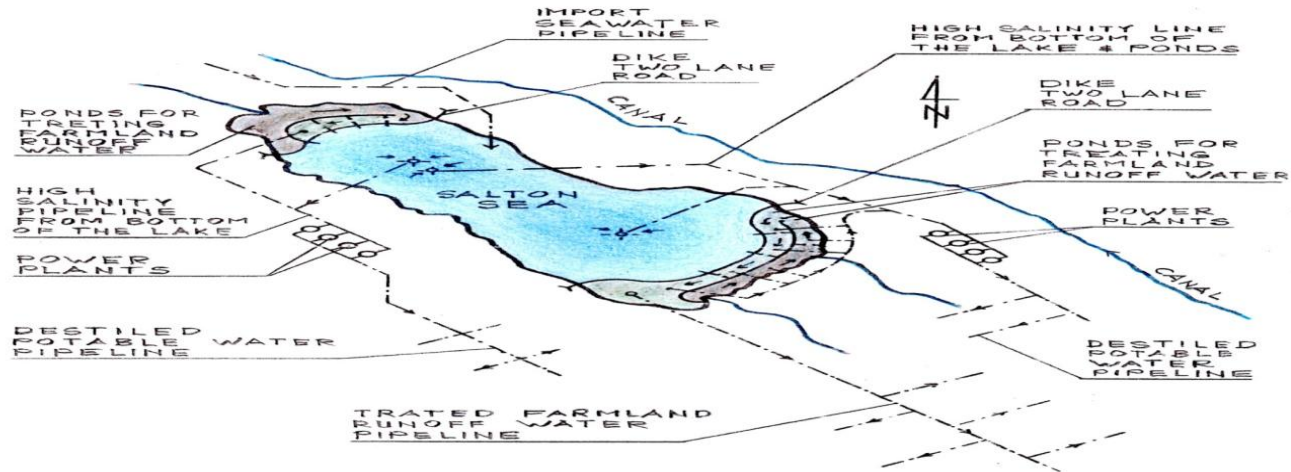


# LIMITLESS ENERGY

Papers for the  
“Request for Information (RFI) for Salton Sea Water Importation Projects”  
by California Natural Resource Agency  
- PowerPoint Presentation - March 9, 2018, Indio, CA



Author: **Nikola N. Lacic**, Graduate Engineer Architect,  
GEOHERMAL WORLDWIDE, INC.  
78-365 Hwy 111, #402, La Quinta, CA 92253  
[www.GeothermalWorldwide.com](http://www.GeothermalWorldwide.com)  
760-347-1609

## **EXECUTIVE SUMMARY:**

### **OVERVIEW OF THE SALTON SEA SITUATION (I)**

- **The Salton Sea is California's largest lake and is presently 50 % saltier than the Ocean. The Salton Sea is a "terminal lake," meaning that it has no outlets. Water flows into it from several limited sources but the only way water leaves the sea is by evaporation.**
- **The lake is shrinking exposing the lake bed and precipitating higher salinity levels and environmental issues as well as a serious threat to its multi- billion-dollar tourist trade.**
- **Under the terms of the Quantification Settlement Agreement (QSA) the lakes decline is set to accelerate starting in 2018. About the 1/3 of inflow water from the canal will be diverted to San Diego and Coachella Valley.**
- **Runoff water from nearby agricultural fields which contains fertilizers, pesticides and other pollutants from Mexicali contaminate Salton Sea and make it an undesirable tourist destination especially for beach goers.**



## OVERVIEW OF THE SALTON SEA SITUATION (II)

- **The lake is 35 miles long, 15 miles wide, and is located south of Palm Springs in a basin 230 feet below sea level.**
- **The Earth's crust at the south end of the Salton Sea is relatively thin. Temperature in the Salton Sea Geothermal Field can reach 680 °F (360 °C) less than a mile below the surface.**
- **There have been many complains and studies about consequences for our community if a solution for the Salton Sea is not found .**
- **There have been several proposals involving importing seawater, but they failed to address the salinity balance and feasibility of the project. It was wishful conventional thinking – implying canals, tunnels, pipelines without addressing the practicality of its implementation and how to pay for it.**
- **This proposal is quite different - it incorporates in final comprehensive design, several patented technologies – that have not been accessible to the authors of previous proposals.**



## **OBJECTIVES OF THE ENCLOSED PROPOSAL FOR RESTORATION OF THE SALTON SEA**

- 1. Raising and stabilizing the lake's waterline level;**
- 2. Preventing further pollution of the lake and treating farmland's runoff waters with natural and plant-based filtration systems – mangrove tree and alike;**
- 3. Providing wildlife sanctuary;**
- 4. Equalizing salinity of the salty terminal lake (Salton Sea) water with salinity of the Ocean.**
- 5. Providing conditions for tourism and making Salton Sea a renewed recreational destination;**
- 6. Harnessing prevalent geothermal source of the Salton Sea Geothermal Field (SSGF) for generation of electricity; and as a byproducts**
- 7. Production of potable water and lithium;**





## PROJECT DESCRIPTION

This proposal has an architectural element which harmoniously incorporates several patented technologies in a functional self-sustaining organism.

- **Phase I** - **Connecting the Salton Sea with the Ocean** (presented are 5 Routs - corridors) with a pipeline 48" (5 pipelines on uphill route and 1 pipeline on downhill route);
- **Phase II** - **Building two main dikes** - One in northern and one in southern part of the Salton Sea and several secondary dikes for forming ponds (wetland) for treatment of farmland's runoff waters.
- **Phase III** - **Building one power plant** using (SCI-GHE) system at one of selected sector;
- **Phase IV** - **Building several more power plants** using (SCI-GHE) system - one in three selected sector; and
- **Phase V** - **Continued buildup** of additional power plants using (SCI-GHE) system at each selected sector;



## DESALINIZATION OF THE SALTON SEA (I):

- **The desalinization of the Salton Sea and salt balance are the primary issues of this proposal.**
- **In order to compensate for evaporation of about 1.25 million acres/feet per year it has to be inflow at least 1.25 million acres/feet per year.**
- **By separating the lake into three sections with two main dikes we can treat existing inflow and reuse it for farmland, which otherwise would be useless for farmland as it merge with the salty water of the lake.**
- **By separating farmland's runoff waters from the central part of the lake, we can fill the central part of the lake with seawater and gradually reduce salinity by extracting higher salinity water from bottom of the lake.**
- **High salinity water (brine) has higher density and has tendency to accumulate at the lowest point(s) at the bottom of the lake where we can access it, pump it up and used in a new design of geothermal power plants for generation of electricity, and as byproducts produce potable water and lithium.**



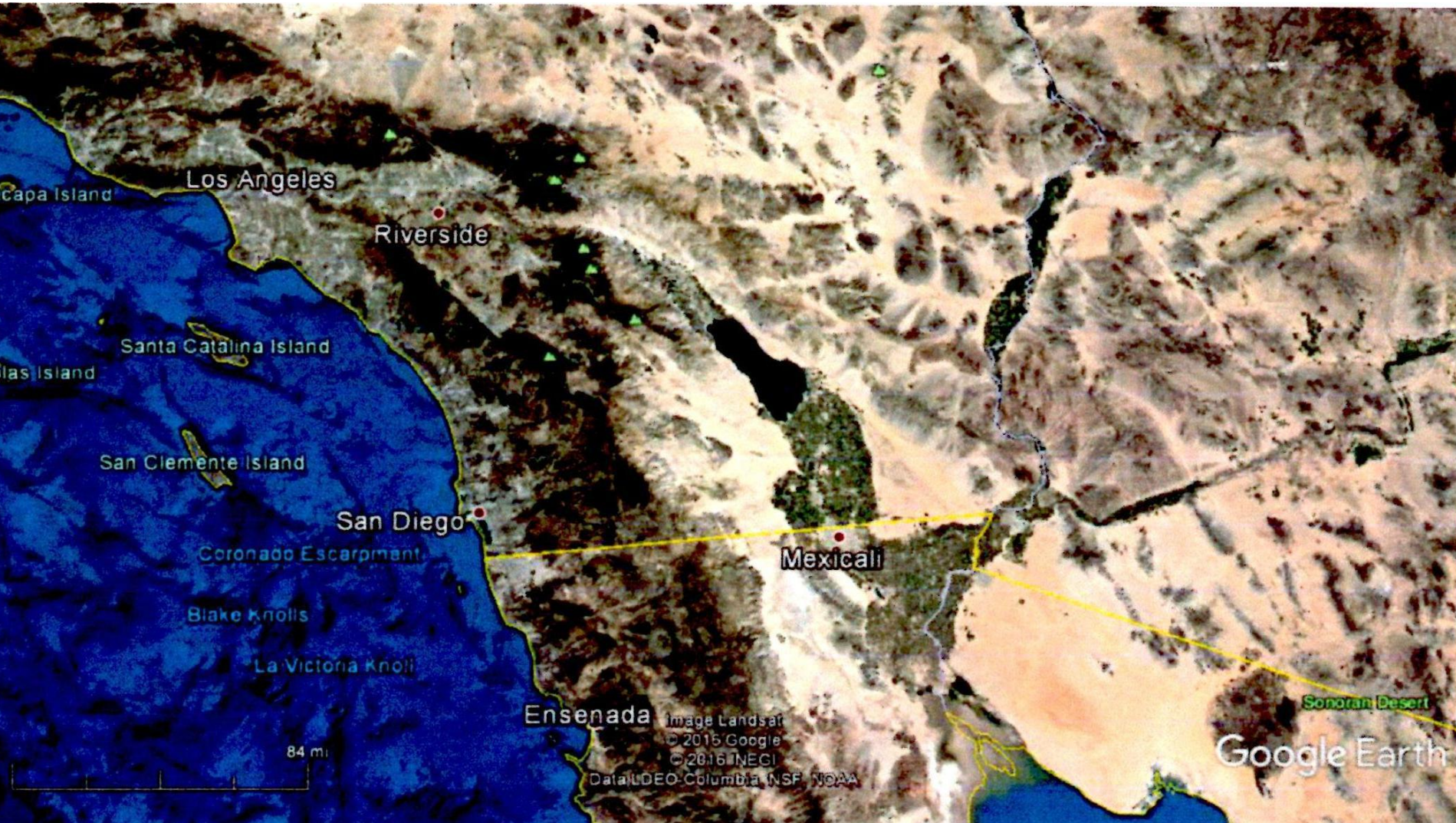
## **DISALINIZATION OF THE SALTON SEA (II):**

- **High salinity water (brine) can be use for forming new geothermal reservoirs in the areas where new geothermal power plants (Scientific Geothermal Technology) are proposed for better conduction of the heat from hot rocks to first heat exchanger.**
- **Optionally, high salinity brine can be use for filing existing geothermal reservoirs;**
- **As an option - We could pump out high salinity water from bottom of the lake with pipeline 24” diameter and disperse it into vast Ocean: A few miles offshore near Carlsbad there is a trench called “Carlsbad Canyon” through which high salinity water would slide slowly into depth of the Ocean and find its way to join existing currents in the vast ocean without negative effect on marine life.**
- **Optionally, we can oxygenate brine on the way to the “Carlsbad Canyon” by injecting air into pipeline in several locations, by compressors.**
- **Hyper saline water – brine - is in sync with natural occurrence in oceans and together with temperature difference the main engine in currents circulation in Oceans - called “deep ocean currents” or thermohaline circulation.**





Southern part of California - the Salton Sea – Pacific Ocean – Gulf of California (Sea of Cortez) - Google map



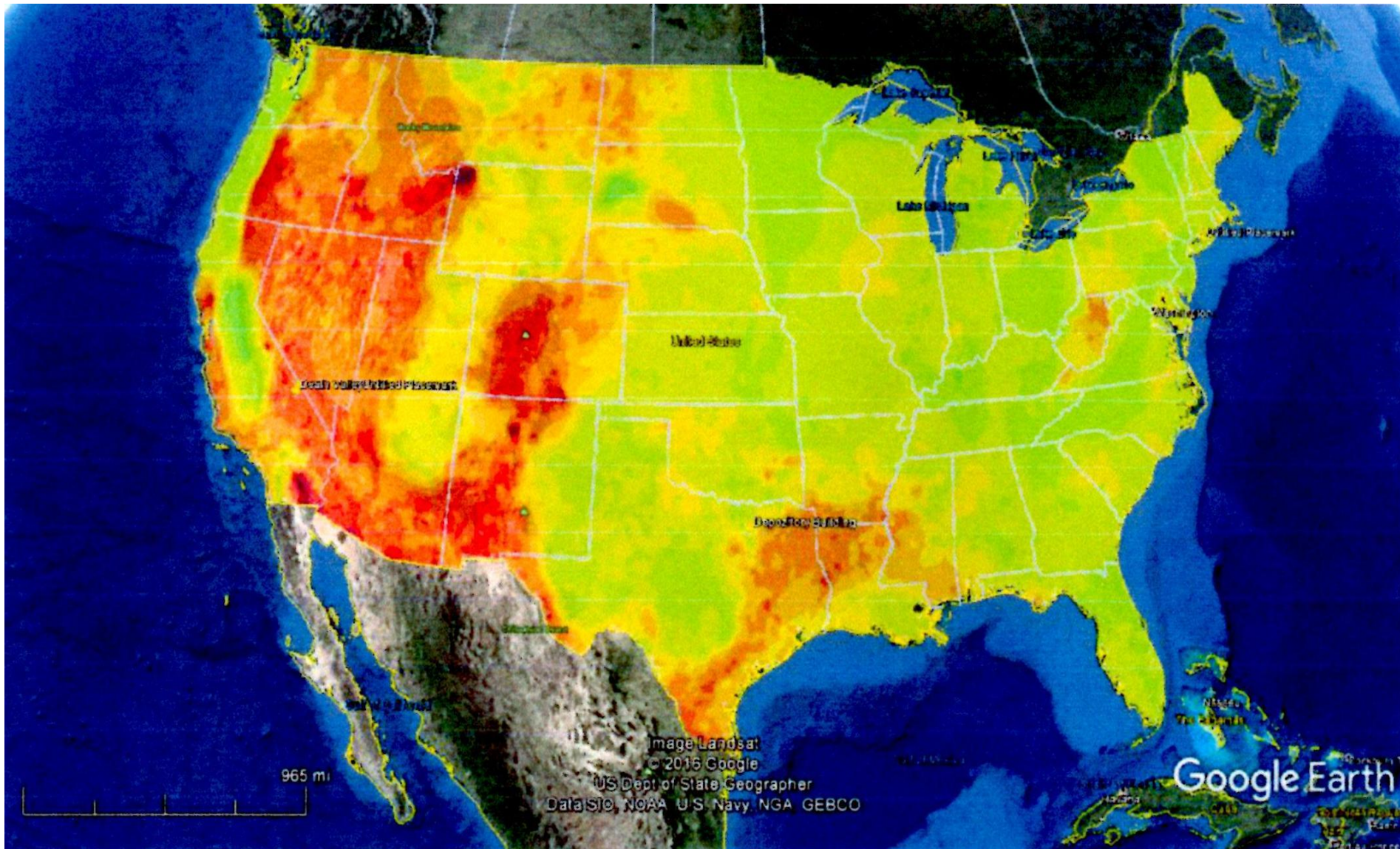


## Dimensions of the Salton Sea - Google map





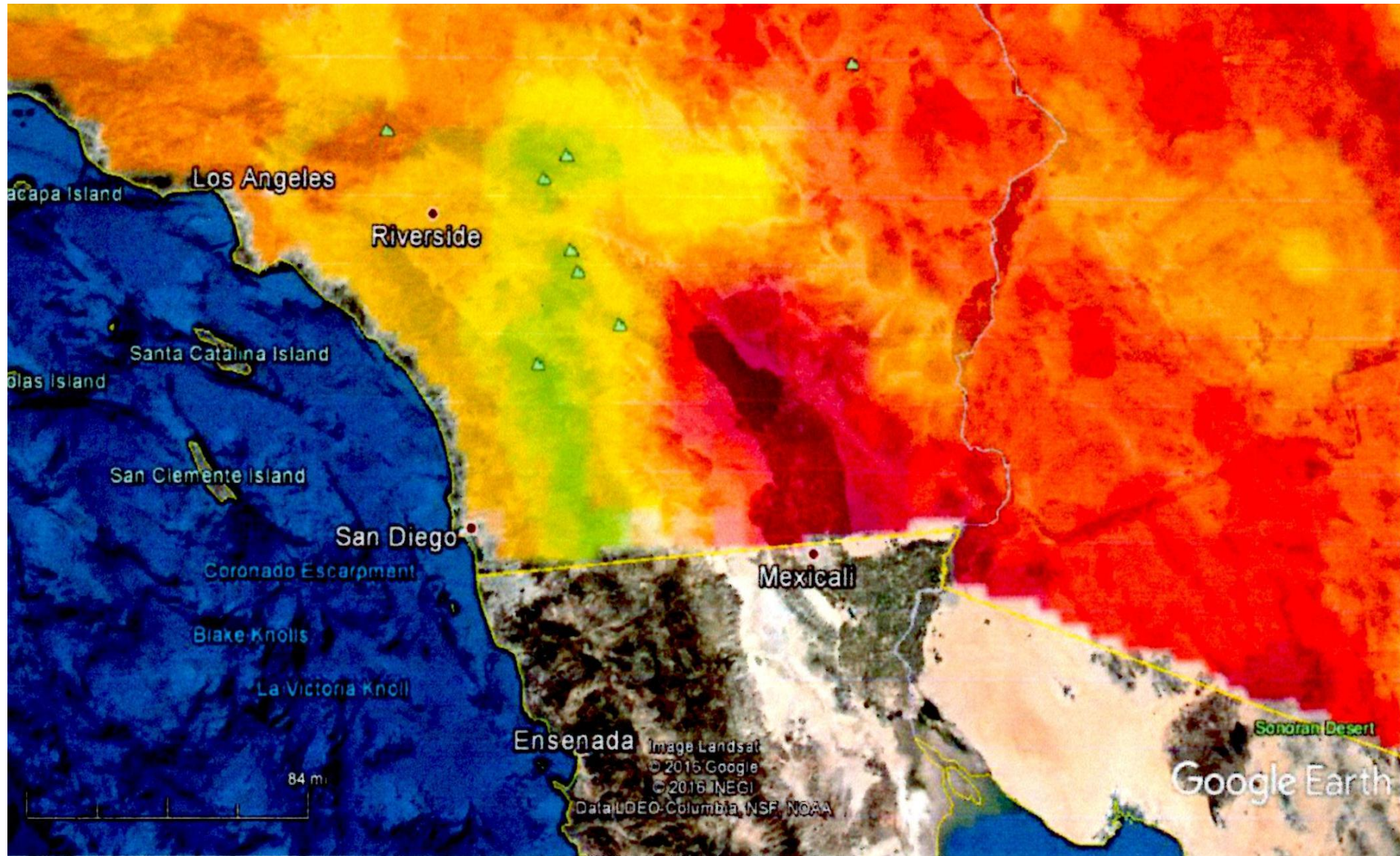
# Geothermal Map – USA – Temperatures at dept of 3.5 km



