

New Concepts in Power Generation

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Originally Published: JBR Vol. 46, No. 2, March-April 1990, 32 pages

A Tribute to Genius

It is several years before the turn of the century in the city of Budapest, Hungary. A tall, gaunt man from Serbia struggles to regain his health. For months he has been in the grip of a strange and violent malady that has threatened to take his life. His convalescence is slow, but his will to live is indomitable. His name is Nikola Tesla. As his strength returns, Tesla's thoughts turn with eagerness towards the resumption of his professional duties at the Budapest Telephone Exchange, and to the solution of a problem that has vexed his mind since his second year of engineering school – the harnessing of alternating currents. Always having found great fortification of spirit in nature, the weakened Tesla retreats to the city park to enjoy a short outing. He is in the company of a former classmate, Szigeti. It is late afternoon in February.

The year is 1881. The dazzling colors in the prismatic sky announce the coming of sunset. The brilliant spectacle infuses life into Tesla's troubled soul. His being is seized by the contrast between this display of the cosmic wholeness and the integrated essence which he perceives himself. The mysteries of the objective and the subjective realities seem to merge. Some great truth appears evident; nearly tangible. He is deeply moved. His sense of the aesthetic escalates to the point of spontaneous expression and he begins to recite a verse from Faust:

*The glow retreats, done are the day of toil;
It yonder hastens, new fields of life exploring;
Oh, that no wing can lift me from the soil;
Upon its track to follow, follow soaring.....*

Suddenly, Tesla is silent, staring at the orb of the setting sun. Szigeti is alarmed and tries to rouse him, but without success. Then as if from a dream, Tesla speaks. His voice is charged with emotion. "Watch me! Watch me reverse it!" In a moment of unparalleled lucidity, the mind of a noble man has merged with the mental fabric of a Higher Consciousness and has captured a grain of truth to share with mankind. During these few seconds of inspiration, Nikola Tesla has discovered the principle of the rotating magnetic field, the foundation from which our entire polyphase electrical technology has evolved. Tesla is 25 years old! I wrote those words in September of 1983 as part of the introduction to a lecture I delivered before the Second International Symposium on Non-Conventional Energy Technology. The paper was entitled "An Introduction to the Concepts of Energy Resonance." The introduction continues:

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These events marked the beginning of a career unsurpassed to this day by any individual in the electrical field. In the remaining 62 years of his life, Tesla was awarded 36 patents for inventions pertaining to motors and generators, 9 major patents involving transmission of electrical power, 6 patents concerning lighting, 17 patents on the design of high frequency apparatus, 12 patents on radio, 7 patents on turbines and similar devices, and many other patents too numerous to mention. What gift allowed Nikola Tesla to stand as a giant among men? How was his thinking different? What secrets permitted him to discover so many truths? Why has no one followed in his footsteps? I began my lecture on Energy Resonance with an introduction centering on the life of Nikola Tesla because I felt indebted to this exceptional man. Likewise, it would not be possible for me to discuss my research in power generation without again giving credit to Nikola Tesla.

His life has had a great effect upon my own and, in some ways my investigations have been guided by his hands. My first encounter with Tesla's work occurred in 1962, when I was a sophomore in high school. I read an article which debated the feasibility of Tesla's plans to light the 1903 International Exhibition in Paris with power generated at Niagara Falls and transmitted to Europe by wireless means. The story had first appeared in *Electrical World and Engineer*, March 5, 1904, where mention was made of Tesla's intention to combine the art of wireless communication with that of wireless transmission of power. In the early sixties, my technical interests were completely directed toward the design of linear particle accelerators. Already I had received a first place award in the New England Science Talent Search and had my sights set on scholarships and grants. I had no time for ancient inventors! However, I remember thinking, "How does one transmit 10,000 horsepower across half the globe without wires?" The thought lingered in the back of my mind for many years and dwells there still.

In 1965, my father died suddenly, and with him, unfortunately, so did my plans to study physics at M.I.T. The following fall, instead of attending college I started work as an electrician in a small New Jersey shipyard. I was 18 years old. The years which I spent around New York Harbor and the New Jersey waterfront were filled with incredible experiences. In those days there were still steam-powered tug boats in operation. Antique coal burning plants provided steam and electricity to many factories. Direct Current machinery over a century old saw daily operation. Old lighter age barges were still repaired by carpenters who had not forgotten how to hew beams by hand. Everywhere there was an atmosphere that resisted change. Constantly I encountered "old timers" with stories to tell, and I was always eager to listen.

One morning I boarded an old steam tug just to look over her propulsion system. Below the decks I found a beautiful old two stage marine engine, skirted with brass and hard wood and supported by a cast iron frame. The cross heads and journals were still shiny and lubricated as if the engine had only recently been stopped. The old machinery was beautiful. There was something artistic in its design and I longed for the standards of the past age which had produced it. Slowly I ingested the complexity of the engine room.

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The piping, the brass steam gauges, the old slate control panel crowded with tarnished copper knife switches, racks of corroded batteries, steam valves, oil coolers and miles of ancient wiring all felt familiar. Suddenly I realized that I had seen no auxiliary engine, no generator. Knowing that there must be a power source, I traced the main cables from behind the switch board and to my surprise they terminated at a small generator in the upper engine room which was attached to a disk shaped device. I rubbed the brass nameplate clean and was astonished to see "Moon Turbine Company."

Always having had a distinct interest in steam power, I looked up one of the oldest captains in the yard to ask him how long turbines had been used aboard steam vessels. His response really startled me. "Since the early 1900's, about the time of the great turbine war!" Captain Allen went on to explain that early in the century, all the big power companies were struggling to produce a superior turbine and there was a great demand for such devices in the marketplace. General Electric, Westinghouse and Allis-Chalmers were all pouring resources into this kind of research, so naturally, many smaller industrial units like the Moon Turbine Co. followed suit.

