"Lightning Harnessed":

The Internal Plasma Expansion/Contraction Engine (IPECE)

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The thirty-five-year-old Joseph Papp technology, properly reconstituted, could solve the world's energy problems. The world science community should examine the facts of the Papp engine history as I and others have described them, then join the challenge to re-discover the methods that allowed Joseph Papp's plasma engine technology to work either with noble gas mixtures—or possibly even with air alone!

In such technology:

- The gaseous fuel is injected into the cylinders when the engine is manufactured; under the right conditions a single gas charge would last about six months.
- No air cooling would be necessary; the Papp engine plasma process did not generate significant heat!
- A Papp-derived engine could make a car run 60 miles per hour on the freeway—with an engine estimated to be 50 to 75 hp.
- The new engine technology requires no radically new infrastructure—just a new gaseous fuel provision system. Existing fossil and nuclear fuel infrastructures could be eliminated over a ten to twenty year period.
- Imagine this Airline "Dream Trip":
  - — Fly eighty times around the world with a fully loaded 747 "Electro-Prop," powered by Papp-derived engines.
  - — Stop at many key places around the world.
  - — There are no hazardous combustible fuels aboard the aircraft and there is increased cargo capacity without the fuel weight penalty.
  - — There will be no re-fueling during the six months of travel.

My proposal for an "internal plasma expansion/contraction engine" (IPECE) would utilize the kinetic to mechanical and/or electric energy conversion from the inert gas mixture, such as Joseph Papp used in his engines, *e.g.* as described in his U.S. Patent #4,428,193. Papp claimed that he used an inert gas mixture, which after extensive treatment could become highly reactive when triggered in an enclosed chamber—going from a "ground state" to an "ionized/plasma state" and back to the ground state. This cycling from the ground to the excited and back to the ground state could be repeated at frequencies of more than 60 cycles/second. The reactive gas mixture is ideal to operate an IPECE without needing an exhaust and an injection of a new gas mixture/cycle as required for any conventional ICE (internal combustion engine).

An engine would be loaded with one charge of gas per internal expansion/contraction chamber at the time of manufacture of the engine. It would then run for 8,000 or more hours (about a year) on this load of gas. To avoid failure of operation of an engine with this unique principle, the internal reaction chamber would have to be leak-proof for the gas injected into the chamber(s). Joseph Papp knew this, because his design teaches the use of metal bellows between the cylinder and the piston (see U.S. Patent #3,670,494). But Papp did not use this sealing feature in his experiments, because in his day there were no metal bellows available which would allow cycling at rates of up to 60 Hz for periods of years. We know that Joseph Papp operated and demonstrated his engines, which had no bellows and therefore had an open-cylinder design using Teflon V-rings for sealing between the cylinder and the piston.

Associates of Joseph Papp, such as Bob Rohner of Rohner Engineering, of West Liberty, Iowa, who built Papp's engines, believe that Joseph Papp used an inert gas mixture in his working engines, which had no steel-bellow seals. It is also claimed by witnesses that Joseph Papp opened the two cylinders of his demonstration engine and let the gas out just a short time before he died. It is also said that there was no gas supply left to refuel the engine and that the gas treatment laboratory was not working at the time of Papp's death.

A reliable solution to this major gas leak problem in the Papp design could be overcome with a "free piston generator" design, as shown in Figure 1, which has patents pending by me. This IECE-MG has an oscillating motor-generator with the piston-alternator floating on an air-bearing structure in a cylinder. The stators of the linear motor-generator are located outside the cylinder. At each end of the cylinder is a volume changeable gas expansion/contraction chamber with electrodes for initiating the pulsed plasma expansion. Each end plate has a gas loading port using a one way ball

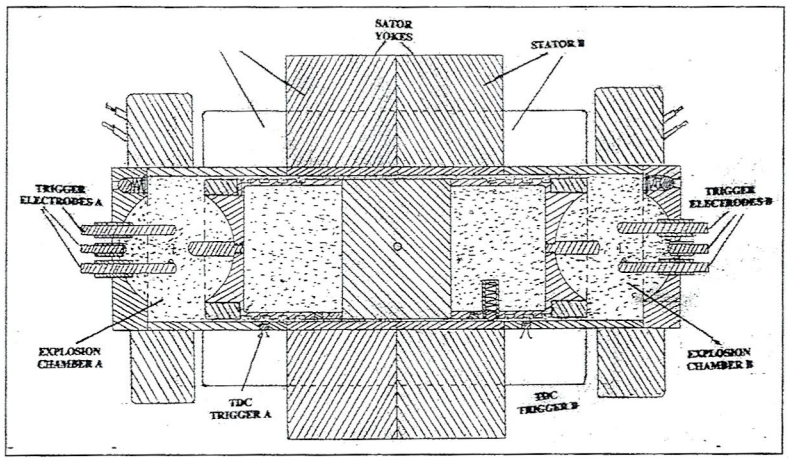

Figure 1. IECE-MG "Internal Pulsed Plasma Explosion Free Piston Motor/Generator" (cross-sectional diagram).

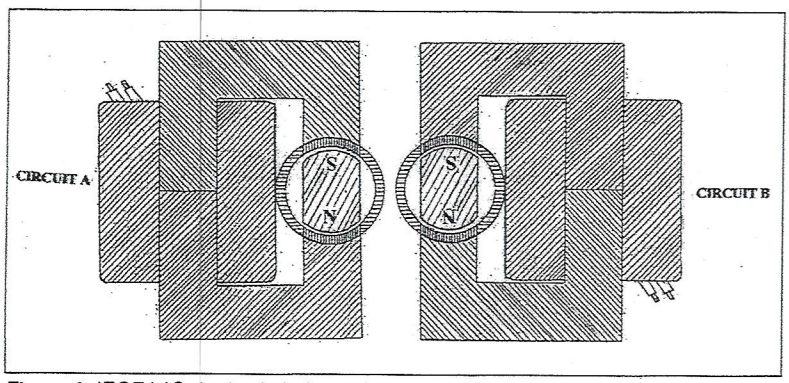

Figure 2. IECE-MG dual split balanced magnetic flux circuits.