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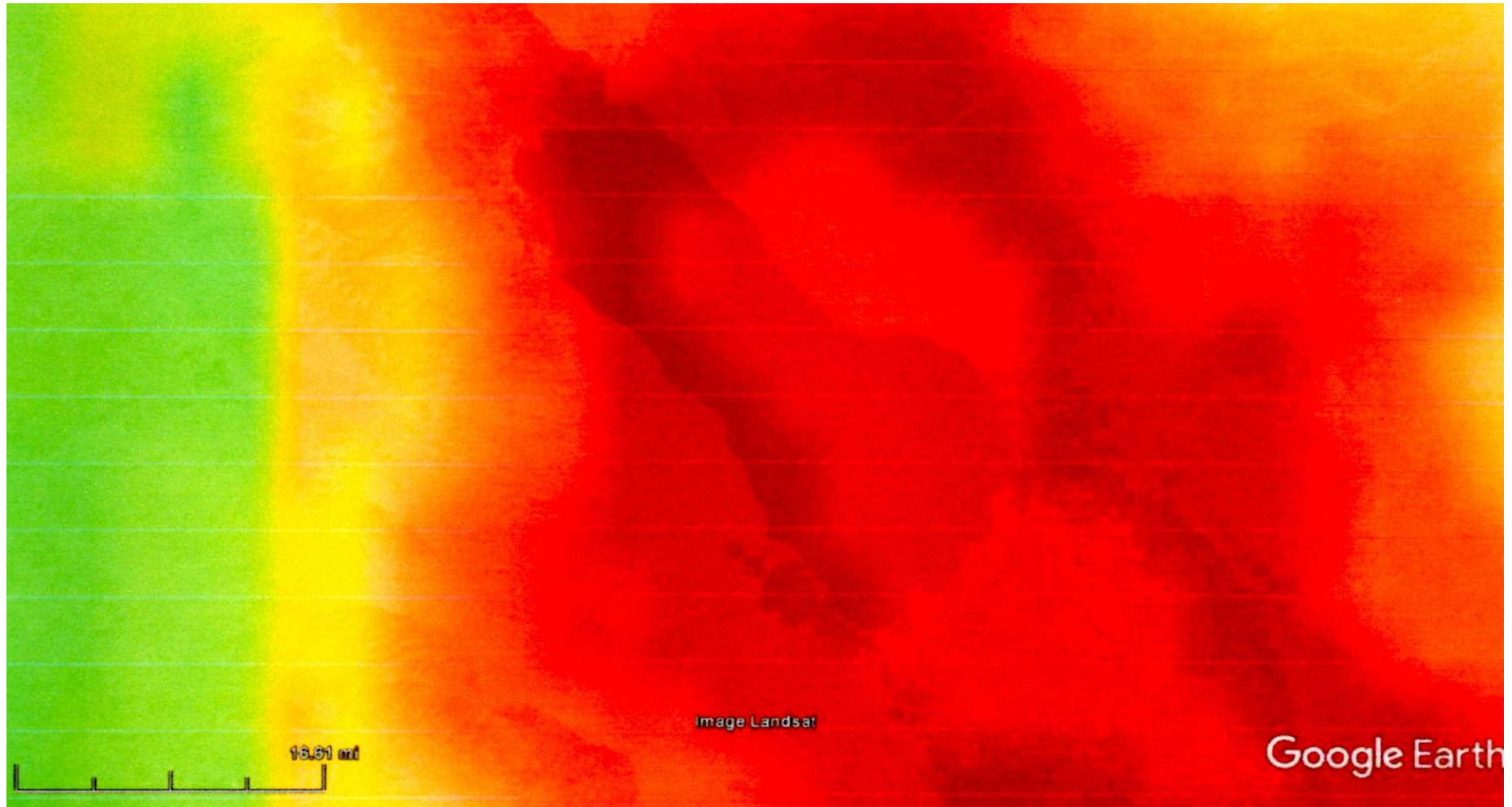


# Geothermal Map – Southern California - Temperatures at dept of 3.5 km



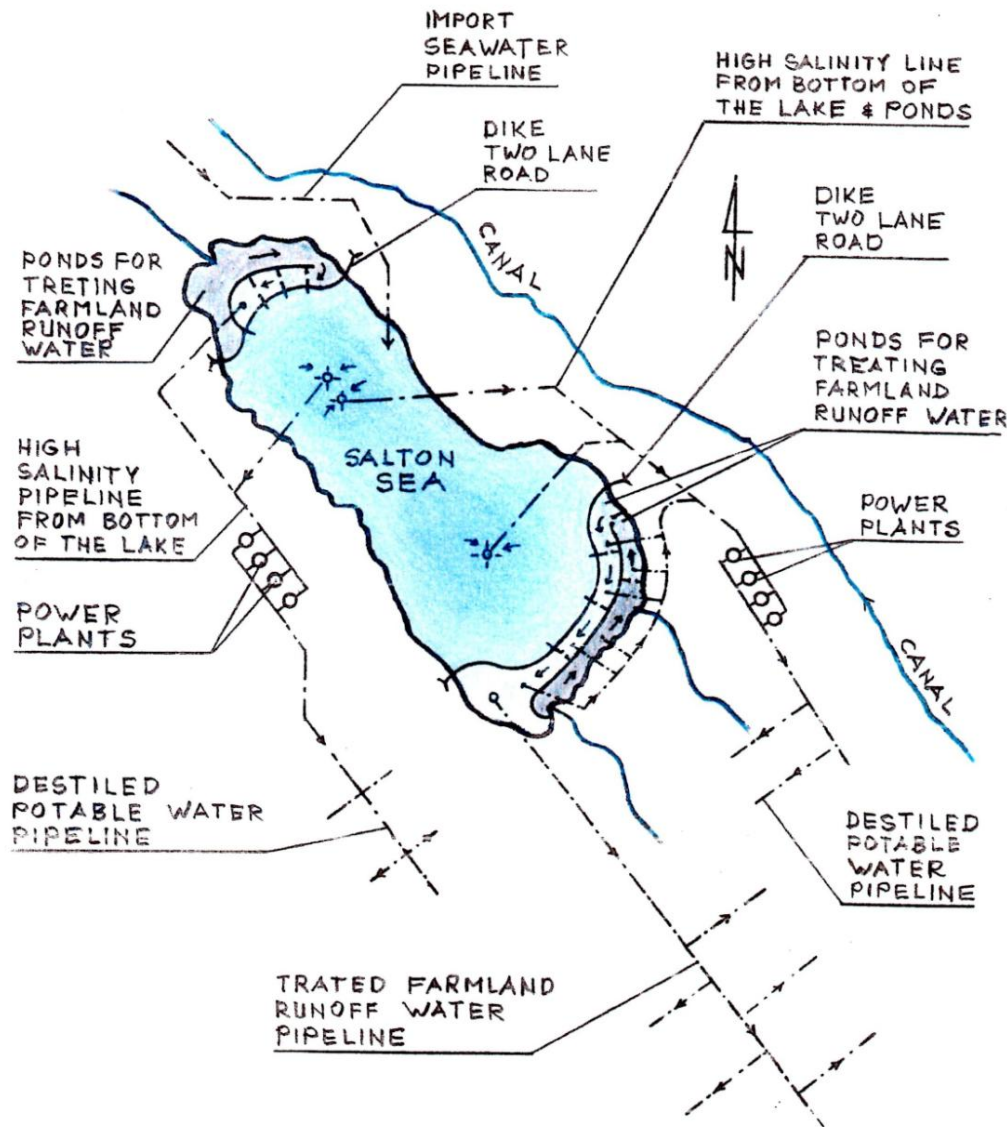


# Geothermal Map – Salton Sea area - Temperatures at dept of 3.5 km





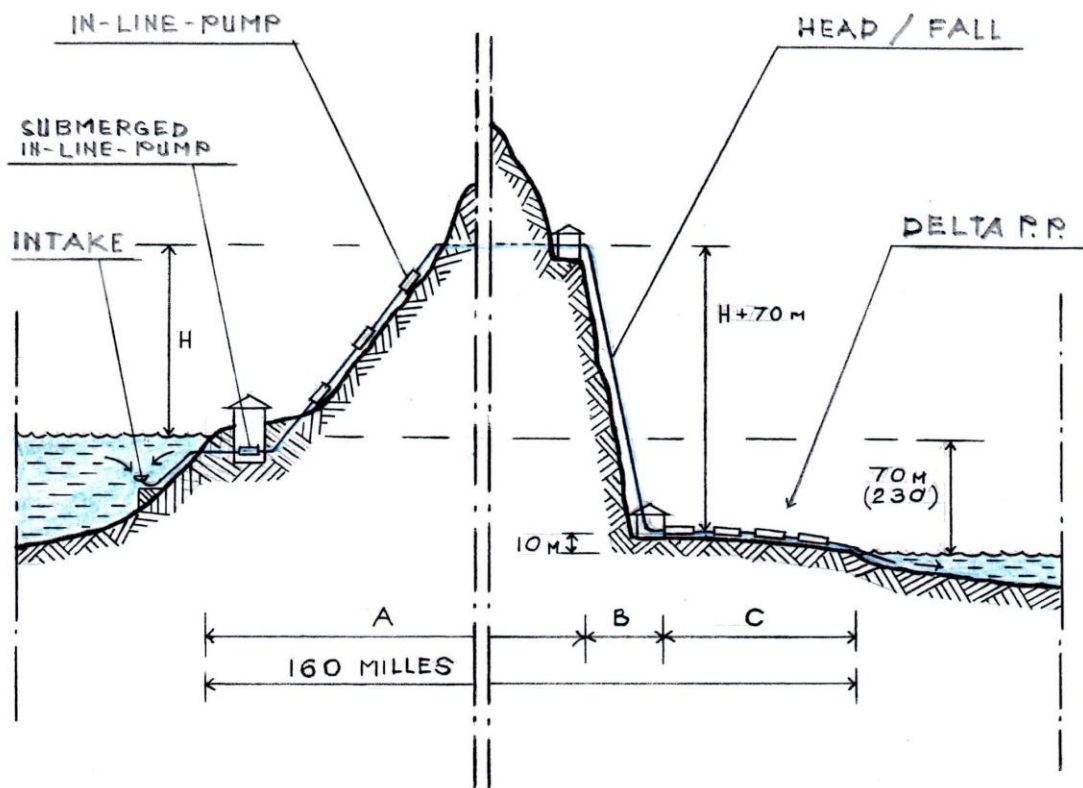
# Summary of the Proposal for Restoration of the Salton Sea – (Phases I-V)



- **Phase I:** Connecting the central section of the Salton Sea with Pacific Ocean with pipelines for controlling waterline level of the lake; and providing conditions for tourism.
- **Phase II:** Production of two sets of dikes – one in northern and one in southern part of the Salton Sea - forming ponds for treatment of farmland's runoff water and providing wildlife sanctuary; and separating (now) seawater in the central part of the lake and preventing its pollution.
- **Phase III:** Production of the first Power Plant using the SCI-GHE system for harnessing geothermal sources for production of electricity and potable water.
- **Phase IV:** Production of two additional power plants on two additional sectors.
- **Phase V:** Continued buildup of subsequent Power Plants at each sector.



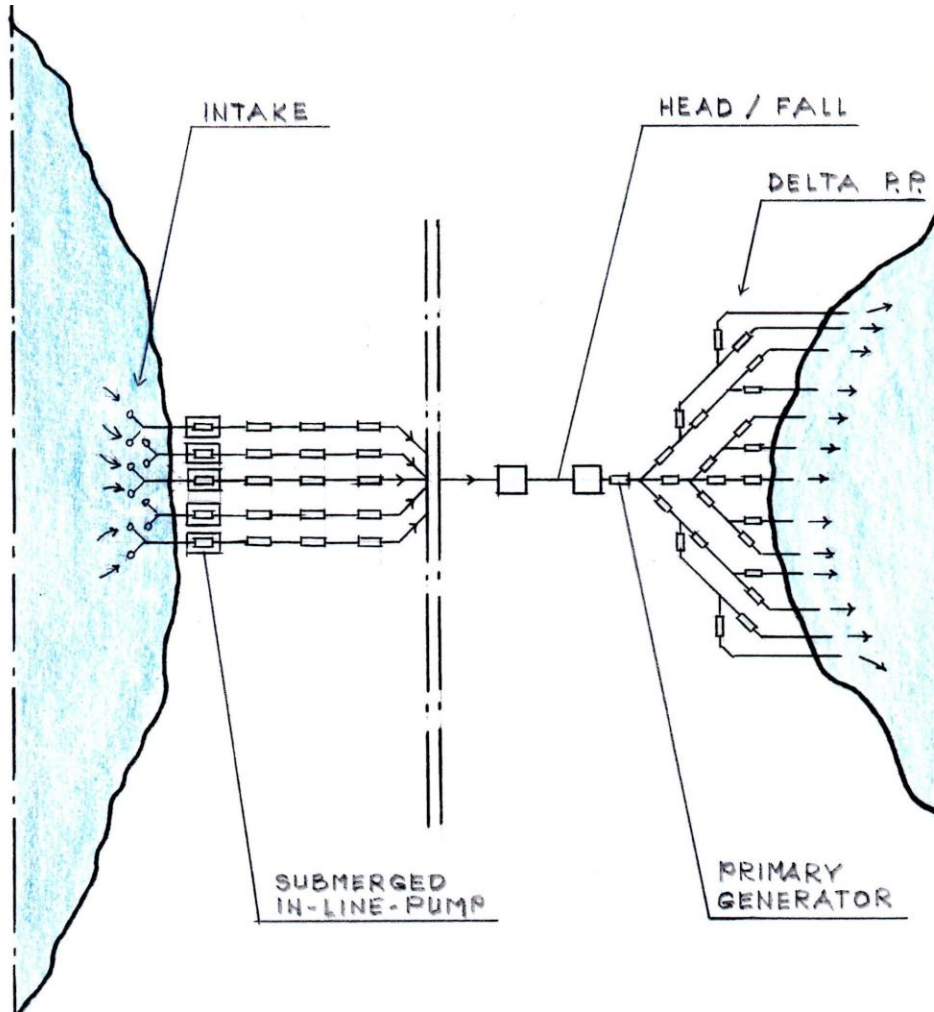
## Typical Cross-section view of Elevation of the Ocean and the Salton Sea



- Salton Sea's water surface is 230' (70 meters) below the surface of the Ocean.
- The first "In-line Pump" is submerged in the Ocean.
- Numerous repetitive segments of the "In-line Pump" are installed in the section "A".
- Numerous segments of the "In-Line-Generators" (Delta Power Plan) are installed in the section "C";



# Typical Cross-section plain view of the proposed pipeline system connecting the Ocean with the Salton Sea



- Salton Sea's water surface is 230' (70 meters) below the surface of the Ocean.
- The first "In-line Pump" is submerged in the Ocean.
- Numerous repetitive segments of the "In-line Pump" are installed in the section "A".
- Numerous segments of the "In-Line-Generators" (Delta Power Plan) are installed in the section "C";



# Route # 1 – Map - Importing seawater from the Ocean to the Salton Sea



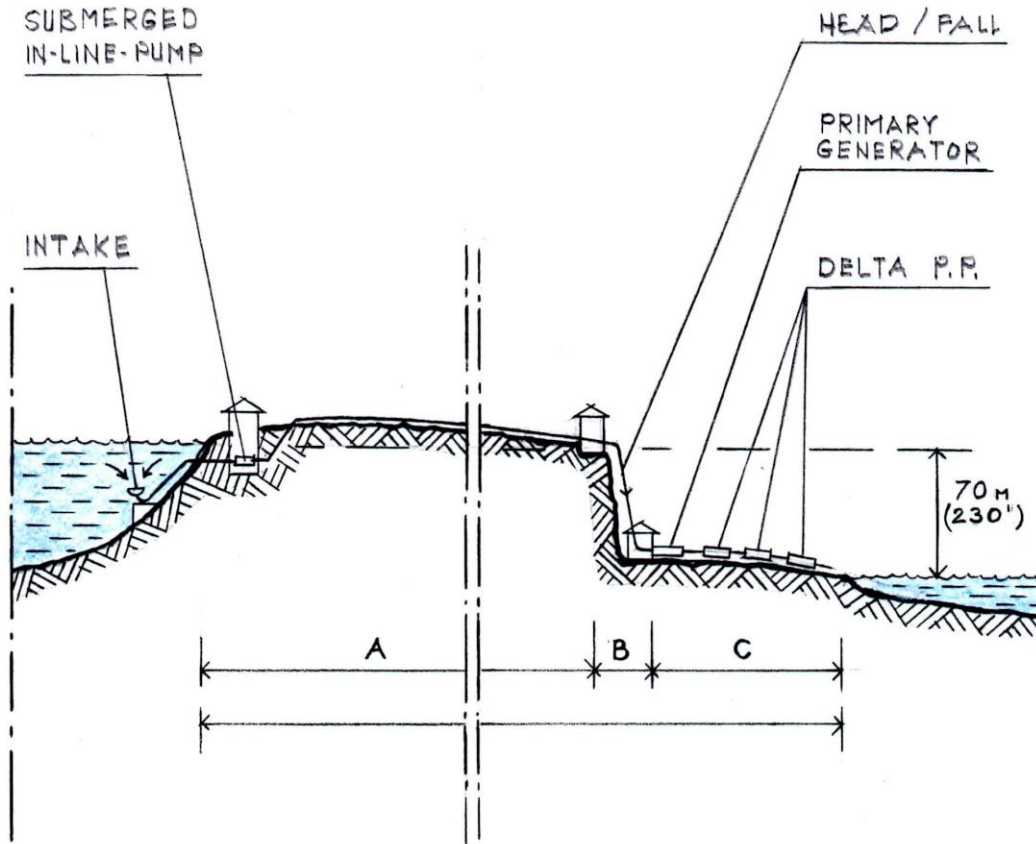
## Route # 1

- Importing seawater from the Gulf of California – corridor: **San Felipe** through **Mexicali**, Mexico, to the **Salton Sea**;
- Elevation to overcome is **35' (10 m)**;
- Pipeline distance is about **150 mile**;
- Cost estimate for pipeline: **\$1.7 B**;
- Cost estimates for TOS: **\$184.8 M**;
- Generated hydro power: **27.3 MWh**;
- Generated solar power: **1,058 MWh**;
- Revenue from TOS: **\$114,349,320**;
- Revenue from hydro: **\$13,759,200**;
- Revenue total: **\$128,108,520**;
- This route also deals with the “**Other Country Issues**” – treaty – purchase of seawater – risk involved, etc.





