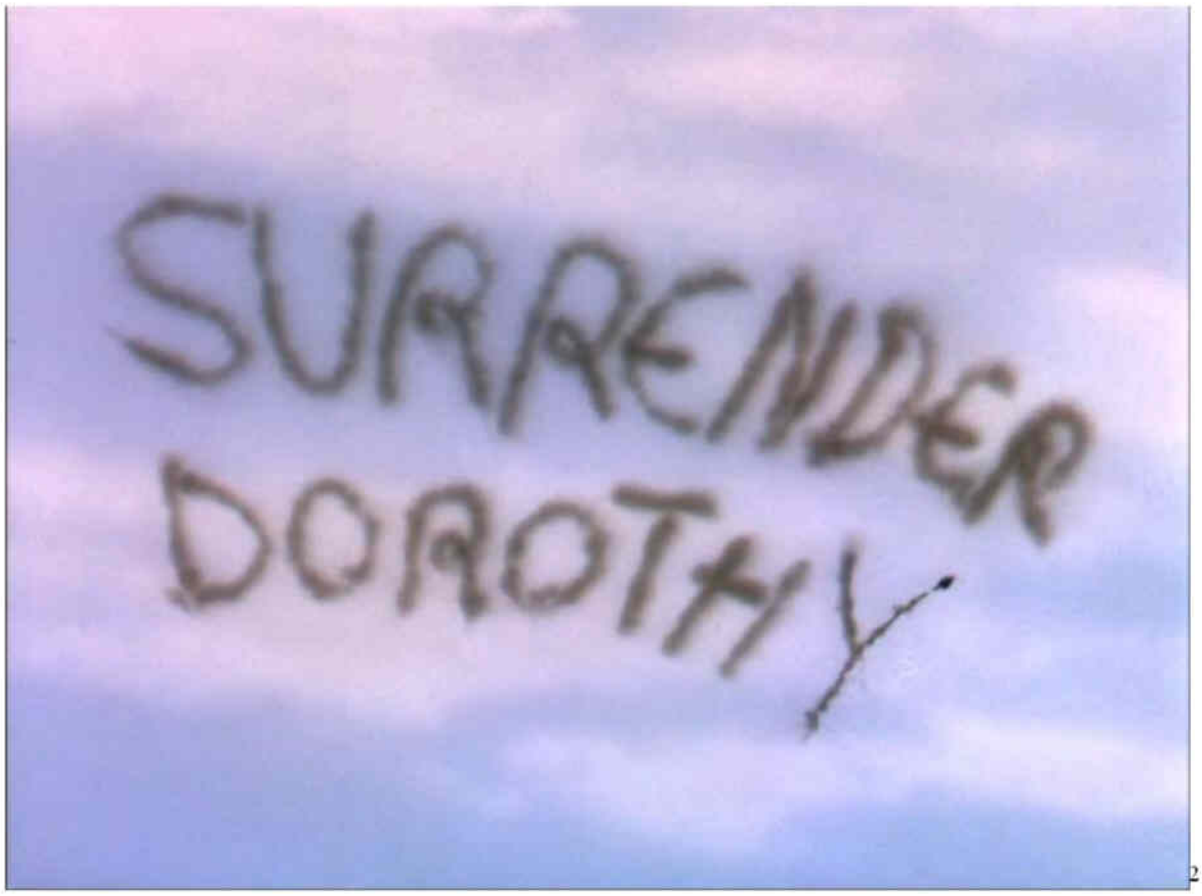


And all along the way, we were told of the Great Minds that had gone before us, laying down the Laws of Physics that were known and immutable.

But the more we looked into these matters and thought for ourselves, the more things didn't quite make sense.

When we asked our teachers embarrassing questions, we were told to shut up, because we didn't have the brains to question whether or not certain issues in science had been settled long ago.....

When we persisted, we were warned about what would happen to us if we went down that path...



As our knowledge increased, some of us have had to live under a cloud of threats .....

Some of us have been visited by the Men in Black.

Some of us have even had the stuffing beaten out of us.

But all of this intimidation has been designed to serve one purpose...

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To postpone the discovery of what a free people will do when they work together to benefit the world with civility, cooperation, and compassion.

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Civilization began with the harnessing of Fire and the invention of the Wheel. We are now approaching the Third Great Epoch in human history.

We have looked past the veil and successfully determined the characteristics of the “self-turning wheel”. What we haven't discovered yet are the characteristics of a society that will use this technology with universal responsibility, self-restraint, and wisdom.

For the benefit of our children, and our children's children, that quest must begin now.

Thank You.

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