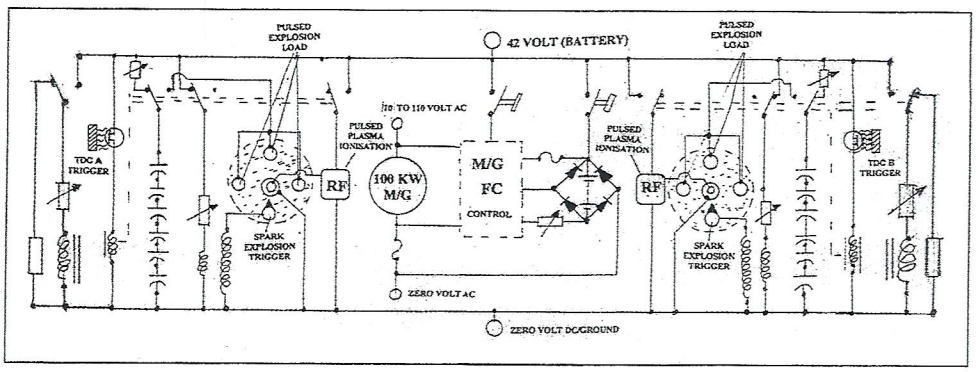

Figure 3. IECE-MG principle circuit diagram.

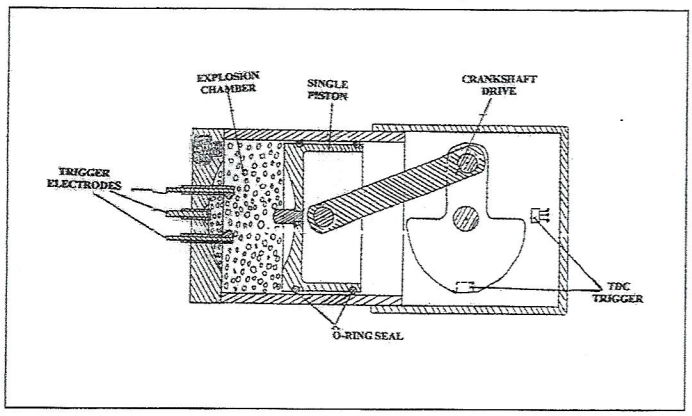

Figure 4. IECE single piston two-stroke crankshaft engine cross-sectional diagram.

valve. When using an inert gas mixture, the ball valve will be hermetically sealed along with the whole cylinder envelope. The cylinder wall has two laminated silicon steel inserts that are hermetically sealed into the housing wall.

The alternator has a 50 MGO NEFEB (neodymium iron boron) permanent magnet. The magnetic flux circuit of the oscillating linear motor generator is shown in Figure 2. It is called a balanced split-flux circuit, which provides maximum flux efficiency. Figure 3 shows a diagram of the IECE-MG operating principle. The motor function is used to start the piston oscillating and thus air is pulled into the expansion chambers A and B through the two ball valves and is sealed. From the BDC A to the TDC A, the compression stroke, the air in the chamber A is compressed, heated, ionized, and becomes highly conductive. At TDC A Magnet Hall Switch sensor A turns on relay A. Thus relay A applies a high voltage spark, RF (Radio Frequency), and a high current discharge through the gas from a capacitor storage and an ionized plasma expansion is initiated moving the piston from the A-TDC to the A-BDC.

Since the two chambers are out of phase by 180 degrees, the compression and expansion is out of phase by the same 180 degrees, thus providing the oscillating movement of the piston alternator. The generator power output depends on the volume, the volume change, the frequency, and the mean effective pressure in the chamber, the magnetic field intensity, and number of turns of current carrying conductors.

The proposed IPECE-MG might have these specifications:

- Cylinder: 304 non-ferromagnetic stainless steel, aluminum or ceramic
- Cylinder end-wall: 416 ferromagnetic stainless steel
- Cylinder inserts: 0.005-inch laminated Si-Ferro magnetic steel (3 inches x 3 inches)
- Cylinder chamber ID: 4 inches
- Cylinder length: ~12 inches
- Piston stroke length: 3 inches
- Piston support: linear gas (air or inert gas) bearing
- M/G alternator: NEFEB 50 MGO, tiled (2 inches radius x 3 inches wide x 3 inches long)
- Sensor: Magnetic, hall switch
- Battery: 42 volt DC
- Operating fuel: Ambient air, or inert gas mixture
- Stator yokes: 0.005 inch Si-Ferro-magnetic lamination
- Stator coils: Copper wire
- Estimated weight: ~100 lb.
- Motor/Generator Power: 200 kw at 220 V 50/60 Hz

Figure 4 shows the principle of a single cylinder two-stroke crankshaft engine, which is not hermetically sealed. Such an engine can be extended to multiple cylinders (2, 4, 5, 6, 8, 16 cylinders). These engines can be connected to either a mechanical drive as used in most transportation vehicles or can be connected to a rotary motor/generator as used in emergency electric power supplies.

To discuss the purchase of a two-cylinder Papp test engine contact:

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Watch for ICCF10 coverage in Issue 52.