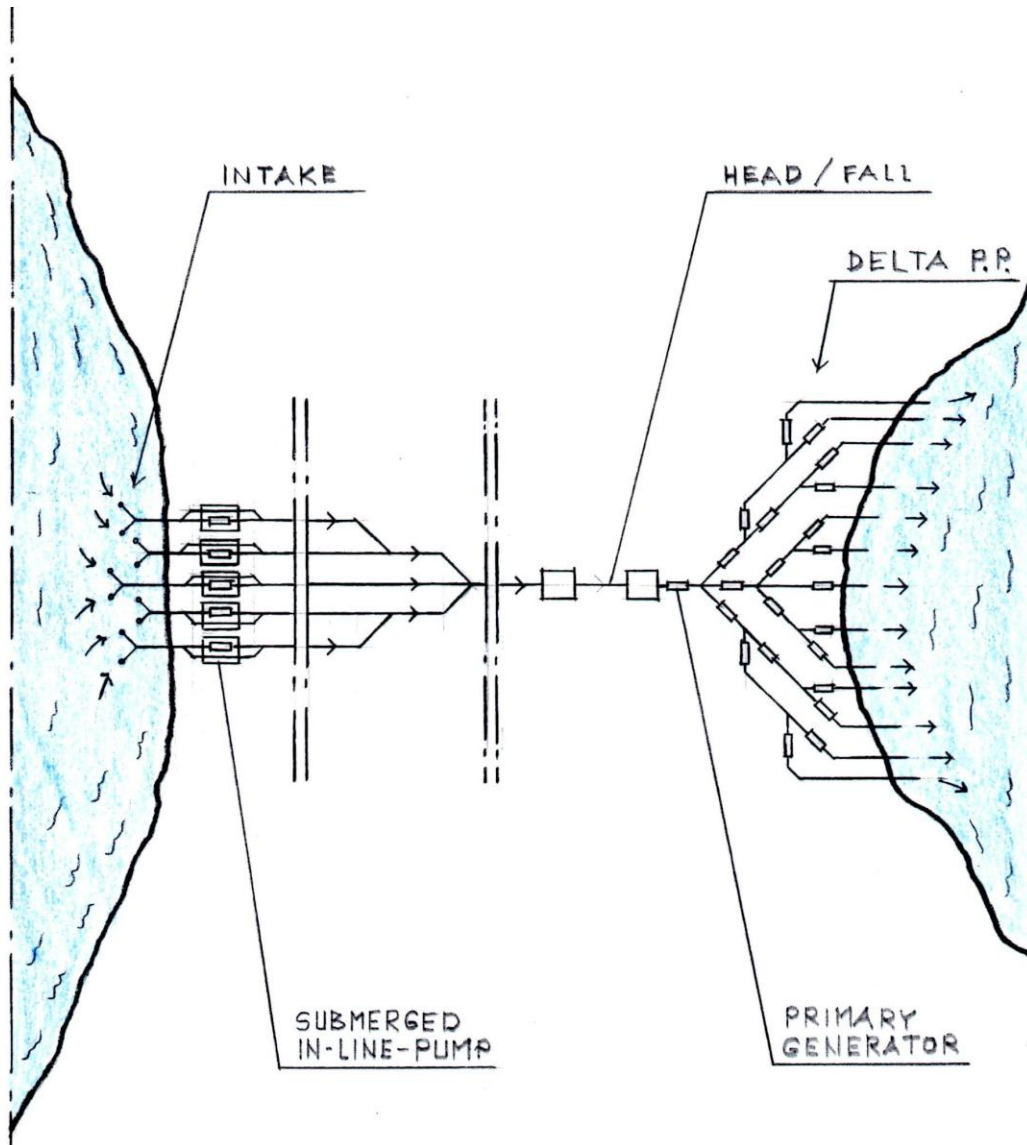
## Route # 1 – Cross-sectional view



- Terrain of the Route #1 (corridor: Salton Sea - Gulf of California) is suitable and would be the **least expensive** option.
- There is the “**Other Country Issue**”;
- Even if treaty with Mexico are reached and route established, I would recommend implementation of one of the USA corridor too.
- It would **reduce dependency** and risk associated with the “other countries issues”.
- It would be relatively **small investment** in comparison to the **revenue and benefits** that whole project would generate in the future.



## Route # 1 – Plain view

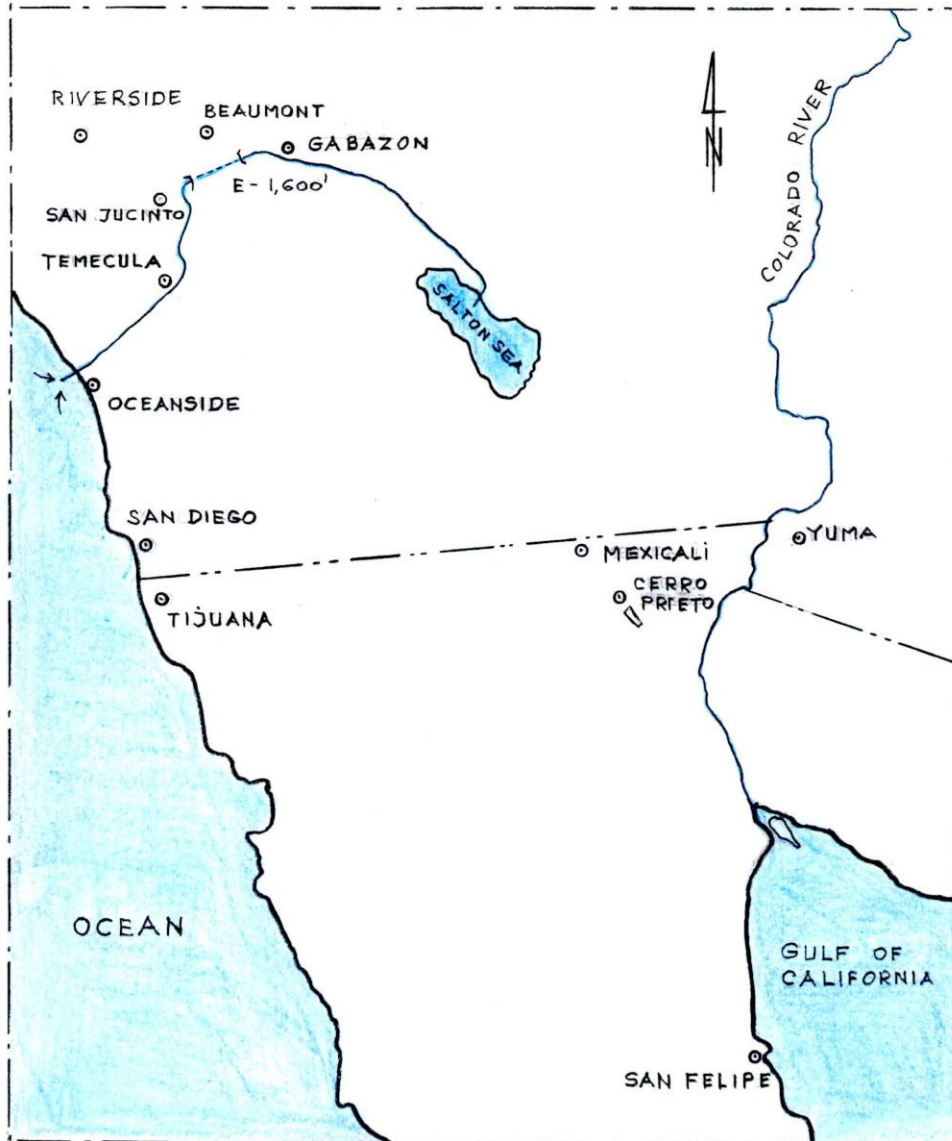


### Route # 1

- Route #1 – corridor: Salton Sea - San Felipe (Gulf of California);
- The Route # 1 has distance of about 150 miles with preferred topography which has an advantage in pipeline cost.
- Assumption \$600 per linear foot.  
One mile 5,280 ' x \$600 = \$3,168,000; =>  
\$3,168,000 x 450 miles relatively flat terrain (50 miles x 5 pipelines + 50 miles x 3 pipelines + 50 miles 1 pipeline) = **\$1,425,600,000**;
- The final cost might increase 20% to about **\$1.7 billion**.
- If implemented a single outflow pipeline 24" the final cost might increase 30%.



## Route # 2 – Map - Importing seawater from the Ocean to the Salton Sea



### Route # 2

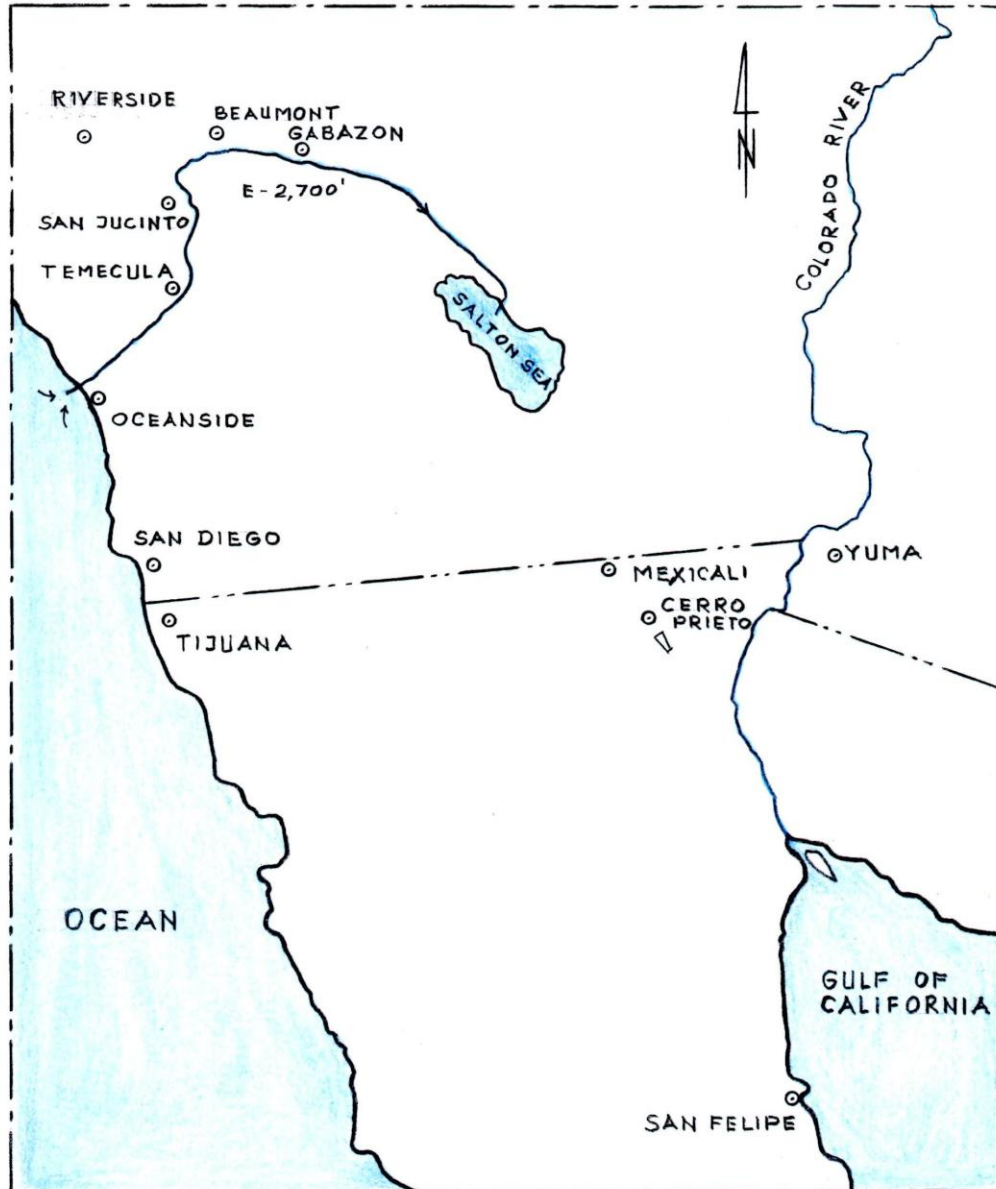
- Importing seawater from the Ocean - corridor - Cabazon (existing tunnel) – San Jacinto – Temecula – Oceanside;
- Elevation to overcome is **1,600' (488 m)**;
- 2 cascades each with 279 m drop and 6 uphill pumping stations;
- Pipeline distance is about 160 miles;
- Cost estimate for pipeline: **\$3.32 billion**;
- Cost estimate for TOS: **\$200 million**;
- Energy needed for operation of the pipeline: **134.5 MWh**;
- Energy generated from TOS: 1,058 MWh;
- Remaining 924.30 MWh to sell;
- Revenue from TOS: **\$99,824,400**;

**EXHIBIT " L "**



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# Route # 3 – Map - Importing seawater from the Ocean to the Salton Sea



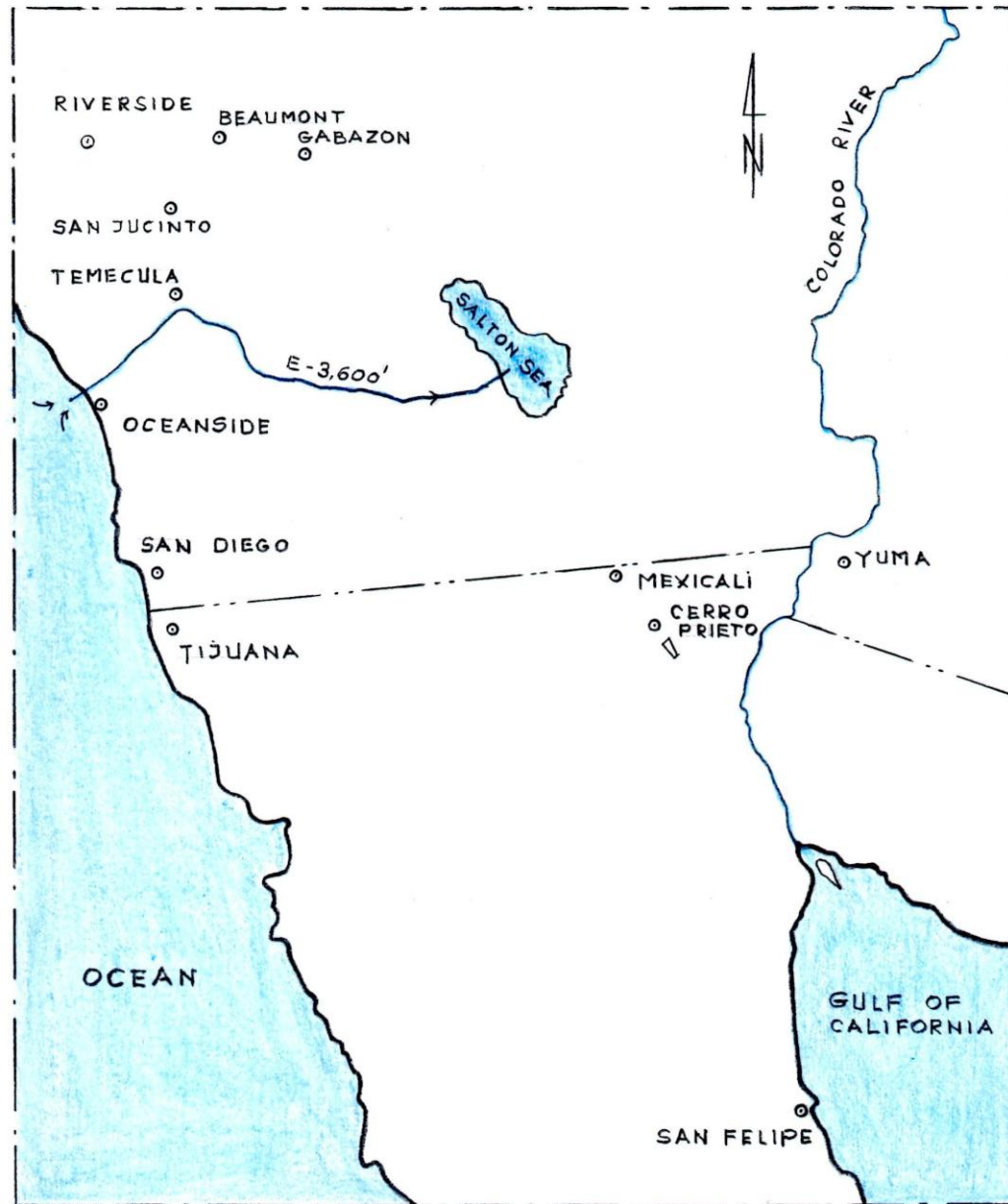
## Route # 3

- Importing seawater from the Ocean - corridor Beaumont – San Jacinto – Temecula – Oceanside.
- Elevation to overcome: 2,700' (823 m). 3 cascades each with 297 m drop and 9 uphill pumping stations.
- Pipeline distance: about 170 miles;
- Cost estimate for pipeline: **\$3.5 billion**;
- Cost estimate for TOS: **\$209.44 million**;
- Energy needed for operation of the pipeline: **275.7 MWh**;
- Energy generated from TOS: 1,124.97 MWh;
- Remaining 849.27MWh to sell;
- Revenue from TOS: **\$91,721,160**;





# Route # 4 – Map - Importing seawater from the Ocean to the Salton Sea



## Route # 4

- Importing seawater from the Ocean – corridor Borrego Springs – Oceanside;
- Elevation to overcome 3,600' (1,097 m);
- 4 cascades each with 292 m drop and 11 uphill pumping stations;
- Pipeline distance: about 100 miles.
- Cost estimate for pipeline: **\$2.22 B**;
- Cost estimate for TOS: **\$123.2 million**
- Energy needed for operation of the pipeline: **380 MWh**;
- Energy generated from TOS: **661.7 MWh**;
- Remaining 281.7 MWh to sell;
- Revenue from TOS: **\$30,423,600**;



# Route # 5 – Map - Importing seawater from the Ocean to the Salton Sea

## Route # 5

- Importing seawater from the Ocean – corridor Long Beach – Whitewater – Salton Sea.
- Elevation to overcome is 2,700' (823 m). 3 cascades each with 297 m drop and 9 uphill pumping stations.
- Pipeline distance: about 200 miles.
- Cost estimate for pipeline: **\$4.118 B;**
- Cost estimate for TOS: **\$246.4 million;**
- Energy needed for operation of the pipeline: **275.7 MWh;**
- Energy generated from TOS: **1,323.49 MWh;**
- Remaining **1,047.80 MWh** to sell;
- Revenue from TOS: **\$113,162,400;**