The next time I was in Manhattan, I made a point to drop by the main branch of the New York Public Library where I did research into the development of the turbine. To my astonishment, I discovered that one of the great contenders in the turbine contest was none other than Nikola Tesla! There was that name again, the man who wanted to transmit power without wires. With renewed interest, I redirected my investigation towards Nikola Tesla himself. I was surprised to find there were precious few books written about this man, but there seemed to be an endless supply of newspaper and magazine articles available on microfilm. So naturally, in a short time, I amassed a large file. Later on I acquired and read numerous times the great classic "Prodigal Genius" by John O'Neill.

However, my best source of information came from a book entitled "Lectures, Patents, and Articles" which I imported from Yugoslavia. The more I studied Tesla's work and his accomplishments, the more I was convinced that something was wrong somewhere. Why have so few of his experiments been successfully duplicated in modern times? Why are his greatest claims regarded with such an air of skepticism by today's engineers? How could the same man who gave the world the polyphase electric motor, rotary transformers, robotics, the basis of radio and foundations of x-ray technology, suddenly be considered mad or senile when he spoke of wireless transmission of power or extracting usable energy from the environment?

Gradually I learned to "read between the lines" as I studied his lectures and patents. Slowly I realized that in many cases Tesla was speaking about very rare or very different scientific phenomena with an attitude of complacency as if he felt that "surely everyone understands this basic material." But everyone did not understand. They were still struggling to digest Tesla's earlier concepts. Tesla did not trust most of his contemporaries. He never bothered to adjust his use of semantics to comply with accepted definitions. If he was misunderstood he was unconcerned.

As a result, after many years this attitude eventually led to multiple interpretations of the meaning and intent of Tesla's work. His statements were considered enigmatic and eventually meaningful communication between himself and the scientific community ceased altogether. But Tesla continued expounding his discoveries as usual, unaware that the wisdom in his words fell upon deaf ears. Animated by the conviction that great knowledge had been lost, I set out to establish where Tesla had made his departure from recognized physics. Guiding myself by intuition, and by the implications hidden in various projects which he had proposed, I concluded the following:

- A) There must be more than one kind of resonance and more than two kinds of induction supported by the laws of nature.
- B) Tesla had discovered something very fundamental about the relationship between energy and power that still eludes the rest of the world.
- C) Most of his later inventions, including the Magnifying Transmitter, probably made use of this "secret" knowledge, and therefore, still remains misunderstood by the scientific community as well as the general public.

Initial Research

Early in 1971, I purchased some property in northern Michigan and set out to establish a research facility geared to rediscovering as much of Tesla's lost information as possible. Armed with only the energy of my youth and the irresistible force that comes from single-mindedness of purpose, I succeeded in raising nearly \$100,000 to fund my venture. I assembled a shop/laboratory combination and quickly went to work. My plan was basically a simple one. I was looking for some anomaly in the laws of physics, and if my hunches were correct, I would find it in some forgotten or unknown aspect of Tesla's work. As guidelines for my efforts, I selected three Tesla projects which required uncommon knowledge to complete.

They were:

- 1) A new type of D.C. motor, which would, operated without a commutator
- 2) A new kind of D.C. generator capable of producing extremely high D.C. voltage
- 3) A self-acting engine that extracts power from the ambient medium

A non-commutating D.C. motor would have commercial appeal and it sounded simpler and less expensive to investigate than the high voltage D.C. machine or the ambient engine, so I chose this as a place to start my research. In order to find a path along which to proceed, I reviewed all the data in my possession concerning D.C. motors, bearing my goal in mind - the elimination of the commutator. Eventually the obvious broke into my conscious mind. The need for the commutation arises because the concept of polar attraction is used to generate the twisting force which drives a D.C. motor. This necessitates switching from one active pole to the next in order to maintain the angular motion.

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However, the only reason why polar forces are used is because the winding of a coil produces a powerful concentrated magnetic field which allows the designer to make use of the ampere-turn concept thereby obtaining the maximum amount of flux per ampere consumed. Suppose it was possible to utilize multiple ampere-turns to develop a field geometry which did not produce a di-pole when energized, but rather a circular resultant field which could imitate the concentration of magnetic energy surrounding a single conductor. In such a case, there would be no magnetic pole produced hence no need for switching, yet powerful forces could still be mustered to perform useful work. The idea was exciting and novel, and seemed like the sort of solution Tesla might have envisioned, so I invested the next few months trying to find an embodiment that would incorporate the idea in a practical fashion.

What was required was the type of field generated within the confines of a torus or a Roland ring. However, conductors could not surround it, the conductors would somehow have to be internal to the field. The problem was acutely vexing, and no matter how I approached it, I made no progress. Eventually I realized that I was attempting to navigate in uncharted waters! There was no data available concerning the behavior of magnetic fields within the interior of metallic structures. I would have to supply my own information. So I designed a simple device to allow me to visually inspect the movement of magnetic flux through various samples. Basically, it consisted of an aluminum car on rails, which was situated between two poles of a powerful electromagnet. Samples were situated within a frame supported by the car and so aligned as to allow the flux to pass through them in a direction perpendicular to the motion of the car.

All samples were prepared by drilling holes in their surfaces into which miniature compasses were placed. In this manner, when the flux was turned on, the tiny compass needles would align with it and produce a literal map of the internal magnetic pattern. It was with this primitive device that I made an intriguing discovery which I initially called the "window effect". Having found the flux motion through various homogeneous samples to be completely uniform, I began to experiment further by machining holes of different shapes in various pieces of metal. Upon boring a large round hole in a piece of mild steel, I noted that a spring-like force appeared in a direction, which opposed the motion of the car.

