production of gas, without an air pump). Thus, no additional pump is needed to be coupled to the container **111** and the produced gases do no need to be transported into a pressurized container.

The power supply in the present invention is required to provide a pulsed signal having only 12 volts at 300 ma (3.6 watts). It has been found that an optimal amount of hydrogen and oxygen has been produced when the pulsed signal has mark-space ratio of 10:1 and a frequency of 10–250 KHz. Using these parameters, the prototype cell of the present invention is capable of producing gas at the rate of 1 p.s.i. per minute. Accordingly, the cell of the present invention is capable of producing hydrogen and oxygen in a highly efficient manner, quickly and with low power requirements.

As noted above, the hydrogen produced by the embodiments of FIGS. **1**–**3** is orthohydrogen. As is well understood by those skilled in the art, orthohydrogen is highly combustible. Therefore, any orthohydrogen produced can be transported from the container **111** through valve **102** and outlet tube **101** to be used by a device such as an internal combustion engine.

The present invention, with sufficient electrodes, can generate hydrogen and oxygen fast enough to feed the gases directly into an internal combustion engine or turbine engine, and run the engine continuously without accumulation and storage of the gases. Hence, this provides for the first time a hydrogen/oxygen driven engine that is safe because it requires no storage of hydrogen or oxygen gas.

FIG. **5** illustrates an exemplary power supply for providing D.C. pulsed signals such as those illustrated in FIGS. **4***a*–**4***c* to the electrodes illustrated in FIGS. **1**–**3**. As will be readily understood by those skilled in the art, any other power supply which is capable of providing the pulsed signals discussed above can be substituted therefor.

The power supply illustrated in FIG. **5** includes the following parts and their exemplary components or values:

Astable circuit	NE555 or equivalent logic circuit
Resistor R2	10K
Resistor R3	10K
Resistor R4	10K
Resistor R5	2.7K
Resistor R6	2.7K
Transistor TR1	2N3904
Transistor TR2	2N3904
Transistor TR3	2N3055 or any high speed, high current silicon switch
Diode D2	1N4007
Capacitors (not shown)	Vcc by-pass capacitors as required.

The astable circuit is connected to the base of transistor TR**1** through resistor R**2**. The collector of transistor TR**1** is connected to voltage supply Vcc through resistor R**5** and the base of transistor TR**2** through resistor R**3**. The collector of transistor TR**2** is connected to voltage supply Vcc through resistor R**6** and the base of transistor TR**3** through resistor R**4**. The collector of transistor TR**3** is connect to one of the electrodes of the cell and diode D**2**. The emitters of transistors TR**1**, TR**2**, TR**3** are connected to ground. Resistors R**5** and R**6** serve as collector loads for transistors TR**1** and TR**2**, respectively. The cell serves as the collector load for transistor TR**3**. Resistors R**2**, R**3** and R**4** serve to respectively ensure that transistors TR**1**, TR**2** and TR**3** are saturated. The diode D**2** protects the rest of the circuit from any induced back emf within the cell.

The astable circuit is used to generate a pulse train at a specific time and with a specific mark-space ratio. This pulse train is provided to the base of transistor TR**1** through resistor R**2**. Transistor TR**1** operates as an invert switch. Thus, when the astable circuit produces an output pulse, the base voltage of the transistor TR**1** goes high (i.e.,close to Vcc or logic 1). Hence, the voltage level of the collector of transistor TR**1** goes low (i.e.,close to ground or logic 0).

Transistor TR**2** also operates as an inverter. When the collector voltage of transistor TR**1** goes low, the base voltage of transistor TR**2** also goes low and transistor TR**2** turns off. Hence, the collector voltage of transistor TR**2** and the base voltage of Transistor TR**3** go high. Therefore, the transistor TR**3** turns on in accordance with the mark-space ratio set forth by the astable circuit. When the transistor TR**3** is on, one electrode of the cell is connected to Vcc and the other is connected to ground through transistor TR**3**. Thus, the transistor TR**3** can be turned on (and off) and therefore the transistor TR**3** effectively serves as a power switch for the electrodes of the cell.

FIGS. **6**–**8** illustrate additional embodiments of the cell which are similar to the embodiments of FIGS. **1**–**3**, respectively. However, each of embodiments of FIGS. **6**–**8** further includes a coil **104** arranged above the electrodes and power supply terminals **107** connected to the coil **104**. The dimensions of the coil **104** can be, for example, 5×7 cm and have, for example, 1500 turns. The coil **104** is submerged under the surface of the water **110**.

The embodiments of FIGS. **6**–**8** further include an optional switch **121** which can be switched on or off by the user. When the switch **121** is not closed, then the cell forms basically the same structure as FIGS. **1**–**3** and thus can be operated in the same manner described in FIGS. **1**–**3** to produce orthohydrogen and oxygen. When the switch **121** is closed, the additional coil **104** makes the cell capable of producing oxygen and either (1) parahydrogen or (2) a mixture of parahydrogen and orthohydrogen.

When the switch **121** is closed (or not included), the coil **104** is connected through terminals **106** and the switch **121** (or directly connected only through terminals **106**) to a power supply so that the coil **104** can a receive a pulsed signal. As will be discussed below, this power supply can be formed by the circuit illustrated in FIG. **9**.

When the coil **104** and the electrodes **105***a*, **105***b* receive pulses, it is possible to produce bubbles of parahydrogen or a mixture of parahydrogen and orthohydrogen. The bubbles are formed and float to the surface of the water **110** as discussed in FIGS. **1**–**3**. When the coil is pulsed with a higher current, a greater amount of parahydrogen is produced. Moreover, by varying the voltage of the coil **104**, a greater/lesser percentage of orthohydrogen/parahydrogen can be produced. Thus, by controlling the voltage level, current level and frequency (discussed below) provided to the coil **104** (and the parameters such as voltage level, current level, frequency, mark-space ratio and waveform provided to the electrodes **105***a*, **105***b* as discussed above) the composition of the gas produced by the cell can be controlled. For example, it is possible to produce only oxygen and orthohydrogen by simply disconnecting the coil **104**. It is also possible to produce only oxygen and parahydrogen by providing the appropriate pulsed signals to the coil **104** and the electrodes **105***a*, **105***b*. All of the benefits and results discussed in connection with the embodiments of FIGS. **1**–**3** are equally derived from the embodiments of FIGS. **6**–**8**. For example, the cells of FIGS. **6**–**8** are self-pressurizing, require no-chemical catalyst, do not greatly heat the water **110** or cell, and produce a large amount of hydrogen and oxygen gases from a modest amount of input power, without bubbles on the electrodes.