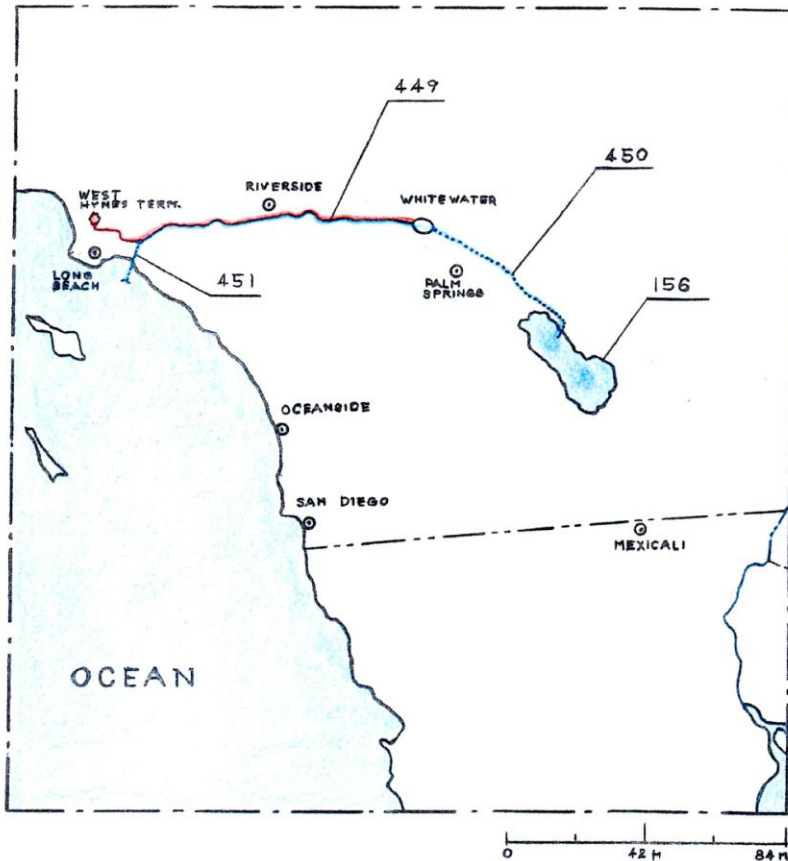
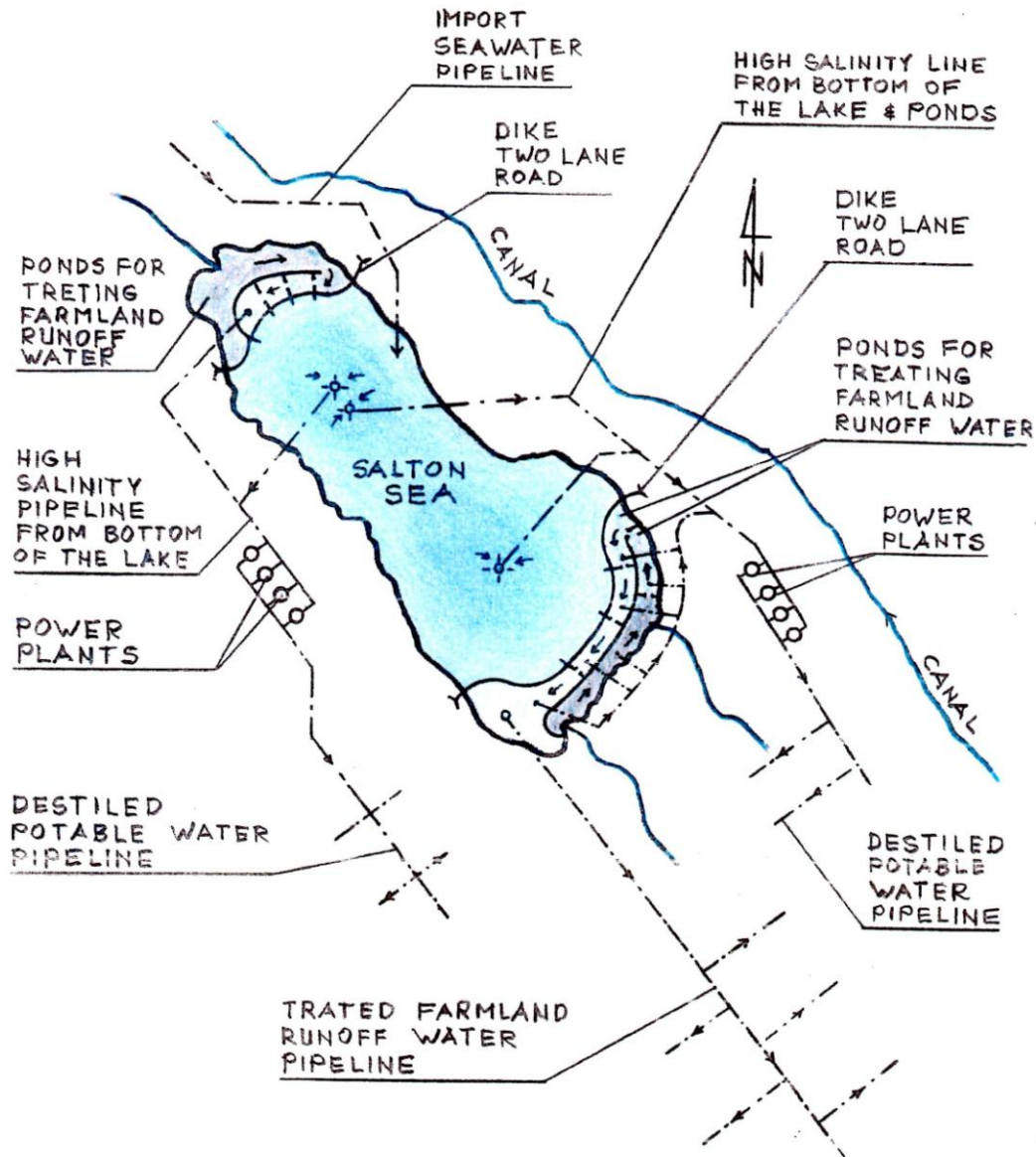


FIG. 54



# Summary of the Proposal for the Restoration of the Salton Sea

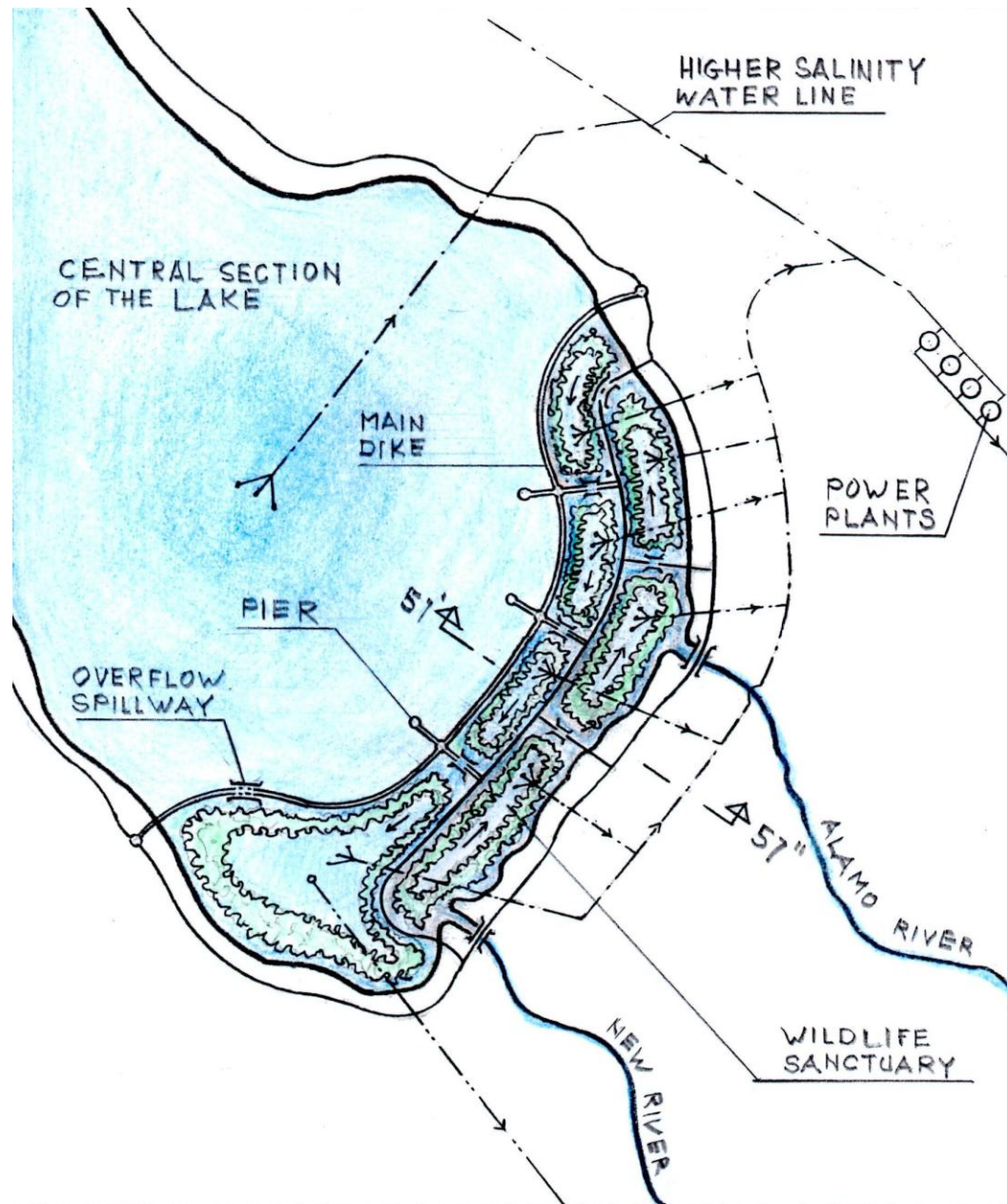


- **Two main dikes** (two lane roads) divides lake in **three** sections – **northern – southern - and central** - preventing pollution of the central section of the lake and **providing conditions for tourism** (hotels, motels, beaches, resorts, etc.) ;
- **Secondary dikes** forms ponds for collecting and treating **farmland's** runoff water and providing **wildlife sanctuary – wetland**;
- **Inflow pipeline** bringing **seawater** from the **Pacific Ocean** (preferably San Diego area) to the **Salton Sea**;
- **Power Plants** – generates **electricity** from prevalent geothermal sources and produces **potable water** and **lithium** as a byproducts.





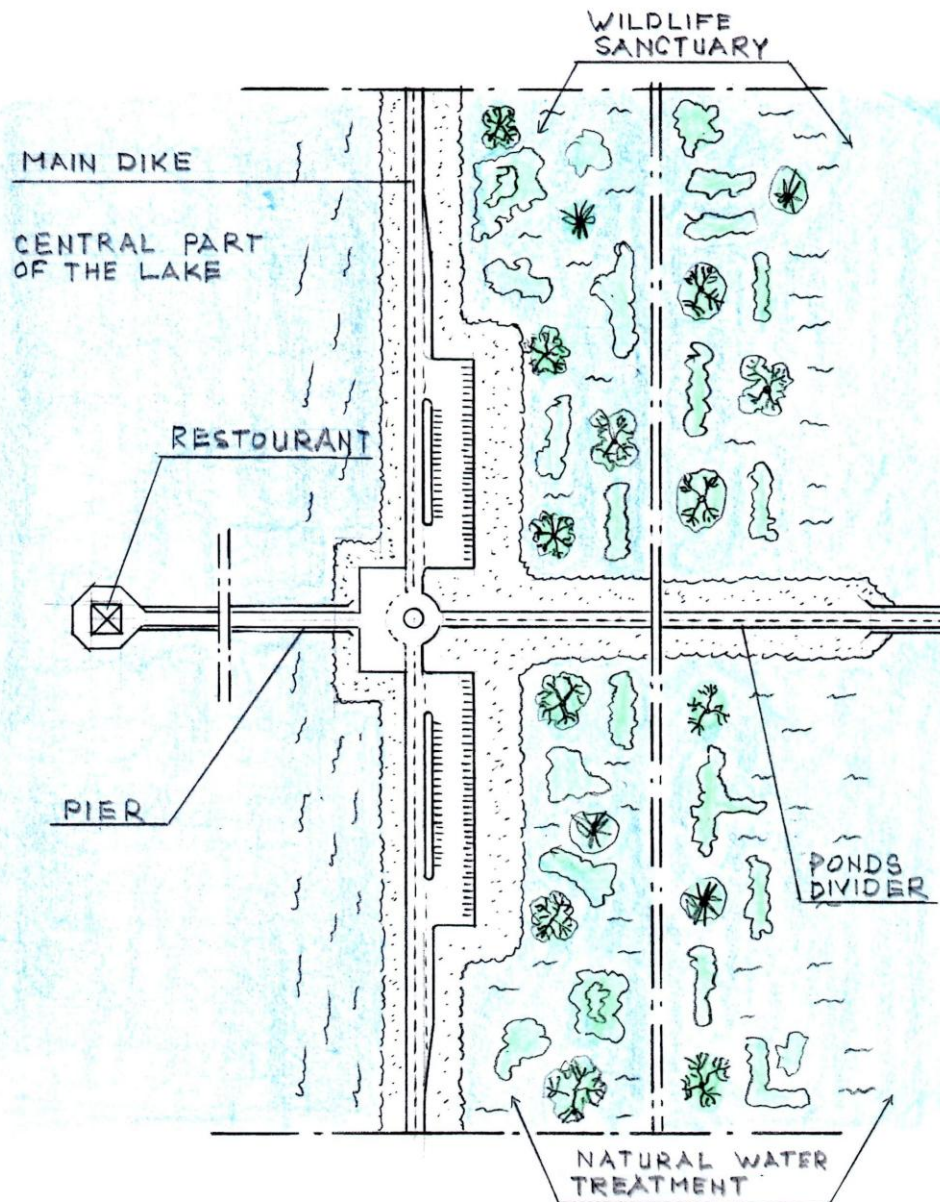
## Enlarged southern part of the Salton Sea – wildlife sanctuary



- **The main dikes** (two lane roads) divides lake into **three sections** – **preventing pollution** of the central section of the lake and **providing** conditions for **tourism**;
- **Secondary dikes** forms **ponds** for collecting and **treating farmland's** runoff water and providing **wildlife sanctuary** – wetland;
- **Wetlands** are planted with **mangrove trees** or alike for **natural filtration** of water;
- **Ponds** are dig in “V” shape to provide **slope** and **deep points** for **segregation** of **higher density** water which is **pumped out** and used in the power plants;



## Plan view of a typical dike-pier intersection

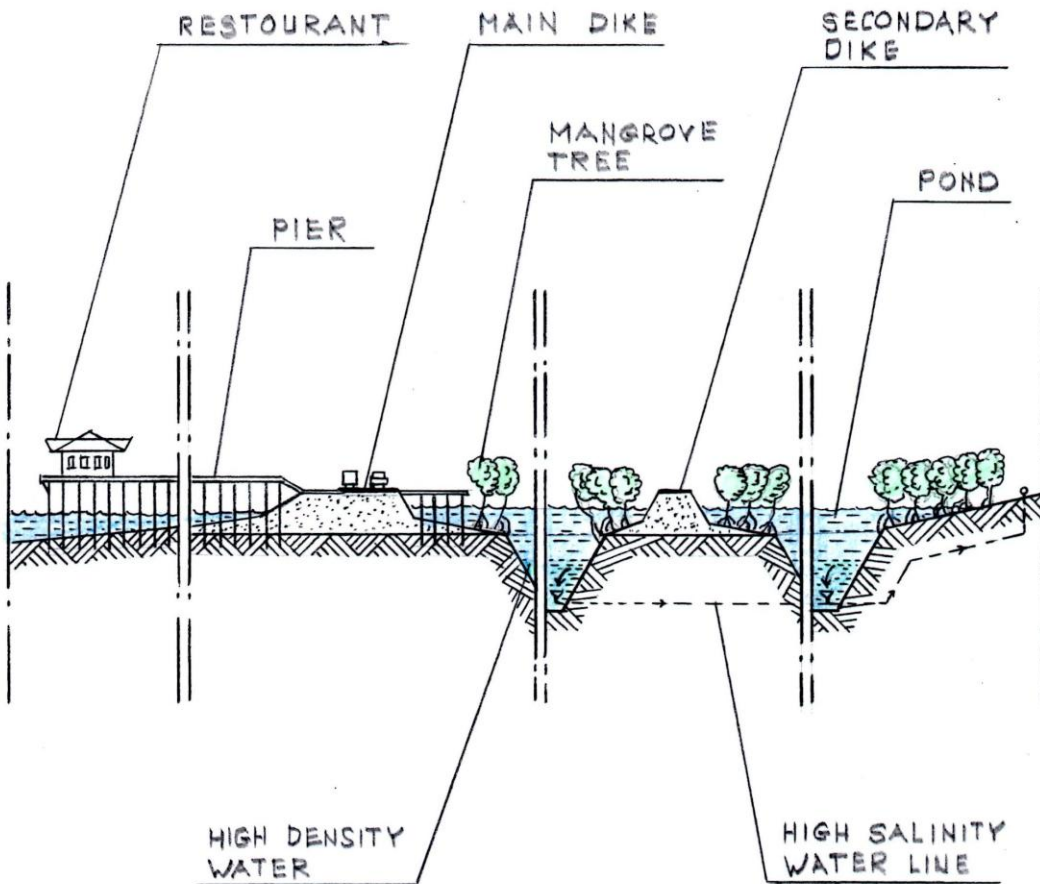


- **The main dikes** (two lane roads) **divides** lake into **three sections** – **preventing pollution** of the central section of the lake **providing** conditions for **tourism**;
- **Secondary dikes** forms **ponds** for collecting and **treating** farmland's runoff water and providing **wildlife sanctuary** – wetland;
- **Wetlands** are planted with **mangrove trees** or alike for **natural filtration** of water;
- **Ponds** are dig in “V” shape to provide **slope** and **deep points** for **segregation** of **higher density** water which is pumped out and used in the power plants;
- There is a **restaurant** on the **pier** and parking places for visitors;





## Cross-sectional view taken near a typical dike-pier intersection and through ponds treatment plant



- The **main dikes** (two lane roads) **divides** lake into **three** sections – **preventing pollution** of the central section of the lake and **providing conditions** for **tourism**;
- **Secondary dike** forms **ponds** for **collecting** and **treating** farmland's runoff water and **providing wildlife sanctuary** – wetland;
- **Wetlands** are planted with **mangrove trees** or alike for **natural filtration** of water;
- **Ponds** are dig in “**V**” shape to provide **slope** and **deep points** for **segregation** of **higher density** water which is pumped out and used in the power plants;
- There is a **restaurant** on the **pier**;



## Plain view of a schematic diagram of an alternative pipeline route connecting Salton Sea with Gulf of California, Mexico

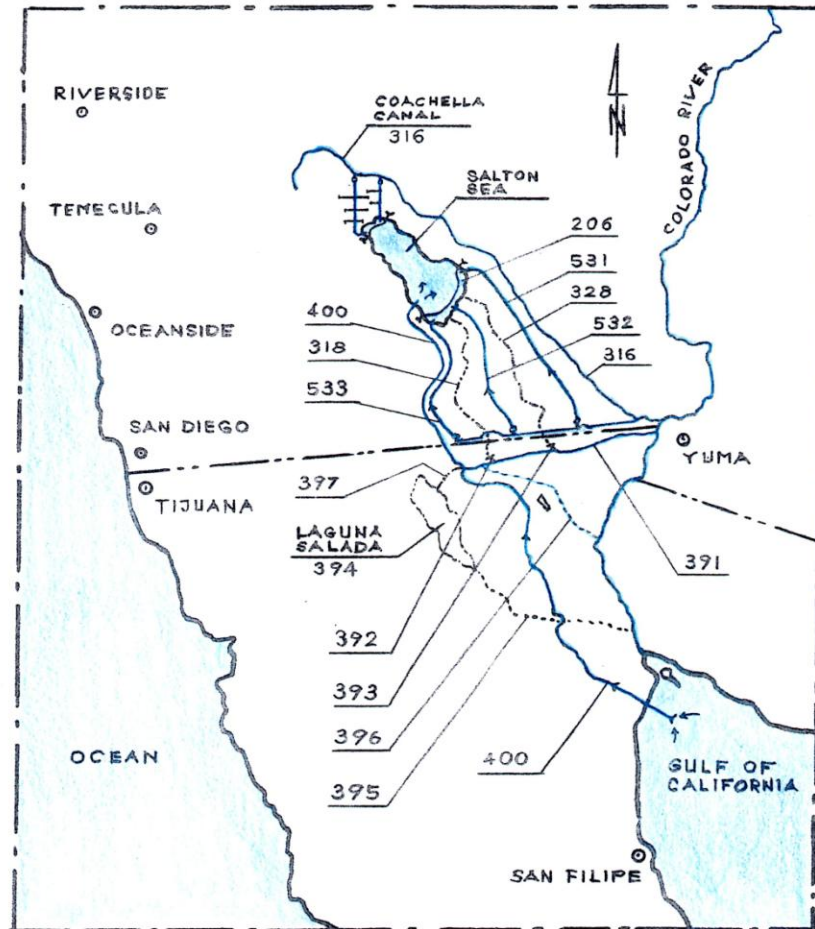


FIG. 86

- Redirection of the New River **318** and Alamo River **328** on Mexican side of the border with two gates **392** and **393** to flow towards Laguna Salada **394**;
- Requires relatively inexpensive earth work (a few miles cut) **397** west of Mexicali, Mexico. ;
- Optional route **396** bypassing Laguna Salada **394** on the way to the Ocean;
- the amount of water for the farmland from All-American Canal can be controlled with valves **536** to be used only as necessary with sprinkler system preventing formation of the runoffs water from farmlands entering the Salton Sea;
- This option requires treaty with Mexico to secure long-term interest of both countries.