Simultaneously, the compasses indicated that the flux was producing a "bow wave" collecting just ahead of the hole in the direction of the car's motion. This action was most certainly due to the area of high reluctance which the hole presented to the normal flux path. However, if the motion persisted, the compasses surrounding the latter portion of the hole suddenly snapped back to a straight alignment! The further the car advanced, the more compass needles reacted in this manner indicating the presence of a magnetic "wake" created by the passage of the hole through lines of flux! The snapping action of the force lines was intriguing to me so I studied the phenomena until its nature became clear.

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The advancing hole, an area of high resistance to magnetic flow, pushed the lines of flux ahead of it so that they collected in a bunch and behaved like stretched rubber bands. If the hole was advanced beyond a limiting point, then those lines of flux which were most stretched would snap back to the rear of the hole and assume an unstretched position. The most interesting aspect of this phenomenon resided in the fact that the lines of flux that were "snapping" across the boundary of the hole would, of necessity, travel with a velocity greater than that of the car.

Hence, it occurred to me that the proper placement of windings with respect to the hole might cause the induction of voltages with magnitudes proportional to the velocity of the flux rather than the velocity of the car! Such a scheme would represent an amplification of sorts, and I could not resist the challenge to devise a practical method of implementing this unusual magnetic property. I yielded to temptation and suspended the motor project. Many experiments were tried without success until I recalled an earlier observation. While experimenting with the effects of holes upon the flux, I had learned a curious fact. If a rectangular hole was machined in a piece of steel and fitted upon the test car, the flux did not produce the familiar "bow wave" effect. Instead, it would bunch together and slowly cross the rectangular hole by producing a "hypotenuse" which slowly increased in length until some maximum value was achieved. Then the flux would again snap to the rear. This suggested that the flux was "aware" that the hypotenuse was a shorter route across the reluctance than the path around the perimeter! This was the seed of a novel idea.

Why not reverse the roles of permeable material and the area of high reluctance, thereby confining the flux to the hypotenuse path. This would allow the unmanageable elastic "action" of the flux to be replaced by a definite structure which could be manipulated in three dimensions relative to the pole pieces! No doubt this idea had its roots in an earlier study I had done where the time axis of various periodic functions was replaced with an actual dimensional axis resulting in the generation of unusual geometric solids. Applying these techniques to the control of magnetic flux resulted in a complex structure, part iron, part aluminum, which took many weeks to machine. Ultimately, the finished rotor was pressed on a shaft, supported by bearings and situated between special field poles. Power windings were formed and pressed into place.

The finished device was mounted on a base and belted to a D.C. motor for testing. I had devised a completely novel form of A.C. generator! A fully instrumented panel and the necessary transducers were then prepared; a surplus magnetron magnet was bolted into place to provide an excitation field and the drive motor was brought up to speed. The A.C. volt meter climbed to approximately 100 volts RMS and held steady. I closed the circuit breaker and the circuit indicated 2 amps RMS! My load was resistive, and while there was a typical drop in the terminal voltage with application of load, there was no increase in current drawn by the D.C. motor, a curious result. I removed the leads from the power resistor and shorted them together. The output current rose to 6 amps, and the current drawn by the D.C. motor decreased nearly a full amp! An impossible result and something I did not understand.

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I spent many long months experimenting with and studying the machine I had created. It was perplexing. I learned a great deal about it, but I could not imagine what arrangement of physical law could account for such behavior. Since I had first applied a load to the machine, I noticed a "purring" sound which only persisted as long as there was a current draw. It was a distinctly mechanical sound and all efforts to locate its source initially failed. However, I instinctively felt the source of this noise was a key to the secret of the device's performance. Ultimately, I mounted strain transducers on the bearing assemblies and repeated the tests. Low and behold, the shaft was undergoing compressive loading in phase relation to the electric current! The answer was suddenly clear, I had ortho rotated the Lenz reaction! Instead of the load current producing a negative torque upon the shaft, it was producing a thrust load upon the bearings Incredible!

I continued my investigation into the nature of this unusual machine long enough to discover a major problem. Unlike an ordinary generation device, in which the power windings are distributed circumferentially about the stator or the armature in order to achieve the best power output per pound of material, the generator I was laboring to develop could only have two power windings located in special positions with respect to the overall magnetic circuit. The reason for this limitation has to do with properties which I choose not to discuss here because of their proprietary nature. However, the immediate and obvious ramifications were a reduction in available output voltage and power. If the output coils were wound with a large number of turns, the resulting inductive reactance would limit the available current, keeping the power yield relatively low. If coils were wound for high current, the voltage was inherently low and again the power capabilities were restricted.

The possibility of resonating windings of many turns in order to obtain the highest voltage/current combination had occurred to me. However, my feeling at the time was that there had to be a simpler answer to the problem. I sat hour after hour, studying the magnetic circuits and electric circuits and reviewing the theory of operation I had developed in hope of being blessed with an inspiration. What other way could there be of eliminating inductive reactance? There must be a method more suited to my application than the addition of capacitance to the circuits. Was there a magnetic solution?

Somewhere in the reaches of my subconscious mind, a realization began to stir. I felt the solution was near at hand. It had that "I should know the answer to this problem" feeling, and I was determined to wrestle it into awareness. All at once, I saw the answer with clarity. It presented itself in the form of a vivid picture, partially literal, partially symbolic, in a manner particular to the collaboration of left and right brain activity. Quickly, I sketched the mental image, lest I forget any detail after the passing of instant of "super perception".

Then I leaned back and surveyed the information before me. There are no words to describe the elation I felt when the magnitude of the solution struck me. I was overwhelmed. There on the scrap of paper before me was the design for a hybrid machine that incorporated

the best features of my earlier generator with certain characteristics of an ordinary transformer! The design made use of the properties of transformer coupling to eliminate the effects of inductive reactance. The idea was complicated but elegant. I wondered if I could factor out the transformer-related concepts, and incorporate them into a simpler embodiment which would allow me to test their validity without having to design and construct the entire mechanism. The accomplishment of this task became my next challenge and propelled me into circumstances which I could have never foreseen.