# Alternative pipeline system associated with route connecting Salton Sea with Gulf of California, Mexico

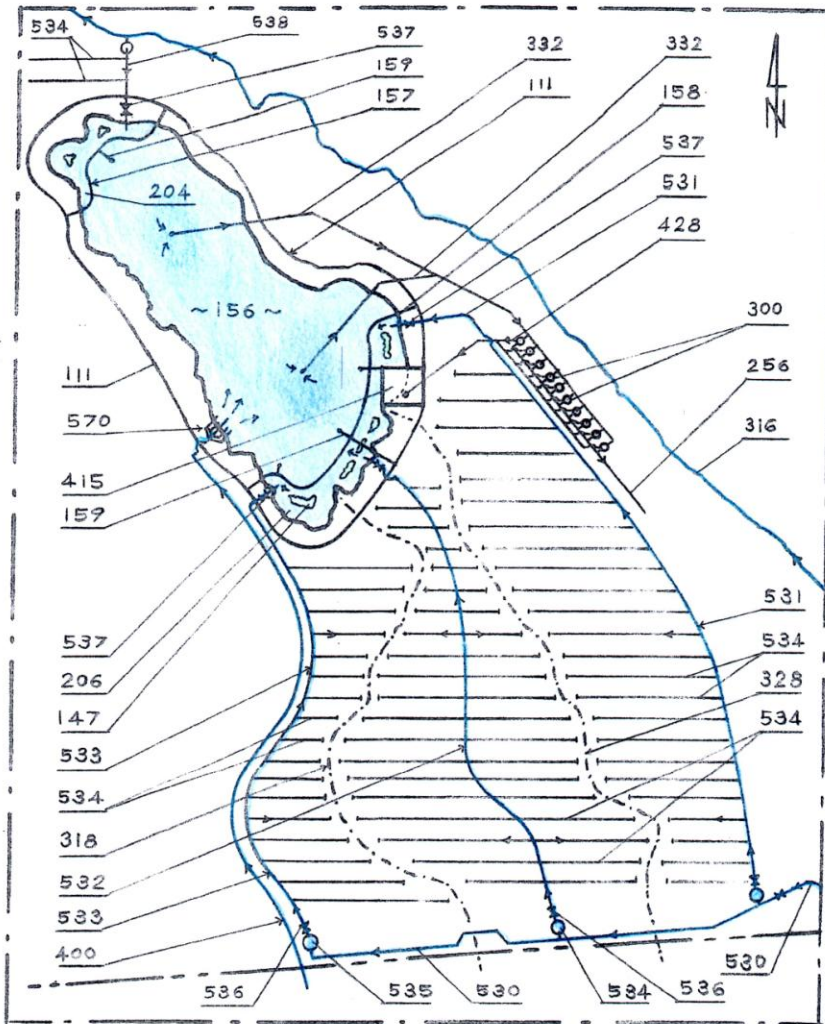


FIG. 87

- System designed for more efficient water conservation to accommodate water restriction and supply to southern section **206** – the wildlife sanctuary;
- The amount of water for the farmland from All-American Canal can be controlled with valves **536** to be used only as necessary with sprinkler system preventing formation of the runoffs water from farmlands entering the Salton Sea;
- Three main pipelines; eastern branch **531**; central branch **532**; and western branch **533**; and secondary pipelines **534** extending from each of three main branches;
- Control valves **536** on beginning and control valves **537** on their ends.





## Plan view of a typical dike-pier intersection

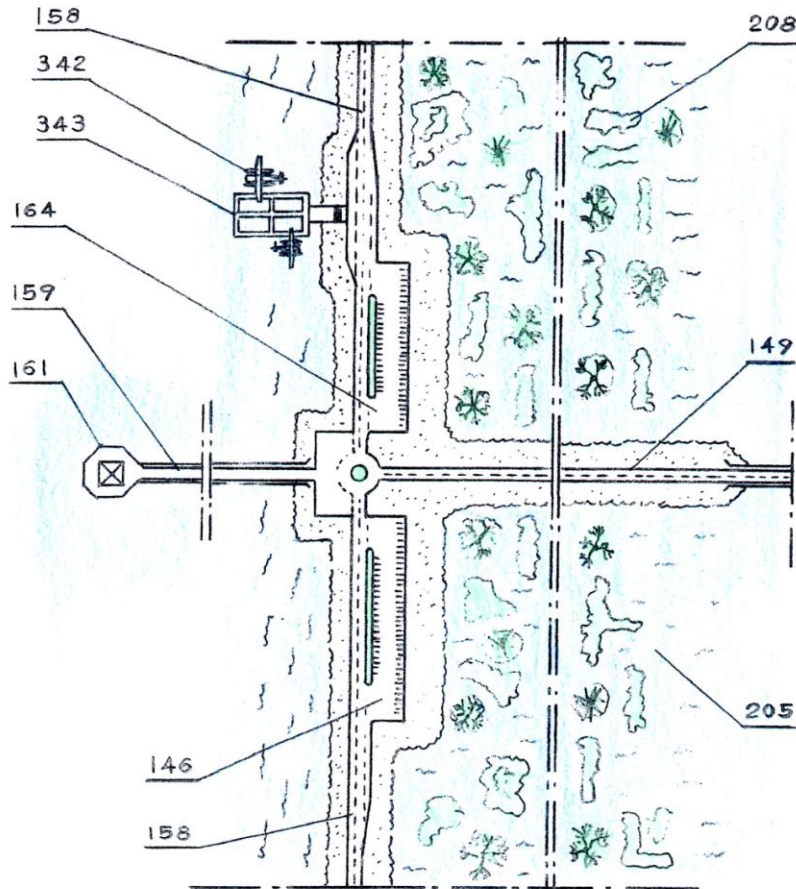


FIG. 57

- **The main dikes** (two lane roads) **divides** lake into **three sections** – **preventing pollution** of the central section of the lake **providing** conditions for **tourism**;
- **Secondary dikes** forms **ponds** for collecting and **treating** farmland's runoff water and providing **wildlife sanctuary** – wetland;
- **Ponds** are dig in “**V**” shape to provide **slope** and **deep points** for **segregation** of **higher density** water which is selectively pumped out and used in the power plants;
- There is a **restaurant** on the **pier** and parking places for visitors;
- There is airport for amphibian airplanes;



## Enlarged southern part of the Salton Sea – wildlife sanctuary

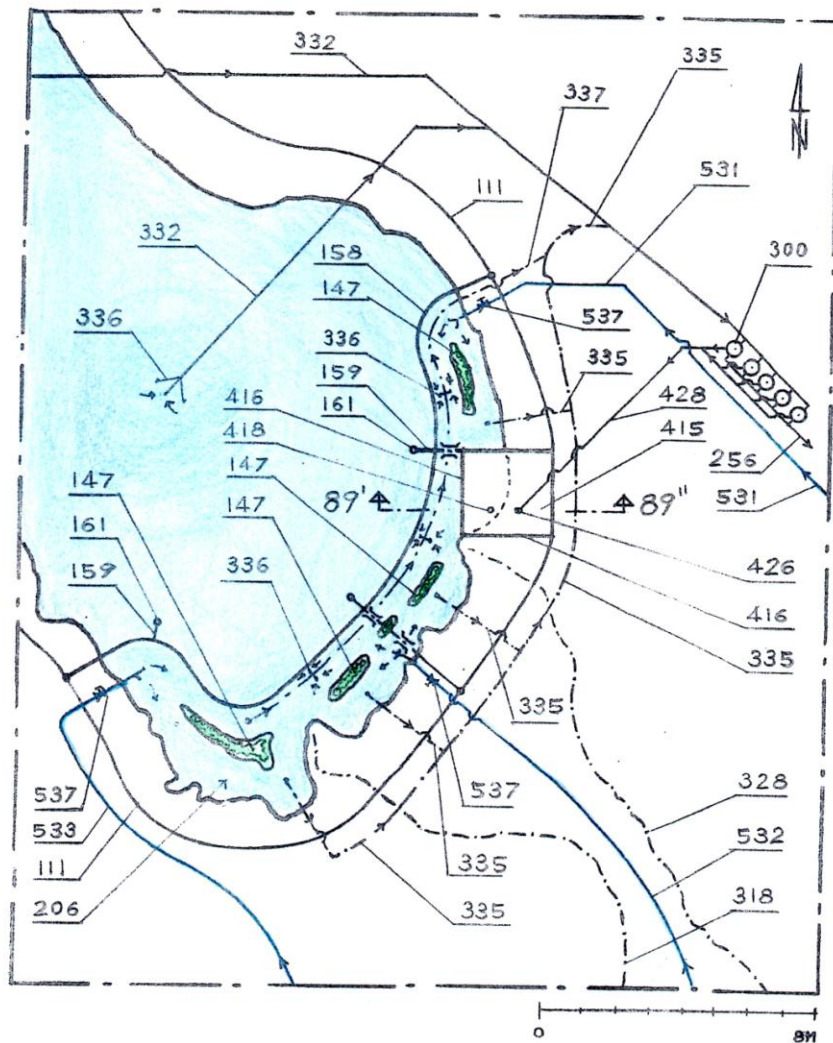


FIG. 88

- The southern section of the lake **206** (wild life sanctuary) with an area **415** surrounded with a levy (dike) - two lain road **416**, to form dry land **415** and secure development of a conventional geothermal power plant **427** at the area of known geothermal reservoir;
- If needed, the waste material from power plant **300** can be diluted with water from pipelines **332**, **335** or **337** before being injected into geothermal reservoirs.
- Three main pipelines **531**, **532** and **533** with control valves **537** for providing and circulating water in the southern section of the lake **206** (the wild life sanctuary).
- There is a **restaurant** on the **pier**;
- There are islands for birds **147**;



## Cross-sectional view 89'-89" taken near a typical dike-pier intersection

- The **main dikes** (two lane roads) **divides** lake into **three** sections – **preventing pollution** of the central section of the lake and **providing conditions for tourism**;
- **Wetlands** are planted with **mangrove trees** or alike for **natural filtration** of water;
- **Ponds** are dig in “**V**” shape to provide **slope** and **deep points** for **segregation of higher density** water which is pumped out and used in the power plants;
- The injection well **426** can be used for depositing waste material from power plant **300** with high salinity water through pipeline **428** into depleting geothermal reservoir.
- There is a **restaurant** on the **pier**;

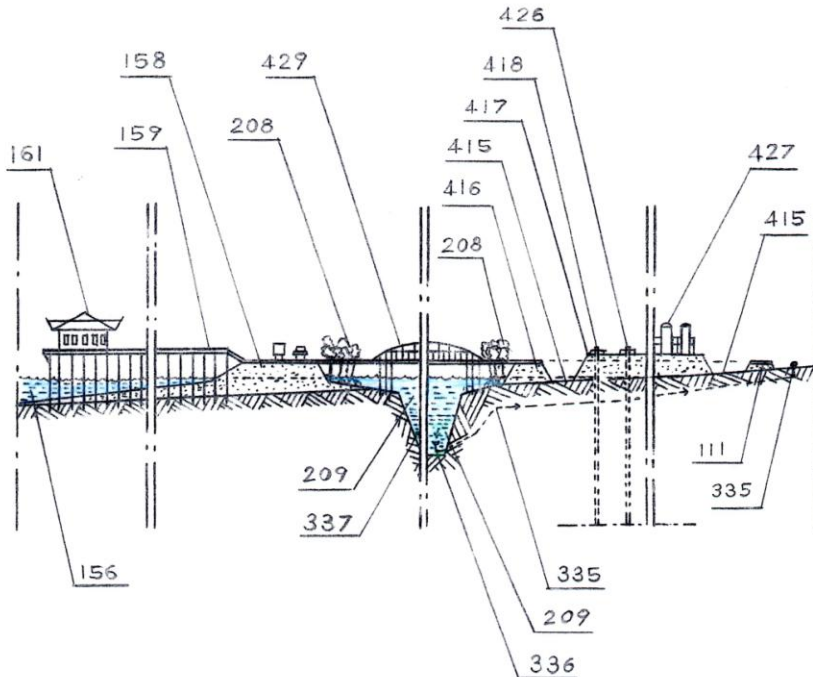


FIG. 89





## Enlarged northern part of the Salton Sea – wildlife sanctuary

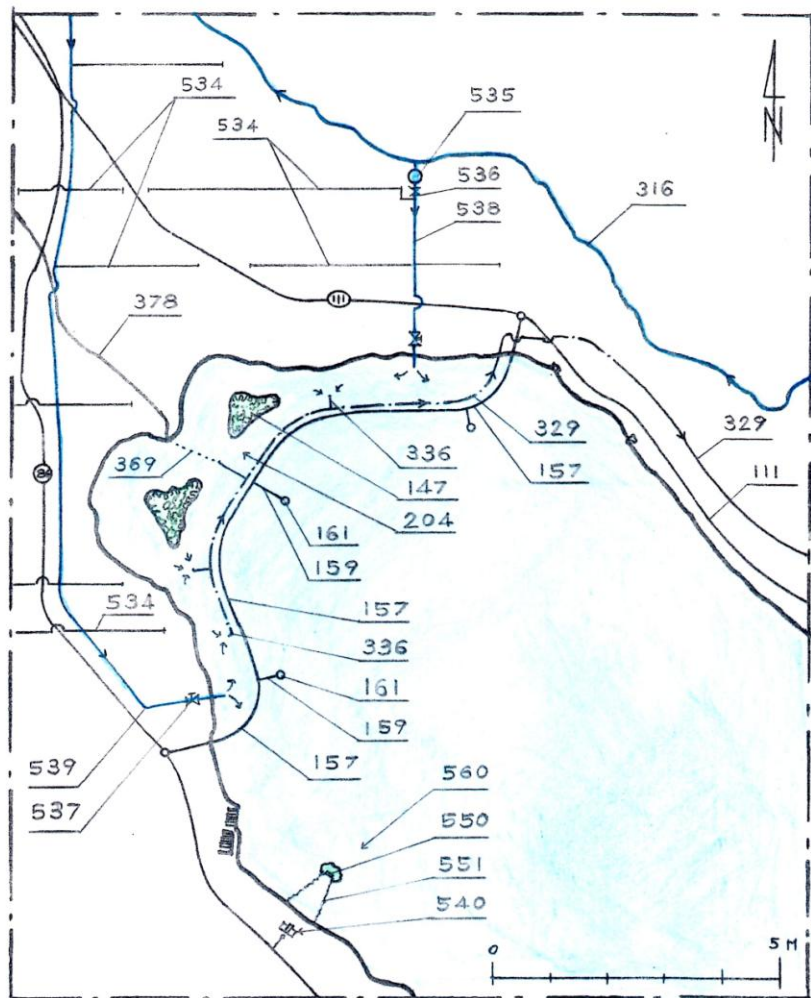


FIG. 90

- The **main dikes** (two lane roads) **divides** lake into **three** sections – **preventing pollution** of the central section of the lake and **providing conditions for tourism**;
- Pipelines **538** and **539** distributing water to secondary pipelines **534** using sprinkler system for final distribution of water to farmland.
- The amount of water for the farmland can be controlled with valves **536** and **537** to be used only as necessary;
- There is a **restaurant** on the **pier**;
- Possible location of a Hotel Resort **540** with a section in the Salton Sea with the tower **550** to be built on manmade island **560** which contain a mechanism for generation of waves for surfing;



## Plan view of a typical Hotel Resort

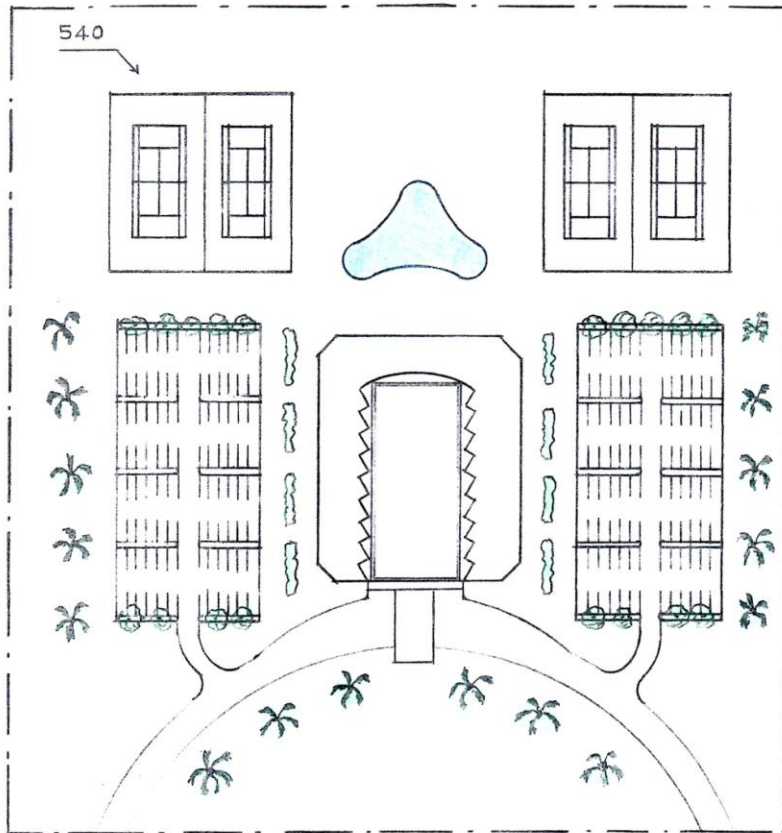


FIG. 91

- Hotel Resort **540** with a section in the Salton Sea with the tower **550** to be built on manmade island **560** which contain a mechanism for generation of waves for surfing;



## Plan cross-section view of a wave generating facility

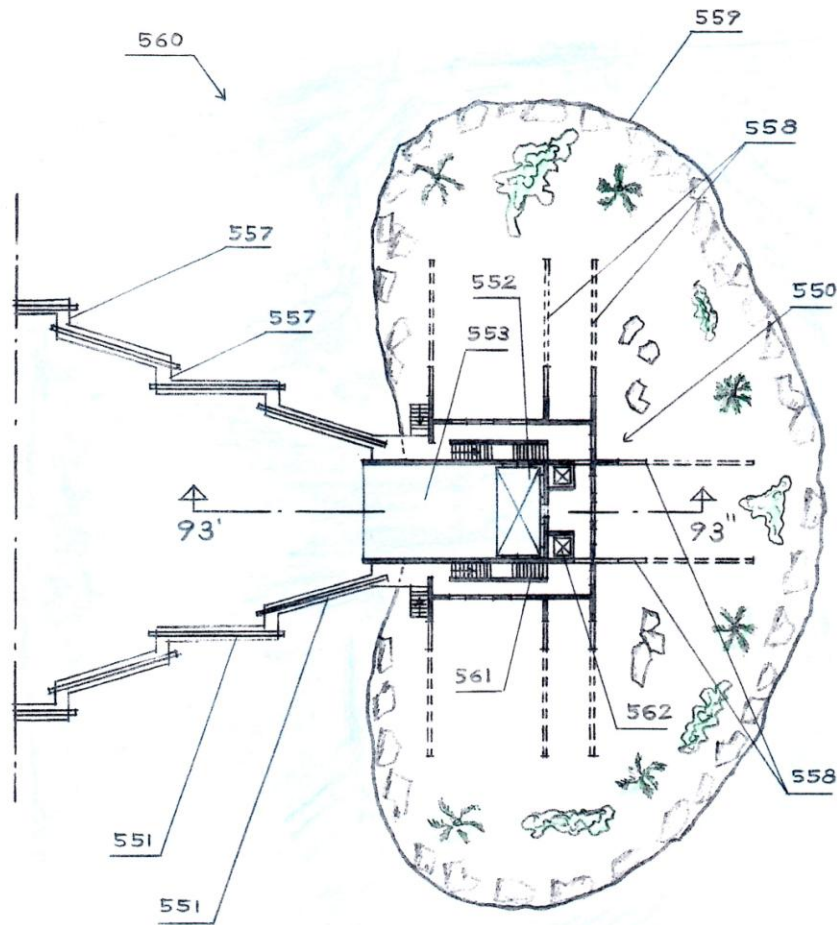


FIG. 92

- Tower **550** to be built on manmade island **559** which contain a mechanism for generation of waves for surfing;
- Tourist attraction;
- Possible International surfing events;