Transforming Generator

The closing months of 1977 found a new prototype in my small laboratory. I called it the transforming generator. It was the result of many hours of meditation and experimentation and embodied those transformer "concepts" which had been presented to me as the solution to the impedance problem in my earlier A.C. machine. The new generator was constructed in such a manner that each coil saw its mirror image in the other. The result was that a coupling existed between windings which varied as a function of the load current. This resulted in a dynamic source impedance which gave the generator totally "alien" properties. First, the machine was self-regulating. A change in the amount of current drawn by the load automatically increased or decreased the terminal voltage. This was not accomplished by varying the strength of the D.C. field, but rather by a change in source impedance provided by the magnetic coupling.

No servo type of voltage regulator could compete with the speed and accuracy of this magnetic means. The load current signaled the generator directly regarding the voltage requirements of the external circuit. There was no time lag in response, and no over-correction to contend with. In fact, the regulation ability of this machine was so fast that an instantaneous 100% increase in load current prompted an immediate voltage increase from the generator, a virtual step function of potential with an infinite slope and no measurable rise time, a feat not possible with electronics! Second, the transforming generator had surprising abilities with respect to its power transfer characteristics. If it was connected to a time-varying load, such as a mercury vapor lamp, it could track the impedance changes with such speed that no ballast was necessary! In addition, the machine delivered constant power to the load; the voltage and the current were both square waves! How does a rotary machine produce square waves of power and what are the physical principles, which make such a technology possible?

The answers to these questions were not completely understood by me in 1977; several more years would pass before such matters would make total sense to me. There was, however, one additional mystery which I uncovered in those years the significance of which would also have to wait. Once I had completed construction of my largest transforming generator, a 750 watt unit, it was of great importance to investigate the performance characteristics and the overall efficiency of that machine.

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To accomplish this, I coupled the generator to a 1 H.P. D.C. motor and I measured the D.C. power consumption with calibrated electrodynamic instruments. The test loads were resistive, and the elements used were non-inductive to assure greater accuracy of measurement. When everything was in readiness, many curves were taken, and a segregated load analysis was performed. The results were most confusing. Taking into account all the known losses, friction, windage, iron and stray copper as well as the power dissipated in the resistors, I discovered that as the load was increased, the conversion efficiency decreased. This meant that with all the known losses accounted for the power drawn from the D.C. motor was larger, than the power dissipated in the load. The conversion was less than unity; power was disappearing! There was no mistake in measurement or calculation; qualified people all of whom drew the same conclusion checked the results: the generator was exhibiting a new form of inefficiency. It was measurable, but non-dissipating, and its nature was a mystery.

Conflict with Washington

Despite the fact that everything was not yet understood about the transforming generator, its obvious industrial potential made it a prime candidate for commercialization. The notion was aired at a stockholders' meeting and it was decided to apply for patents. As a first step, a patent search was performed by our attorney which had the surprising result of discovering no prior art. Much encouraged by these preliminary findings, I set about the arduous task of writing the patent. Our goal was to achieve as broad a coverage as possible on this technology, so the formal disclosure became a lengthy and detailed document containing theory of operation, multiple embodiments, calculations, performance characteristics, graphs, etc. It took weeks to prepare the rough draft, and longer to edit it into acceptable legal format.

Ultimately, the task was completed and the application submitted to the patent office. After the first six months of waiting, a first action was received; it was a rejection accompanied by a collection of older patents which supposedly were relevant. I examined each in detail and found nothing which had a bearing on my machine. Accordingly, an amendment was prepared and resubmitted to Washington. Six months later a second rejection was received. Disappointed and more than mildly angered, I took new steps. A second amendment was prepared, an election of species was made, our claims were narrowed, and detailed explanations were written explaining why the cited prior art did not apply to the transforming generator.

This new application was submitted to Washington, but it too was eventually rejected. None of the examiner's arguments seemed relevant but no matter how the concepts were reworded or explained, the reaction was always the same: "Rejection". This battle went on for three years, at a great cost to my little corporation, and at greater cost to my health. In order to maintain my sanity during these times, I provided an outlet for my frustrations by returning to my original research on the Direct Current Motor.

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By this time, I had acquired some unusual insights into the problem, as well as uncommon expertise in the management of magnetic forces. I concluded that the earlier discovery of the "window effect" was more applicable to the generation process than the motoring process. However, the basic notion of producing a non-polarizing magnetic field structure was definitely correct. I had proven this in many independent experiments.

What was actually needed was something which behaved like only "half" a winding, but was such a thing possible? I tried various shielding arrangements. I tried engineering exotic windings which produced asymmetrically distributed magnetic fields. I attempted fantastic schemes in which there was an enormous difference in the relative torque production between each side of the same winding, hopefully resulting in a uni-directional net torque. Nothing worked. Sometime during the closing months of 1981, a final rejection notice was received from Washington. According to the patent attorneys, I still had the option of a final appeal directly to the patent commissioner through the patent claims court. That was somewhat uplifting, but, between domestic and international patent applications, the numerous amendments, various fees, penalties and taxes, over \$60,000 dollars had been spent on legal costs, and there was nothing left to fight with.

My stockholders were disenchanted and angry because there were not yet millionaires! I argued late into the night trying to convince them that we should not quit, but it was too late, the human fabric had frayed beyond repair. I retired, angry and exhausted. Eventually, morning came, as it always does, and I became aware of a peculiar state of consciousness. I knew I was no longer sleeping, yet I was not exactly awake, either. In the depths of my mind an image was moving. I focused attention on it. It was an Indian man seated on a blanket. He was stacking golden disks upon a peg. The disks were of diminishing sizes, and they formed a tapering stack. I recognized the image. I had seen it in a book associated with a mathematical problem in which a number of disks are moved from one peg to another in a certain sequence. The solution is said to require more moves than can be accomplished in a lifetime.

But what did this have to do with anything? I stared at the stack of disks in my mind. They were gold in color, and that seemed important somehow. My mind moved like cold molasses. I could not see any connection or relevance between this image and my life. I rolled over desiring more sleep. "Maybe they're brass not gold" I thought. Suddenly, I sat up fuller alert, there was the answer! The tapered stacks were brass, not gold! In no time I was down in my shop running the engine lathe. I watched the little shower of brass chips fly from the bar I was turning, and something rang in my mind. It was a comment that Tesla had made in 1933 regarding his new D.C. generator "a peculiar assembly of steel, brass and aluminum." The little model took nearly all day to construct, but finally it sat on the bench before me, a peculiar assembly indeed.

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Nervously, I connected leads from a D.C. power supply. I flipped the switch and slowly increased the current, but nothing happened. I increased the current further and suddenly the little device leaped into action, spinning at a great rate of speed! I was hypnotized, and elated as I watched the strange little motor spinning without commutating! I wondered if this was the same principle that Tesla had discovered. Without warning, I was roused from my musings by the smell of smoke. I quickly glanced at the ammeter; it was registering in excess of 20 amps. "It needs additional armature sections" I thought as I shut down the supply. The little motor squeaked to a halt. The windings were already black, and the plastic portions of the rotor were warped. I began to disassemble the device. "It won't take long to repair" I figured "and with this breakthrough surely the stockholders will regain their interest." I worked late into the night, making new armature sections and winding the special coils.

The last thing I did before I retired for the night was to lay out all the parts on the bench. "I'll assemble that little beauty first thing tomorrow", I muttered as I locked up the building. I drove home with renewed confidence and excitement. The next morning I had an early breakfast at the local restaurant and wheeled to the shop. It only took a few seconds to grasp the meaning of the sheriff's notice and the padlock on the shop door. With a sinking heart, I stared through the window at all my equipment and the small collection of odd parts on the edge of the bench. I knew it was time to quit.

Energy Resonance

I left Michigan not a moment too soon. My funds were gone, my hair was falling out, I had developed a bleeding ulcer, I was overweight and I couldn't sleep. I needed a complete overhaul. The company I was working for was good enough to transfer me to a small mining community in Eastern Pennsylvania. Once I had gotten established, I promptly joined the Y.M.C.A. where I began working out on a regular basis, and I found myself a lovely girlfriend. The last thing I wanted to do was to think about electricity! This attitude was short lived, however, for there were numerous electrical problems in the mind, which I could not avoid, and little by little, I began thinking about my research again.

The situation was completely different now though, because I had no shop and no equipment with which to experiment. Circumstances forced me to make my investigations mathematically. It seemed as if there were a million questions to answer and each would require rigorous mathematical analysis. With no models for generating data, my options were indeed limited. What I needed was to discover some underlying principle which could tie together all the loose ends and give direction to my research. But where do you look something which no one else has found? Asking the questions seemed to prompt an answer "how about right under your nose?" True, the least obvious spot to hide something is right out in the open.

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Perhaps what I was looking for was so fundamental and so universal that on one suspected its existence. I began to ponder anew the most elementary of physical concepts: Force, Work, Velocity, Momentum, and Newton's Laws and, of course, the Conservation of Energy. I was not interested in simply reviewing problems in physics, but rather in achieving a fresh point of view on principles which I had long ago taken for granted, and which I used almost daily through habit rather than by reason. To accomplish this end I began to apply differential and integral calculus to very basic equations in order better comprehend their origins and dimensionalities. I rambled through hundreds of calculations, and while I did greatly clarify many things in my own mind, I made no earth-shattering discoveries. However, eventually I came upon the basic relationship which links work to force and distance:

$$W = FS$$

This I differentiated with respect to time in order to develop an expression for power:

$$dW/dt = d(FS)/dt. \text{ Therefore, } dW/dt = F d(S)/dt, \text{ and...}$$

Here I suddenly paused when I realized that I was solving this derivative through habit and convenience. I had removed F from the parenthesis without thinking. How did I know that the force was constant? In many cases the force is actually a variable. So I started over:

$$W = FS$$

$$dW/dt = d(FS)/dt \text{ Therefore } dW/dt = F dS/dt + S dF/dt \text{ and } P = Fv + S dF/dt.$$

This equation states that if F is allowed to vary in time, then the power must consist of two components, Fv, the force times the velocity, and S dF/dt, the distance time the rate of change of the force with respect to time. In other words, not only must the agency supplying the power pay for moving the force through a minute distance, dS in some minute time dt, but it must also pick up the tab for the changing forced F/dt over the total distance S. I stared at the new relationship $P = Fv + S dF/dt$ fully aware that something was going to happen. I kept thinking about the transforming generator, about the increased torque necessary to turn it and about the low conversion efficiency. But another part of my mind was trying to tell me something else. Something about non-linear rates of change, something about logarithmic functions, something about equation in the fourth quadrant, something about the derivative of decreasing functions! Yes, the derivative of a decreasing function is a negative quantity! This means that if F were decreasing in time, then dF/dt would be negative, in which case:

$$P = Fv + (-S dF/dt) \text{ or } P = Fv - S df/dt$$

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So if F decreases fast enough, then theoretically, dF/dt could become a large enough negative quantity to effect the magnitude of the positive power component such that if

$$P_1 = Fv \text{ and } P_2 = Fv - S \, dF/dt, \text{ then } P_1 > P_2,$$

In which case, if P_2 represents power entering a system and P_1 represents power leaving the system, then the system would demonstrate a net power gain. But how could such a thing happen if energy must be conserved? It required three more years of mathematical study before I managed to isolate and demonstrate a simple mechanical system in which such an effect is apparent. And I am both proud and relieved to say that conservation of energy is not only upheld, but utilized extensively in my proofs. What does develop in a totally new light, however, is conservation of work. It has always been assumed that the work done must equal the change in the available energy under all circumstances. However, this proves to be true only in traditional linear system! In non-linear systems, two additional conditions can be demonstrated:

- I. The work done is greater than the change in available Energy.
- II. The work done is less than the change in available Energy.