## Cross-section view of a wave generating facility

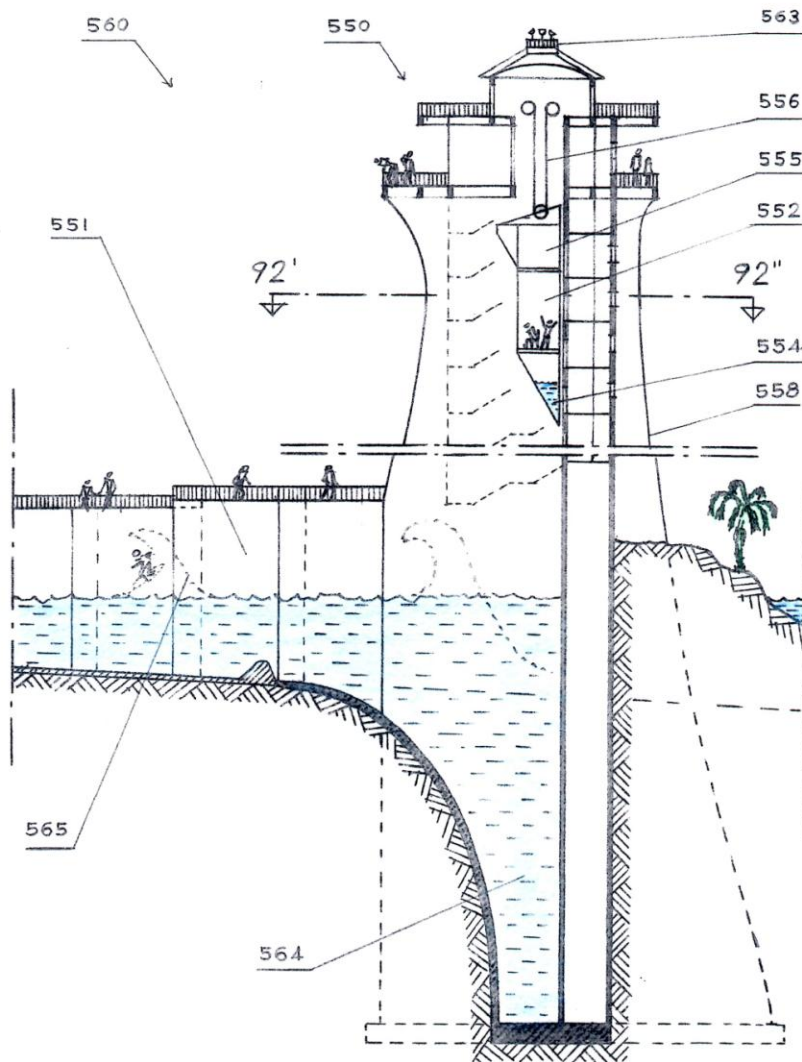
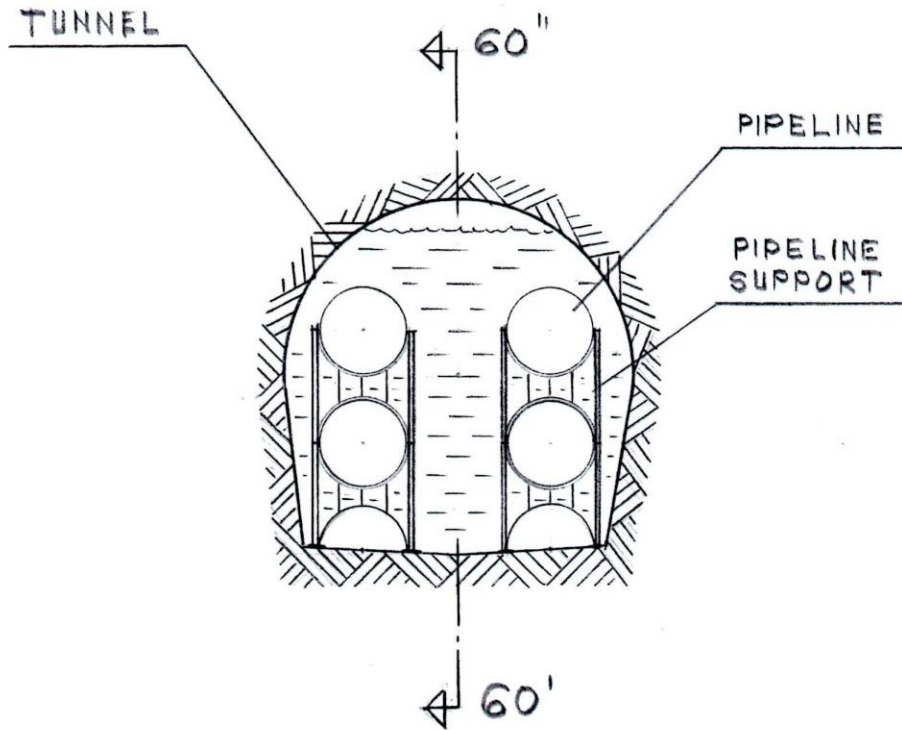


FIG. 93

- Tower **550** containing a mechanism for generation of waves for surfing;
- The ax room **552** is waterproof space suspended on cables **556** and securely engaged with vertical rails
- The ax room **552** provides space for visitors with secured acrylic windows so that visitors can view descent above and under water.
- The visitors are fastened and can experience weightless sensation for several seconds on the way down.
- Possible International surfing events;



## Cross-sectional frontal view of an existing tunnel



- Existing tunnel from **Cabazon** to **San Jacinto**;
- **12 miles** long;
- **Elevation 1,600' (488 m")**;
- **16 feet** high and **16 feet** wide.
- Tunnel is used for delivering water from Colorado river to costal cities;
- Tunnel can be also used for **pipelines transporting seawater** from the **Ocean** to the **Salton Sea** according to the presented proposal.





## Cross-sectional longitudinal view of an existing tunnel

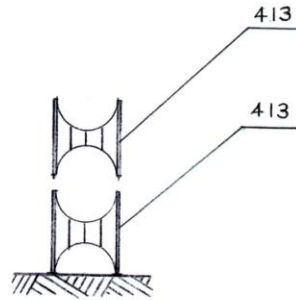


FIG. 60

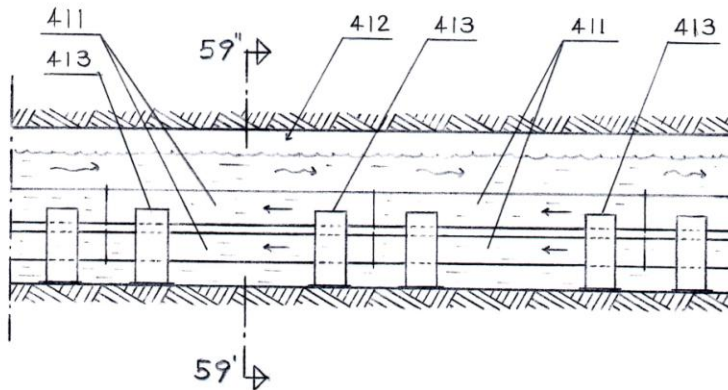


FIG. 61

- Existing tunnel from **Cabazon** to **San Jacinto**;
- **12 miles** long;
- **Elevation 1,600' (488 m")**;
- **16 feet** high and **16 feet** wide.
- Tunnel is used for delivering water from Colorado river to costal cities;
- Tunnel can be also used for **pipelines transporting seawater** from the **Ocean** to the **Salton Sea** according to the presented proposal.
- **Pipeline support assembly**;



# Typical cross-section view of the mid section of the pipeline connecting the Ocean with the Salton Sea

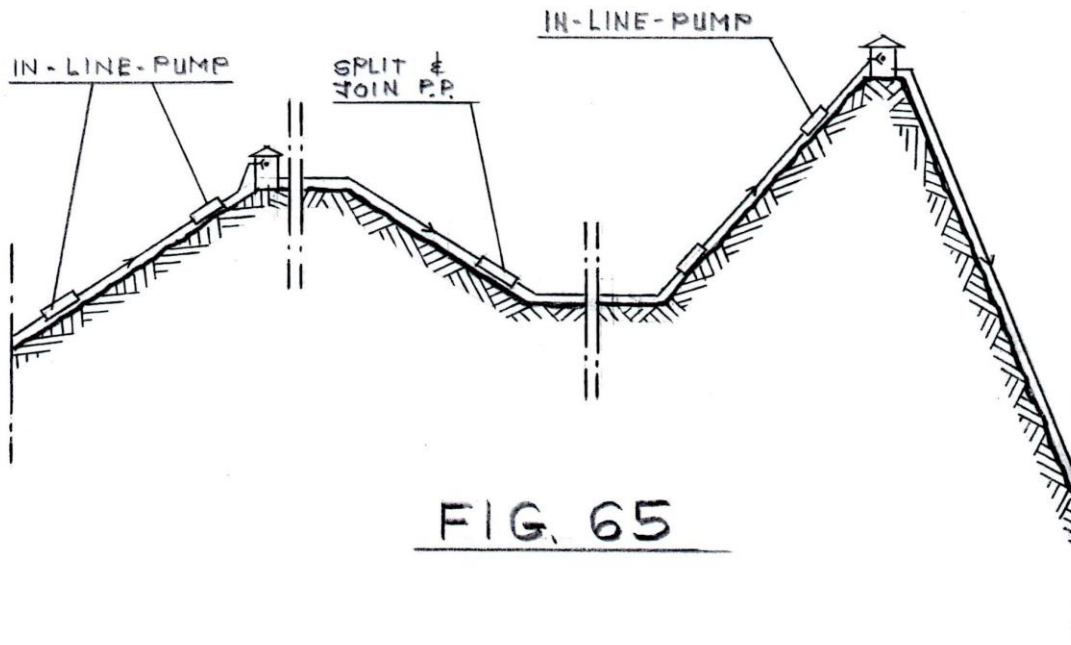
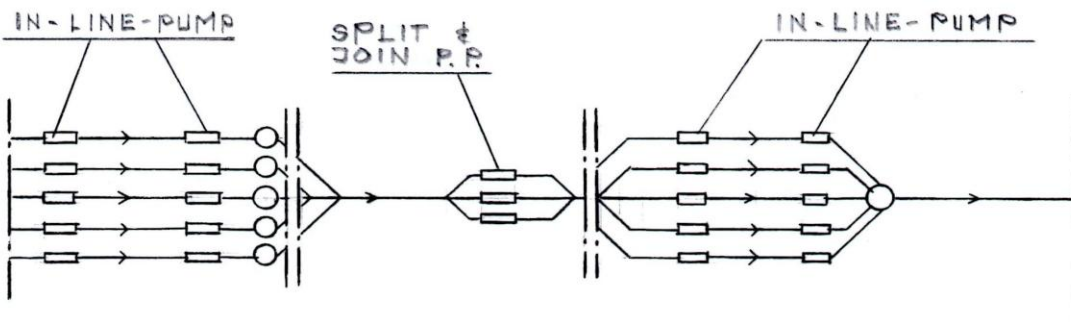


FIG. 65



- Numerous repetitive segments of the “**In-line Pump**” are installed in the **uphill** routes.
- Numerous segments of the “**In-Line-Generators**” (**Split & Join** - mini Power Plan) are installed in the **downhill** routes;
- **Split & Join** - mini Power Plants uses kinetic energy **after** fluid **exit** primary turbine.
- **It provides necessary volume** of fluid for multi-line uphill routes to **accommodate** necessary volume of fluid at the **final exit** section .



## Typical cross-section view of the final downhill pipeline route.

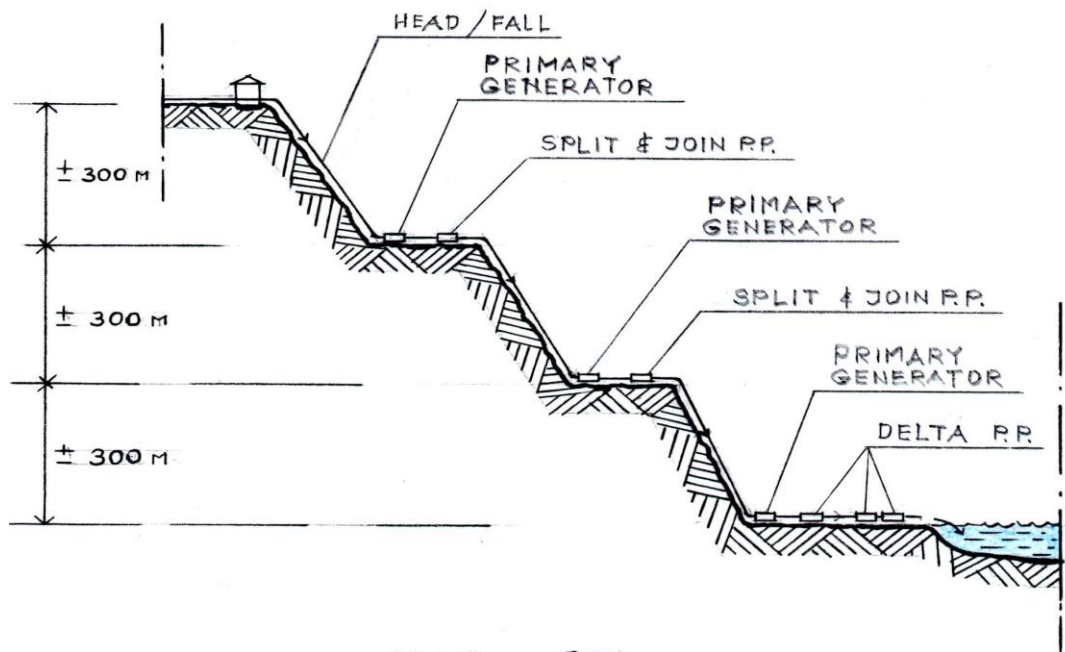
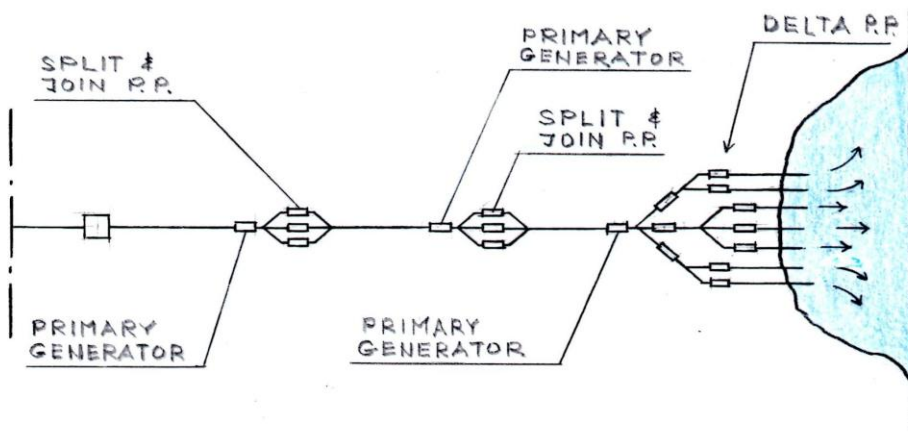


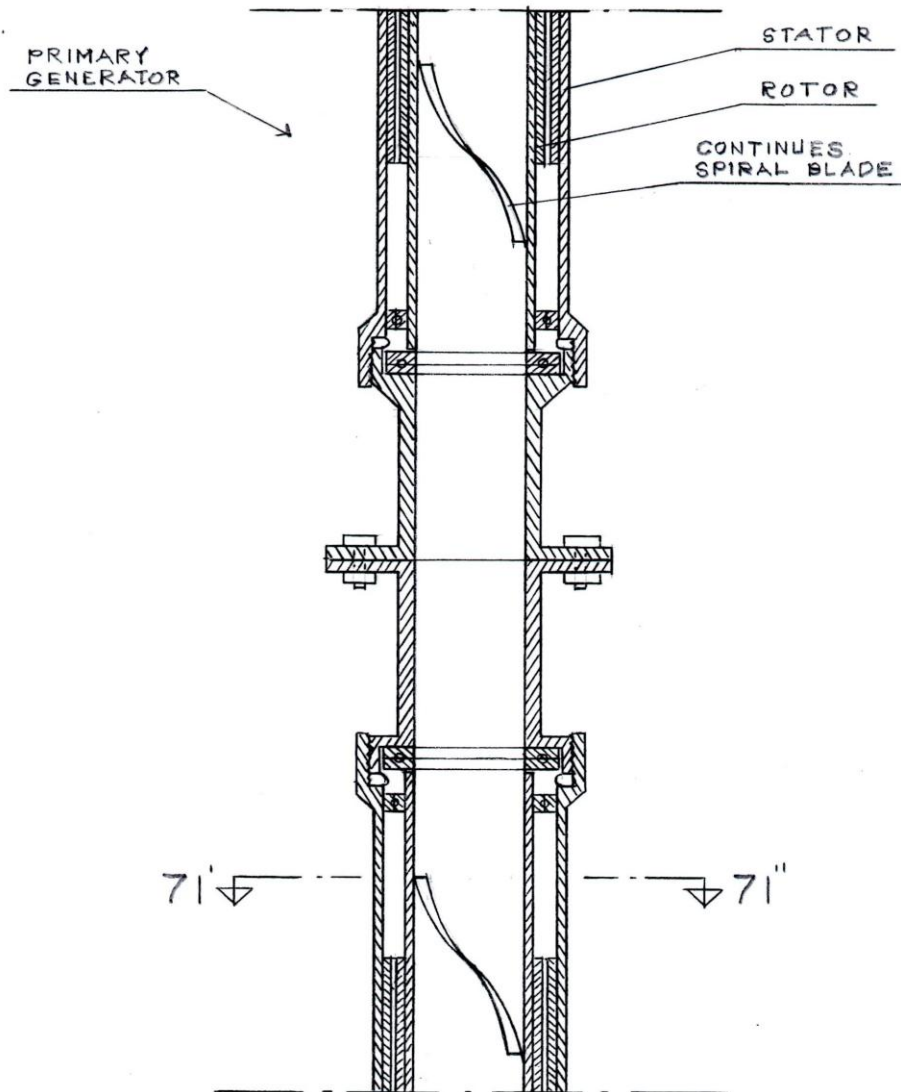
FIG. 67



- Downhill routes of pipeline can be built using several **cascades** with “**split and join**” mini hydropower plants to **avoid** buildup of **extreme pressure** in the pipeline especially in the last section of the final **downhill route** and to **harness more** kinetic energy and **minimize loses**;
- “**Delta**” mini power plant **splits fluid flow** into smaller branches with gradually **lesser fluid flow speed** in each subsequent branch, hence, increasing efficiency of harnessing kinetic energy and at the same time providing **the same volume** of seawater leaving the pipeline and **entering the lake** as is the volume of seawater entering the pipeline from the Ocean.