Now, if we consider a non-linear electrical system, which is specifically engineered such that its parameters vary in time so as to cause an alteration of the system between condition I and condition II, then the energy will truly oscillate! And if the components are properly designed so as to cause the movement of energy to become optimized rather than the current, then the system will demonstrate Energy Resonance! With this deeper insight came the understanding that both earlier generating devices were exhibiting only half the total picture. I realized that a standard alternator is really a D.C. machine from the standpoint of power delivery. For although the voltage and current both oscillate, the power merely pulsates in amplitude. Hence, there is a great fallacy in comparing present day generating equipment to the electric oscillator, particularly if the machine is driven by a thermal engine of any kind.

This stands to reason when you consider the fact that heat engines are thermodynamically irreversible, and therefore, any power returned to the engine would be incapable of even a minute re-conversion into fuel. This means that thermal systems cannot support a bi-directional movement of energy, nor can they give rise to Energy Resonance phenomena of their own accord. After many years of effort and contemplation, I began to see the light. I was absolutely certain that Tesla had ventured down a similar path, although his journey had been much more expedient than my own to be sure. Perhaps these humble foundations might again lead to the lost principles of the great Magnifying Transmitter, or other undisclosed secrets sleeping with the master.

Jim Murray Excerpts on Dyna-Flux Alternator

In September of 1983, I delivered a paper before the Second International Symposium on Unconventional Energy Technology in Atlanta, Georgia. The work was entitled "An Introduction to the Concepts of Energy Resonance". With the time slot allotted to me, my delivery did not do justice to the subject matter. However, I did attempt in earnest to acquaint my audience with the basic principles of the non-linear work/energy relationships I had discovered and their importance as a potential non-nuclear power alternative. I doubt many people got the point. Perhaps my talk was too mathematical as the only comment I ever heard concerning it was, "What the hell did you say?" Maybe my lecture in Atlanta was premature but I still left Georgia with a renewed sense of optimism. I felt for the first time that my goal was a visible glimmer on the horizon.

The Dyna-Flux Alternator

The fall of 1984 found me again in my native state of New Jersey. Thirteen years had passed since my departure, and while it was good to be home, in many ways it felt quite strange; a great deal had changed. Slowly I re-established communications with old friends and relations. Human nature being what it is, most people had no idea where I had been or what I had been doing. However, a few of my good friends were genuinely curious. Little by little I disclosed the nature of my research to those who were interested. One individual in particular was greatly excited. I will identify him as Mr. K. This person became my first partner in a new endeavor: a practical demonstration of Energy Resonance.

There were quite a number of engineering problems to overcome before a design could be considered. Most of them centered around the non-linear nature of the technology itself and the large number of variables which had to be dealt with in designing a specific machine. To make matters worse, scaling factors were also non-linear, so it was virtually impossible to leap-frog from one successful design to another. All these complications suggested that it would be premature and financially dangerous to set up another shop. However, it was crystal clear to both of us that an investment in computer equipment would be economically sound and practical. Hundreds of mathematical models can be easily designed, and tested for the cost of one mechanical model.

The next year or so saw a great deal of progress from the mathematical standpoint. Of course I cheated a bit. Some of the non-linear equations I solved by mentally anticipating the results, and some of the wave forms for the flux I approximated with complex harmonics or least square fits. Often it took dozens of printouts to tell me which way to "steer" the numbers. One spring afternoon Mr. K. dropped by unexpectedly and found me in my office buried in printouts. "Well, where do you stand, professor?" I stared at my visitor over the rims of my glasses in silence. The last thing I wanted to feel like was a damn professor. I decided to ignore the remark. "I think we're ready to build one!" I exclaimed. "What the hell are we building?" Mr. K. wanted to know. "Energy Resonant Generator; a Dyna-Flux Machine!" I replied.

Jim Murray Excerpts on Dyna-Flux Alternator

With that remark, the die was casted. By mid-summer, the design was solidified, and a new order of business was at hand: fund raising. I approached another friend of mine, Mr. H. and divulged to him the nature of my research. He was impressed and agreed to finance the first prototype as well as the patent expenses for a piece of the action. The ball was rolling! I took great pains to ensure each phase of the project was properly completed. The Dyna-Flux rotor was contour ground and dynamically balanced. The power coils were hand wound on special forms and then pressed into position. The field poles were carefully machined and mounted on special aluminum pedestals. The field windings were prepared by a professional motor shop, and then compressed upon a steel suspension yoke. Piece by piece the idea was condensing into reality. To facilitate testing, the generator D.C. field supply was manually adjustable at the main instrument panel, and the voltage and excitation current were accurately displayed on state of the art digital meters.

The Dyna-Flux machine was to be rotated by a $\frac{3}{4}$ -horse power D.C. motor. The motor, in turn, could be speed regulated by tachometer feedback via a solid state drive controller. Both the motor input voltage and the current were also monitored on the main panel. The A.C. output power was to be directed into a power resistor decade box so that the optimal load point of the machine could be determined. The RMS voltage and RMS current delivered by the Dyna-Flux device would both be available on the console and back up measurement was to be supplied by a calibrated electrodynamic VAW meter. Space angles would be detected and measured on a dual trace oscilloscope, where the input from a magnetic proximity switch could be simultaneously compared with the generator output current. All the control features as well as the elaborate instrumentation were necessary.

Thousands of data points would have to be taken, averaged and plotted with great precision if the operational characteristics of Dyna-Flux were to be accurately portrayed. My intention was to follow as closely as possible the IEEE standards for the testing of magnetic machines. This would require open circuit voltage curves, field current saturation curves, short circuit current curves, iron loss curves, stray copper loss curves, friction and windage curves and a segregated load analysis. With this voluminous data, the overall system and conversion efficiency could be measured at any load level. This allowed the optimal load condition of the machine to be discovered. It must be borne in mind also that for all this data to be meaningful, especially in the case of such an unorthodox device, it would have to be compared against similar data taken from a standard alternator.

The test stand, which I devised, provided for this comparison by using electro-mechanical clutches to direct the mechanical power from the D.C. motor to either the Dyna-Flux Alternator, or the standard alternator. The calculating, designing, fabricating, calibrating and testing seemed an endless task, but at long last the entire system was completed and ready for operation. Maybe it was the seven years I spent working alone in Michigan, or maybe it was just fear of failure, but I insisted on doing the trial runs in absolute seclusion.

Jim Murray Excerpts on Dyna-Flux Alternator

It took many hours of work to gather the data and to plot the performance characteristics of the standard alternator and the Dyna-Flux machine. Compound plots of six curves were prepared for each device, then scaled and plotted by computer. In both cases, the following parameters were graphed for comparison:

1. Load resistance in ohms
2. Total input power (watt AVG)
3. Actual input power (total input minus losses)
4. Load current (AMPS RMS)
5. Output power (watts AVG)
6. Efficiency (conversion efficiency)

The results were completely astounding! The efficiency of the standard machine peaked out at the value of its optimal load resistance and dropped off sharply thereafter. The output power, the actual input power and the load current curves were nearly "parallel." These results were well within expected limits. The efficiency of the Dyna-Flux machine remained nearly constant for all values of resistance until the optimal load was approached. Then the efficiency began to climb exponentially! The actual input power curve remained parallel to the output power curve and increased with it. At the optimal load point however, the actual input power dropped nearly vertically, dragging the total input power down with it. Simultaneously, the output power continued to climb, finally leveling off after the optimal load was reached. The output current rose exponentially over the entire load range, passing through the optimal point before leveling off to a constant value. What incredible results, despite the enormous increase in output current, the total input power dropped away to 75% of its previous value. The machine was compensating for its own losses and delivering anomalous efficiencies at the same time! Dyna-Flux was in Energy Resonance! The time had come to compute the relative efficiencies of both devices at their optimal load levels.

Here is a tabulation of the results:

Alternator	Standard	Dyna-Flux
Full load input power:	357.35 watts	404.75 watts
No load input power:	319.80 watts	381.94 watts
Actual input power:	37.55 watts	22.81 watts
Full load output power:	31.77 watts	33.06 watts
Conversion efficiency:	84.61 %	144.93 %
System efficiency:	8.82 %	8.16 %

Upon contrasting the results, the first obvious difference is the higher power consumption rate of the Dyna-Flux machine as compared to the standard machine. This result was anticipated because great physical differences exist between the two generators.

The standard machine uses laminated rotor and stator in construction, has extremely small air gaps, contains six sets of power windings and has an efficiency designed magnetic circuit. The Dyna-Flux machine, on the other hand, only contains laminations in its rotor, has much larger air gaps, has two sets of power windings and utilizes an antiquated yoke-type magnetic circuit, a consequence of limited financial resources.

Overall, the Dyna-Flux prototype does sustain higher losses. However, despite this handicap, note the incredible difference in actual input power rates once the losses have been segregated; not the higher yield in output power between the two contestants, and note the absolutely unheard of difference in conversion efficiencies, while the system efficiencies are nearly equal! To really appreciate this anomalous conversion efficiency, it is necessary to understand the meaning of the term. The highest possible energy conversion for standard Electro-dynamic machinery is 100%. This means that after all losses have been accounted for and deducted, the actual input power should be equal to the load power if the circuits have been optimized. In the case of the standard machine some number very close to the theoretical limit, say 98.5% or so, could probably have been achieved if conjugate impedance matching has been supplied.

However, this would have made an already tedious task even more difficult. Conjugate compensation would have had to be calculated for each load level and then the necessary electrical components of appropriate value located and inserted into the circuit. This extra work seemed pointless when it was already evident that the conversion efficiency would never exceed 100%. In the case of the Dyna-Flux, no conjugate compensation was provided either, although for totally different reasons. Nonetheless, the results certainly have the appearance of pure science fiction; how are such numbers possible? Standard power systems imitate D.C. machinery in their ultimate functioning, that is, their power flow is uni-directional.

To support this flow of power away from the source, an endless supply of energy must be available. Realization of this fact is embodied in the laws of thermodynamics as they apply to standard linear systems, i.e., you cannot get out more than you put in. If Energy Resonance is to be achieved, then the system giving rise to this phenomenon must be capable of bi-directional energy flow; the energy must oscillate. As a result of oscillating the energy, the same energy is used over and over again until it is completely diminished. The prime mover need only supply enough to keep the overall volume constant. Ramifications of oscillating the energy in a system include oscillating power, oscillating velocity, oscillating torque, as well as the standard oscillating voltage and current. Hence, the complexity of such a process is obvious; I seriously doubt if it could ever have been discovered by accident. This article has been structure to achieve the greatest degree of openness possible without disclosing proprietary information.

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However, knowing human nature as I do, it is a safe guess to assume that many readers upon reaching this point will conclude one of the following:

- A) The device is a fraud.
- B) There is no room in natural law for the results described, the inventor is in error.