# Cross-sectional longitudinal view of the Primary In-Line-Pump / Generator

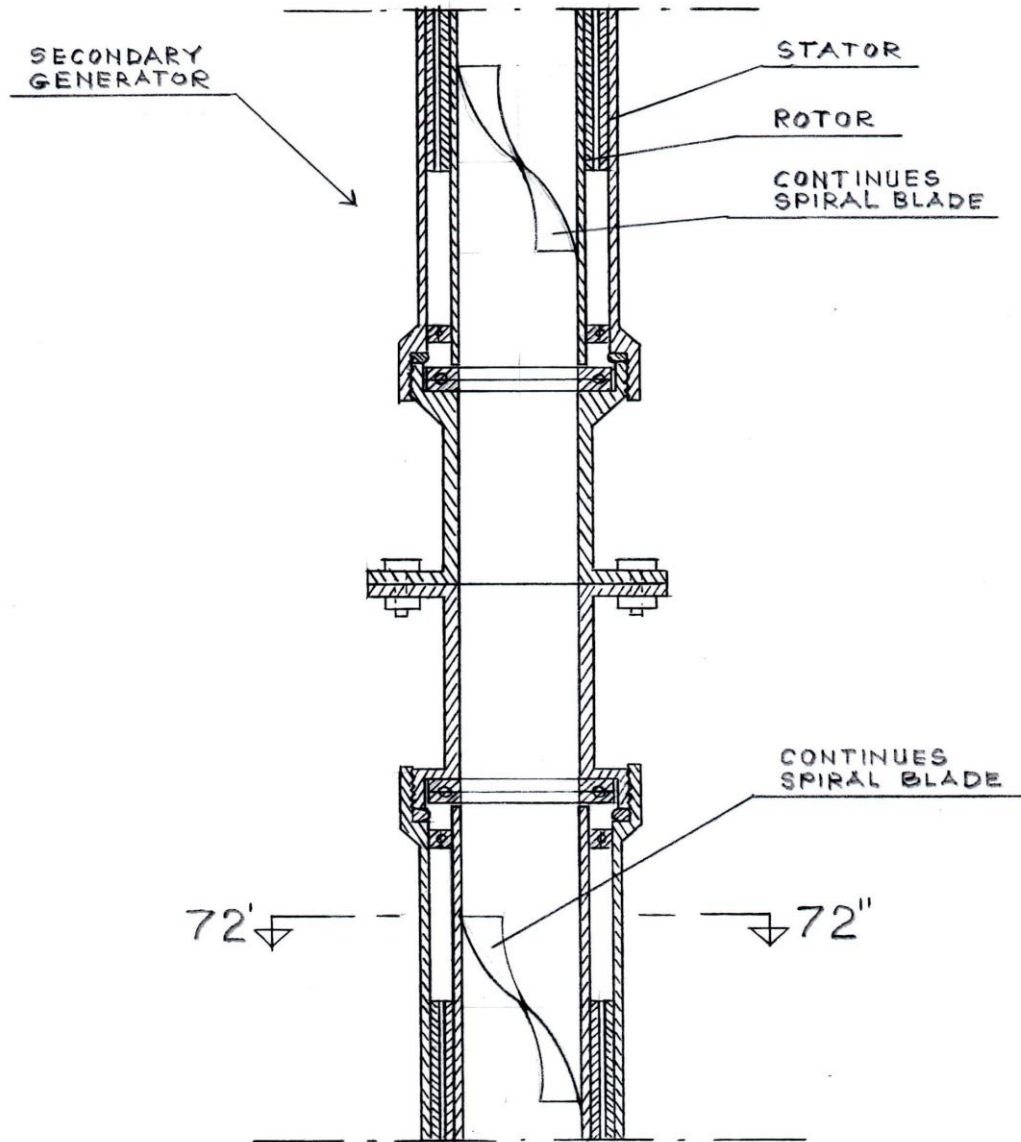


- The In-Line-Pump / Generator is an electromotor cylindrical shape and is inserted as a repetitive segment in the pipeline.
- As a shaft of the rotor it has a hollow cylinder with continuous spiral blades inside hollow cylinder / shaft.
- In order to harness maximum energy from the fall, the primary generator at the bottom of the fall, have continuous spiral blades, inside the hollow cylinder, less exposed providing bigger openings for fluid to flow through the middle of the cylinder /shaft.
- It yields a maximum flow rate with limited diameter.





# Cross-sectional longitudinal view of the Secondary In-Line-Pump / Generator



- The In-Line-Pump / Generator is an electromotor cylindrical shape and is inserted as a repetitive segment in the pipeline.
- As a shaft of the rotor it has a hollow cylinder with continues spiral blades inside hollow cylinder / shaft.
- The Secondary In-Line-Pump / Generators are a subsequent segments in the “Split & Join” and “Delta” mini Power Plants having gradually more exposed continuous spiral blade providing smaller openings in the middle of the cylinder as speed of fluid gradually decreases.
- It yields a maximum flow rate with limited diameter.



# Cross-sectional frontal view of the Primary and Secondary In-Line-Pump / Generator

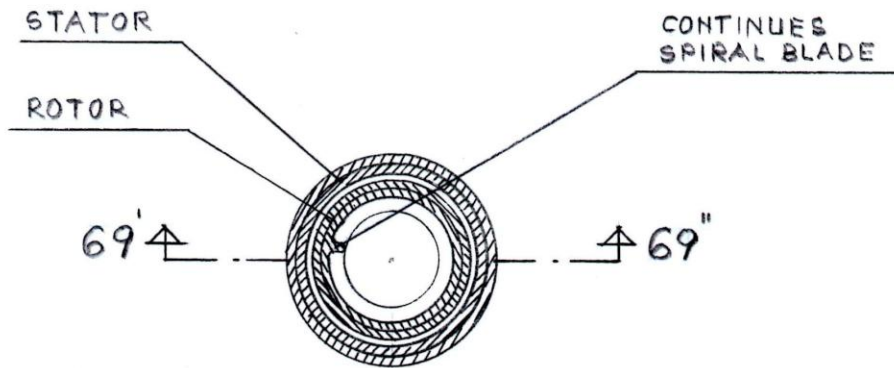
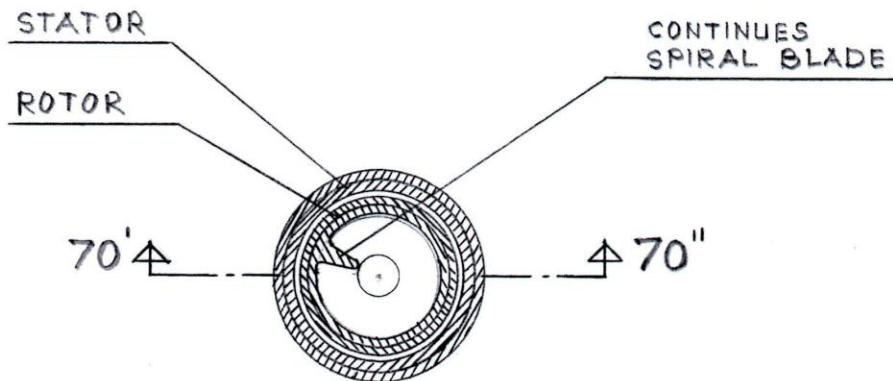
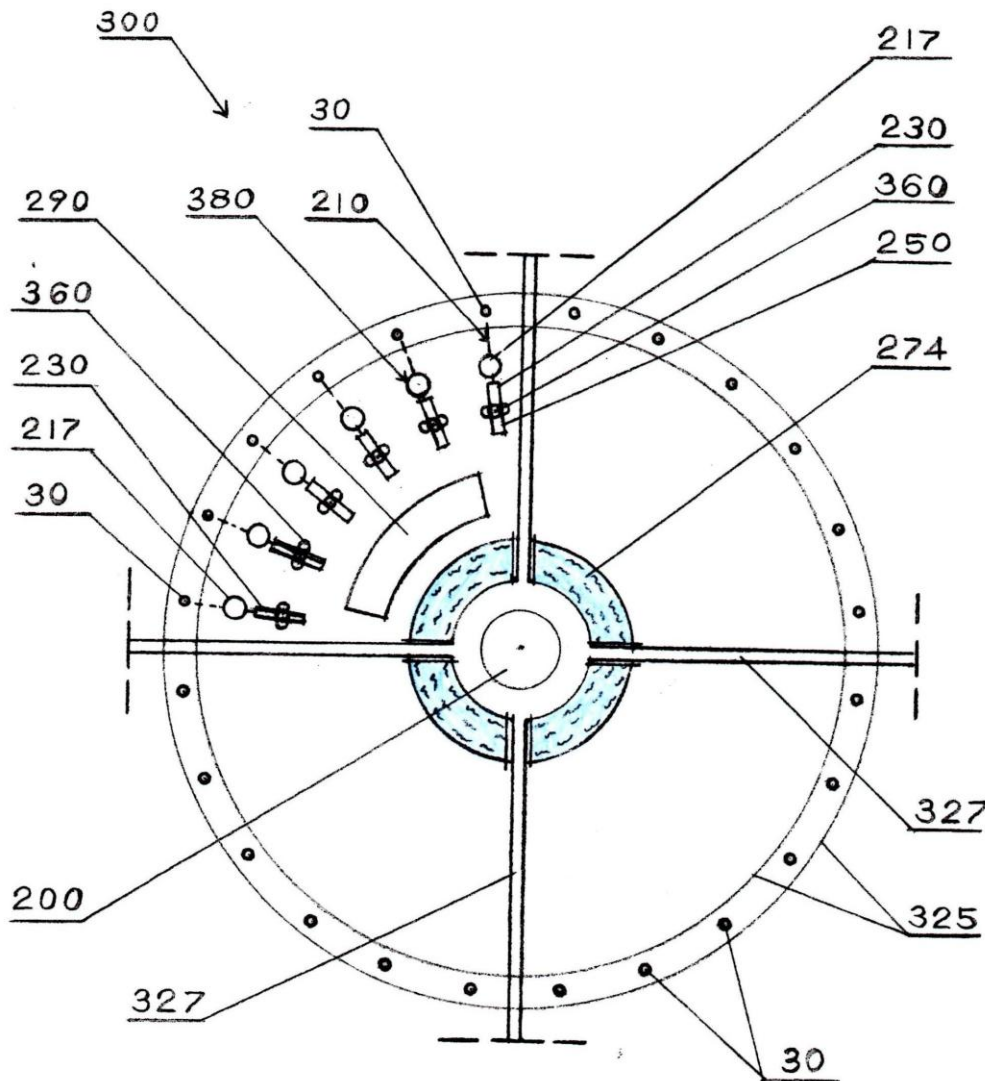


FIG. 71

- In order to harness maximum energy from the fall, the Primary Generator at the bottom of the fall, have continuous spiral blades, inside the hollow shaft, less exposed with bigger openings in the middle of the cylinder / shaft.
- The subsequent segments - the In-Line-Generators - in the section "C" (Delta Power Plant) have gradually more exposed continuous spiral blades with smaller openings in the middle of the cylinder / shaft as speed of fluid gradually decreases.



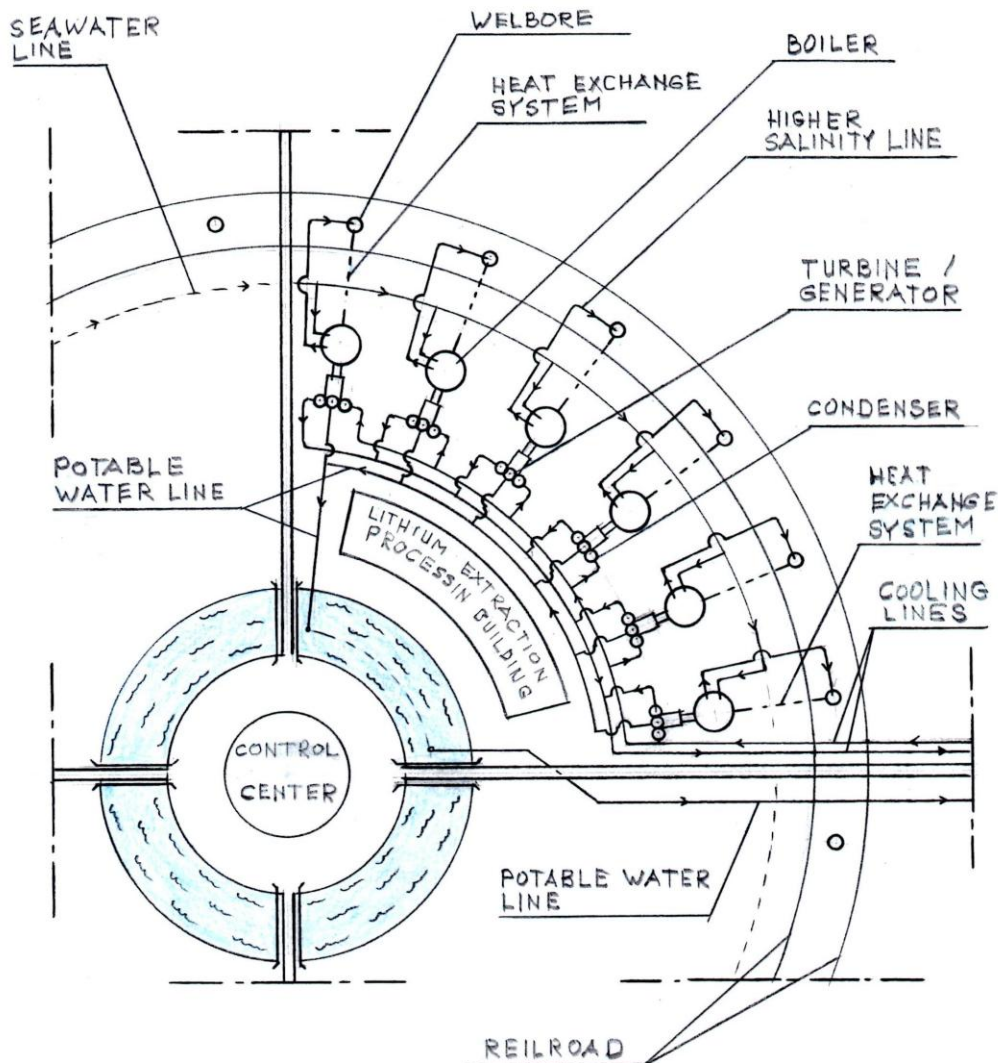
## Plain view of a typical Power Plant



- **300 – Power Plant** about 500 meters diameter;
- **30 – Wells**;
- **380 – Power Units**;
- **200 – Control Center**;
- **290 – Processing Building**;
- **274 – Potable water pond**;
- **210 – Heat Exchange system**;
- **325 – Railroad track**;



## Plain view of a quarter of Power Plant – Modular Unite

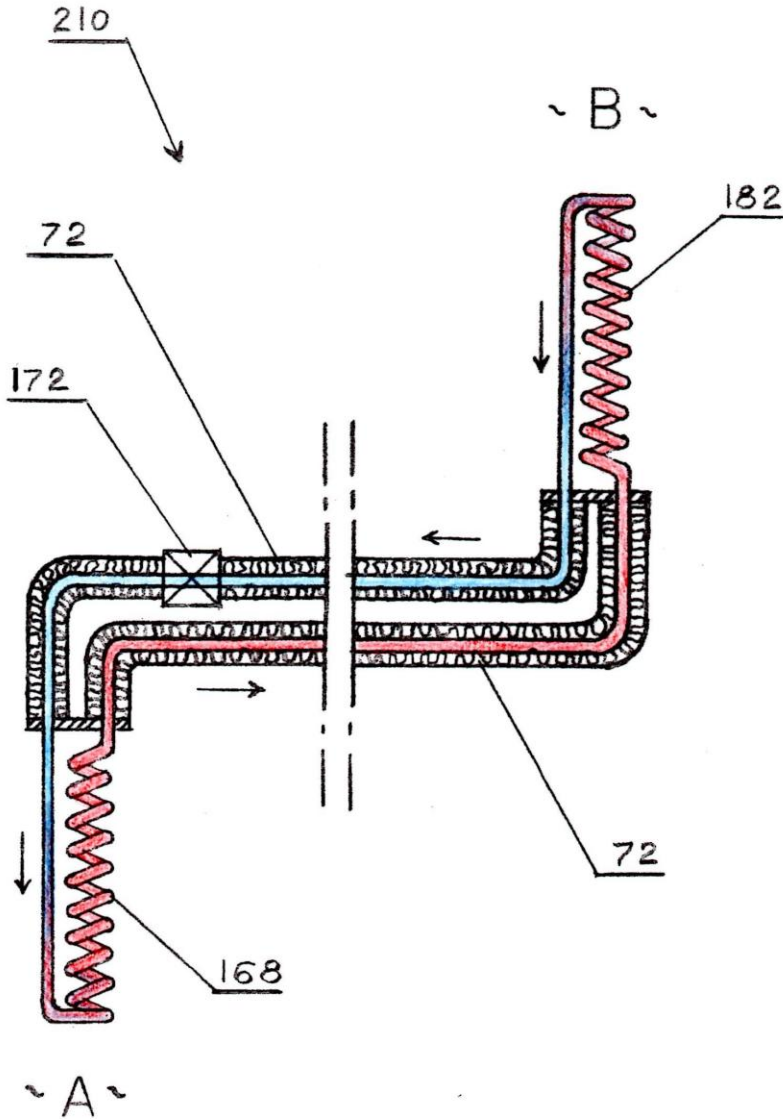


- The Power Plant uses completely closed loop system;
- Sea water is distributed to the boilers of the Power Unites;
- Steam passes through turbine / generator and condenser and condenses as a potable water;
- Remaining water in the boiler is now more saltier and is injected into wellbore to form geothermal reservoir for better conduction of heat from hot rocks to the first heat exchanger;
- After wellbore is filled the (now) saturated brine it is periodically excavated and distributed to the processing building for the extraction of lithium;





# Schematic Cross-Sectional Diagram of an Universal Heat Exchange System 210



A schematic cross sectional diagram of an universal heat exchange system 210 with main segments including:

- A thermally insulated close loop line 72 with an in-line pump 172;
- A first heat exchanger 168 positioned in heat source environment "A"; and
- A second heat exchanger 182 positioned in preferred environment "B";
- Heat is extracted from heat source through the first heat exchanger 168 and transferred through thermally insulated line 72 to the second heat exchanger 182 for external use including production of electricity.
- The universal heat exchange system 210 is a portable unite and can be used in many applications.





# Schematic cross-sectional view of a Power Unit

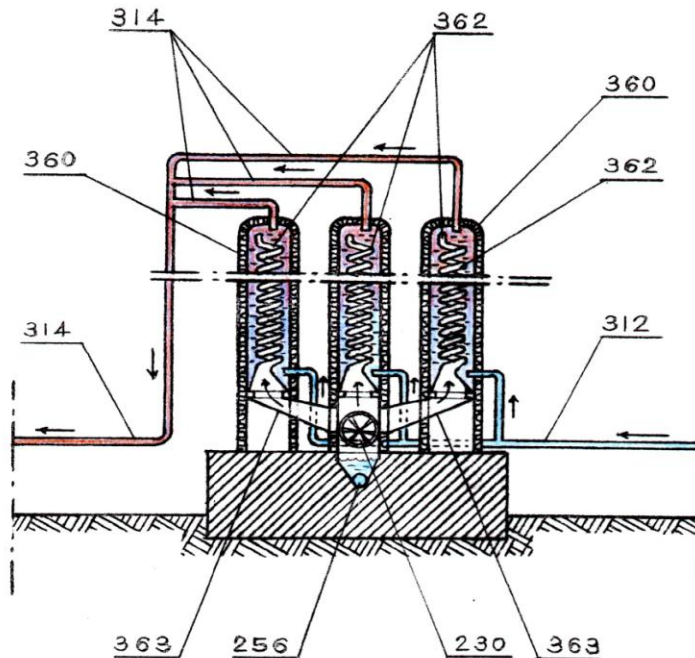


FIG. 46

- 360 - Condenser.
- 362 - Inner Pipes.
- 230 - Turbine.
- 312 - Inflow cooling line.
- 314 - Outflow cooling line.
- 256 - Condensed fresh water line.