For those readers who align themselves with conclusion A, please be advised that the Dyna-Flux Alternator has been examined by the Electrical Engineering Dept. of the University of Pennsylvania. Preliminary investigations support author's findings. For those who tend towards conclusion B, please be informed of the following historical facts. In the early 1900's when James Clerk Maxwell was formulating his theories of electro-magnetic waves, he stated emphatically "It's of great importance to determine whether any portion of energy conveyed by an electric current can be attributed to matter possessing inertia; it is desirable, therefore, that experiments should be made on the subject with great care." He then showed that three types of experimental effects should occur if true momentum carriers actually comprise as electric current:

- A) If a circular coil is freely suspended by an axial thread with its axis vertical, any change in current flowing within it should produce a rotation of the coil.
- B) A coil carrying current should exhibit gyroscopic effects.
- C) When a rapidly rotating coil, part of an un-energized closed circuit suddenly stopped; the inertia of the charge carriers should produce a current in the circuit.

Maxwell performed experiments to detect these effects and all his results were negative. Accordingly, he concluded "since no evidence has yet been obtained to support the notion of current carrier momentum, I shall now proceed on the assumption that they do not exist, or at least that they produce no sensible effect." Following the dictates of this line of reasoning, Maxwell went on to develop his theories of electro-magnetism in the belief that all energy associated with an electric current is conveyed solely by its electric and magnetic field structure. Nevertheless, all three effects described by Maxwell have since been experimentally observed. Barnett successfully measured the gyroscopic effect in 1915. Einstein and de-Haas in 1915 and 1916 respectively observed effect C, and Barnett detected effect A in 1930 again. It is interesting to note that no amendments have ever been made to basic magnetic wave theory to accommodate these findings. Therefore, it is certainly possible that our present day conceptions of efficiency and the energy of induction may be in error by as much as 50%! We need only identify the nature of this additional energy in order to avail ourselves of its benefits. Energy resonance appears to be one mechanism capable of achieving this end.

A Greater Mystery

The successful testing of the Dyna-Flux caused great enthusiasm and activity among the partners. Mr. K. and Mr. H. began making plans to raise development capital, while I continued with the theoretical aspects and the preparation of patent applications. I suppose that I need not mention that I have grave apprehensions concerning the reactions of the patent office to this invention. The problems experienced with the transforming generator were insignificant in comparison to what I expected to encounter with Dyna-Flux. Therefore, I toned down my invention disclosure so that it reflected only the necessary information to show that the device was new and novel.

I submitted my application and then dismissed all concerns from my mind. I absolutely refused to become emotionally involved with the bureaucratic processes which I knew would ensue. My previous experiences had been far too damaging. It will interest the reader to know that at the time of writing this, my application has already been rejected twice! While I was attending to the complexities of the patent preparation, my partners had also been active. They were identifying and qualifying potential investors, preparing secrecy agreements and other legal documents and laying the strategy for demonstrating the device without jeopardizing our legal position in the eyes of the patent office.

Eventually, many prestigious individuals were exposed to the wonders of Dyna-Flux: corporate officers, physicists, engineers and investors of all descriptions. Some came out of curiosity, some had true interest, and some, no doubt, intended to scoff and discredit the invention. But, regardless of their motives and the differences in their professional viewpoints, everyone who viewed the presentation reacted in the same manner; they left in silence never to be heard from again. The presentation program continued for nearly a year, and every participant, without exception, behaved the same way. It was incredible! Neither of my partners ventured an explanation, or even voiced any negative comment, but slowly, the enthusiasm began to swindle, and gloom descended over our little group and its activities.

If I were a paranoid individual, I might suspect that the government or some powerful cartel was interfering with our plans, but the more I pondered the situation, the more I began to suspect that some other mechanism was at work. Perhaps there is a mystery here far more intriguing than Energy Resonance, a factor which may greatly affect the pace at which the human race can evolve its consciousness. A factor that may explain why Nikola Tesla was not permitted to give his full complement of knowledge to humankind. A factor, which may explain many forms of prejudice scientific and otherwise.

To elucidate on this matter, let me paraphrase from James Gleick's provocative book "Chaos". "The historian of science Thomas S. Kuhn describes a disturbing experiment conducted by a pair of psychologists in the 1904's. Subjects were given glimpses of playing cards one at a time, and asked to name them.

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There was a trick, of course. A few of the cards were freakish: for example, a red six of spades, or a black queen of diamonds. At high speed the volunteers moved smoothly along. Nothing could have been simpler. They didn't see the anomalies at all. But when the cards were shown for longer periods, the subjects began to hesitate. They sensed a problem, but were not aware of its nature. A subject might say that he had seen something strange, like a red border around a black heart. "Eventually, as the pace slowed even more, most subjects would catch on, but not all of them. Some suffered a sense of disorientation that brought real pain. 'I can't make out the suit, whatever it is' or 'it didn't even look like a card that time', or 'I don't know what color it is now, or it it's a spade of a heart', or in an extreme case 'My god, I can't even remember what a spade looks like!' Professional scientists, exposed to brief uncertain glimpses of nature's workings are no less vulnerable to anguish and confusion!"

1, Could such a psychological mechanism be at work in the case of Dyna-Flux and other discoveries?

I am writing this article to find out. Since none of you have had a demonstration, you only have my written words on which to form your opinions.

2, Will you be capable of greater open-mindedness on this subject if its validity is proven to you?

3, Will your opinions change if you ever view the device? As you read these words, can you envision ways in which Energy Resonance technology could be applied for the betterment of man?

4, Will you cry hoax if you see the machine in action or dismiss it from your conscious mind?

There is no reason why these machines cannot be manufactured right now.

5, Do you perceive Dyna-Flux as a non-nuclear alternative?

6, Will you judge it as another perpetual motion machine?

I would really like to know the answers to those questions. In fact, I would be greatly interested in any comments pertaining to this article. Please feel free to correspond with me. I cannot promise to answer all letters, but I will certainly try. Interested parties should write to:

M K H Partners - Mr. Murray P. O. Box 8481 Piscataway, New Jersey 08855

End.