# Schematic cross-sectional view of a Power Unite

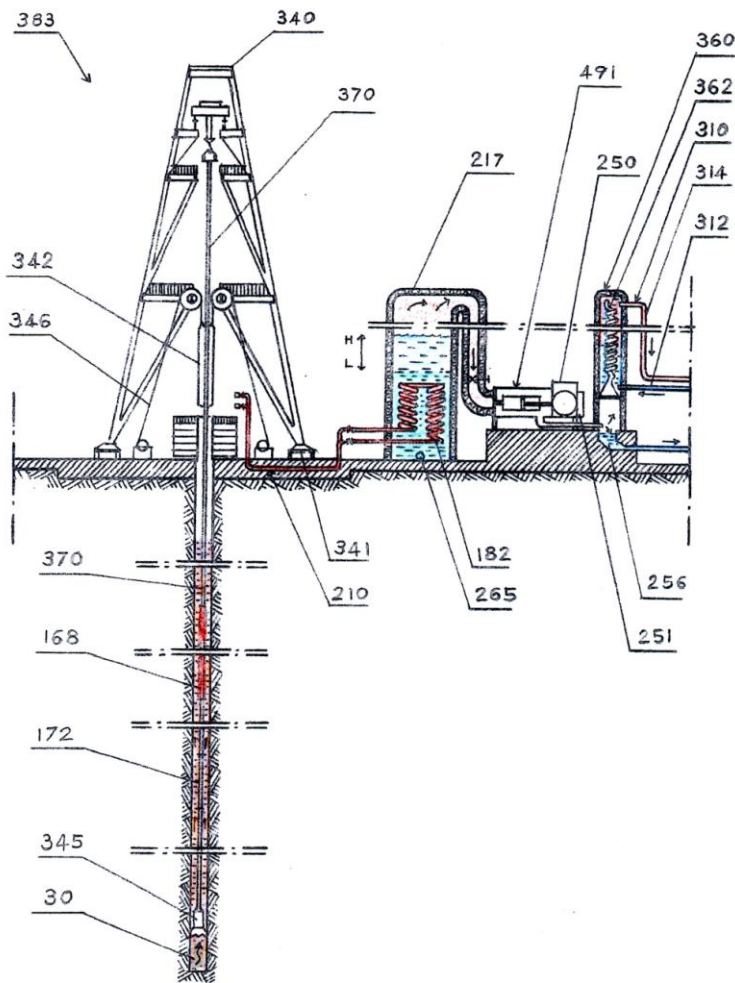


FIG. 79

- A method for harnessing geothermal energy for generation of electricity by using complete closed loop heat exchange systems combined with on-board drilling apparatus.
- The first heat exchanger of the closed loop system is lowered at heat source and second heat exchanger is coupled into boiler / evaporator of the Power Unite.
- Salty water from the Salton Sea is injected into boiler / evaporator to the level "H".
- Salty water is heated by heat exchanger and steam is produced which enters pistons and generator, which generates electricity.
- The power unit has a condenser which is cooled with additional closed loop system.
- Geothermal fluid and/or saturated brine is circulated around first heat exchanger with an on-board in-line-pump to minimize heat flux.
- Drilling can continue as needed in search for hot rocks until equilibrium is reached.





# Schematic cross-sectional view of a Power Unit

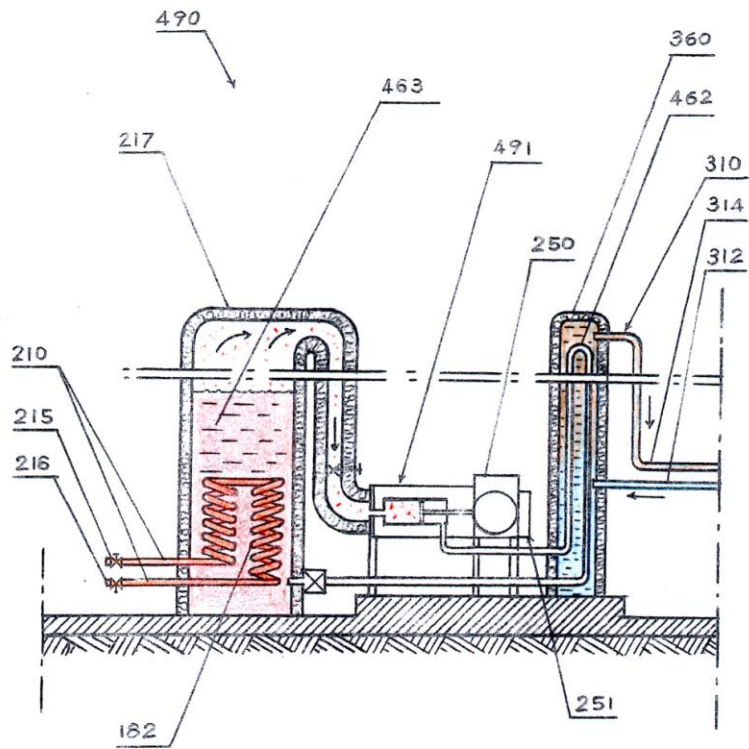


FIG. 80

- An independent piston power unit that can be used in different applications for generation of electricity



# Schematic view of a Piston Power Unit – stroke one

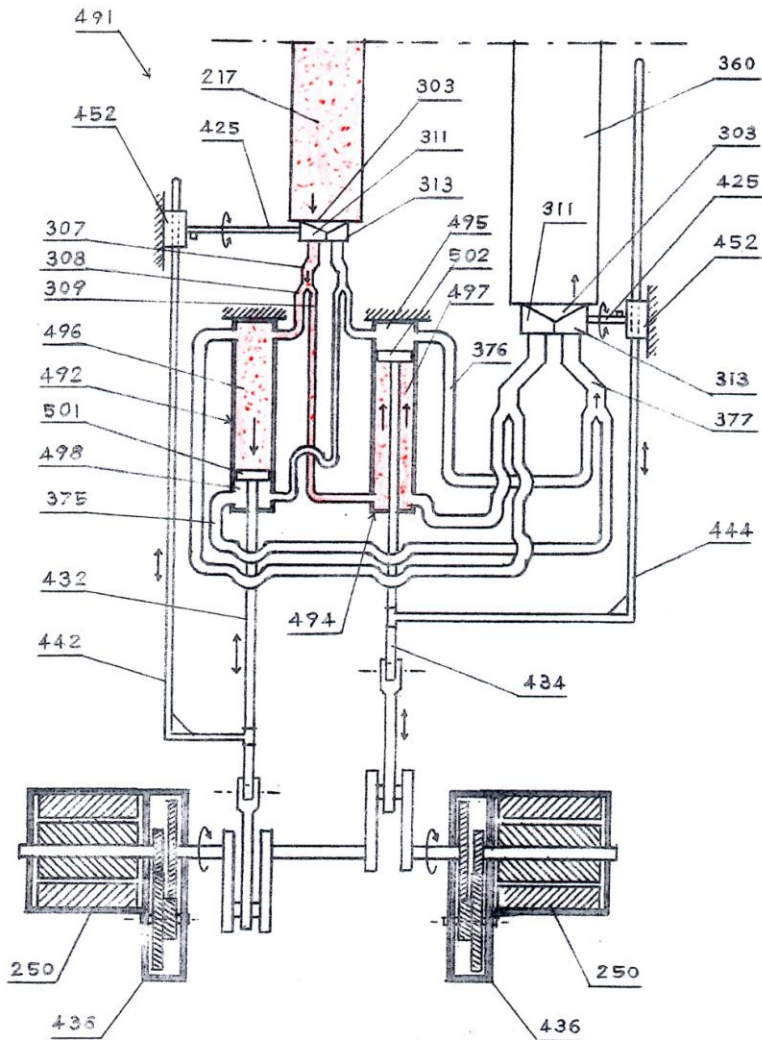


FIG. 31

- Schematic diagram of the function of the piston unit of the independent power unit **490** with piston in position of stroke one;



# Schematic view of a Piston Power Unit – stroke two

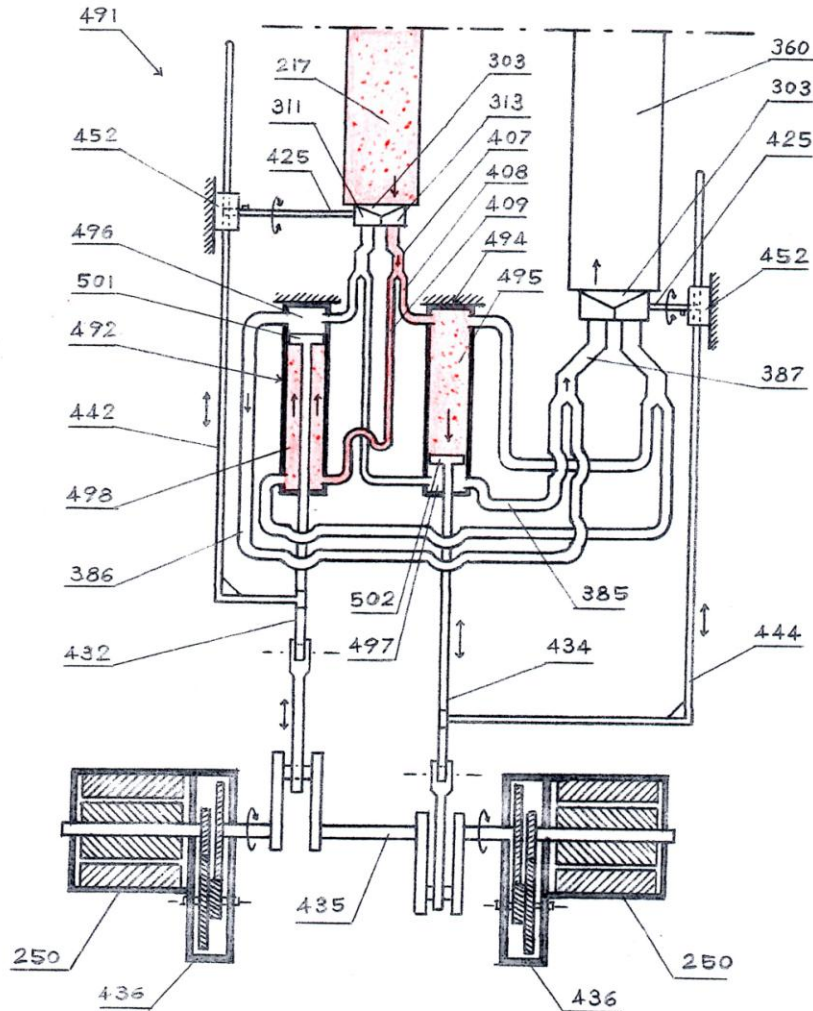


FIG. 82

- Schematic diagram of the function of the piston unit of the independent power unit **490** with piston in position of stroke two;



# Schematic cross-sectional view of a the activator used in the Piston Power Unite

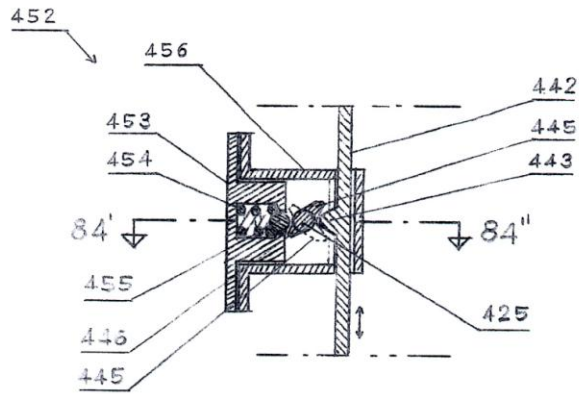


FIG. 83

➤ activators **452** in first position

➤ activators **452** in second position

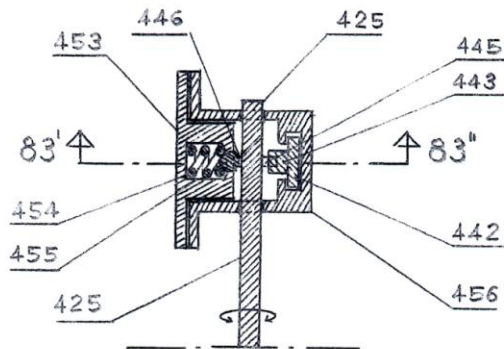


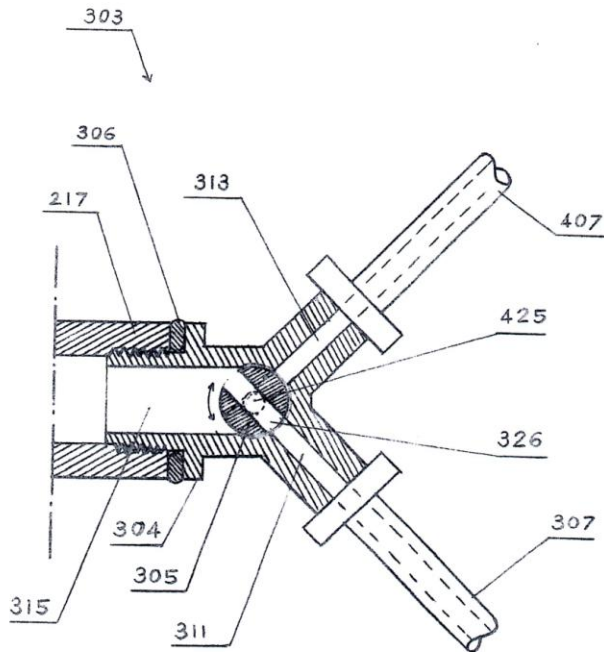
FIG. 84

➤ the Three Port Switch Valves **303**





# Schematic cross-sectional view of a Three Point Switch Valve used in the Piston Power Unit

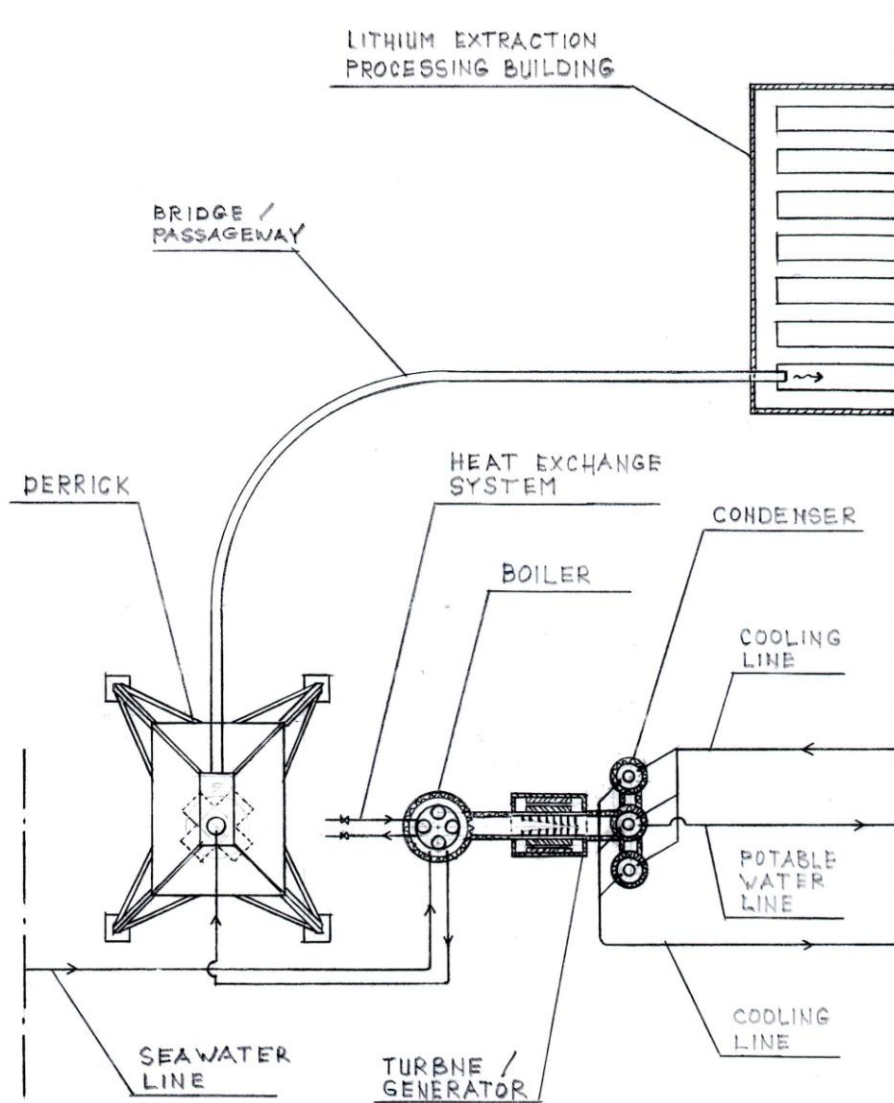


➤ The Three Port Switch Valves **303**

FIG. 85



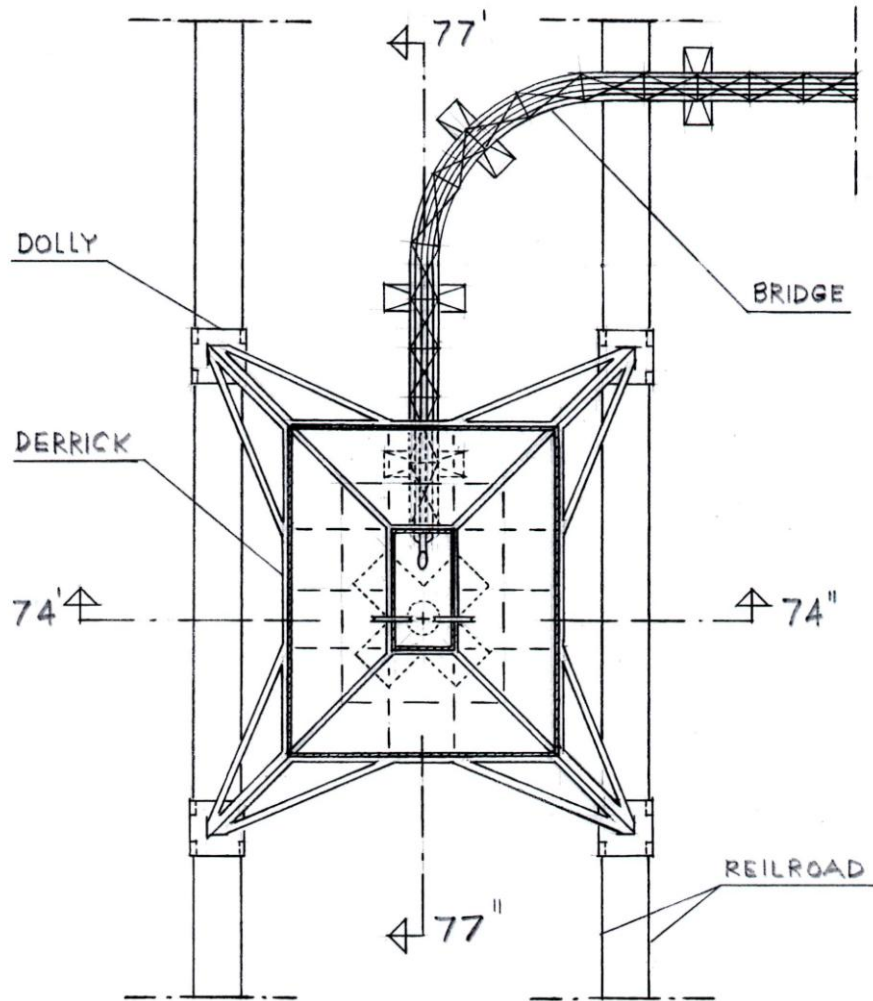
# Schematic Plan View of a Power Unite



- Remaining salty water, level “L”, from distiller is injected into wellbore to form geothermal reservoir for better conduction of heat from hot rocks to the first heat exchanger;
- After wellbore is filled with saturated brine the brine is periodically excavated and distributed to the processing building for extraction of the lithium;
- This system enable drilling deeper and wider wellbores with constant diameter.
- Presented system for drilling faster, deeper and wider wellbore consist of motorized drill head; separate excavation line; separate fluid delivery line; and separate closed loop cooling line engaged with Power Unit on the ground surface.



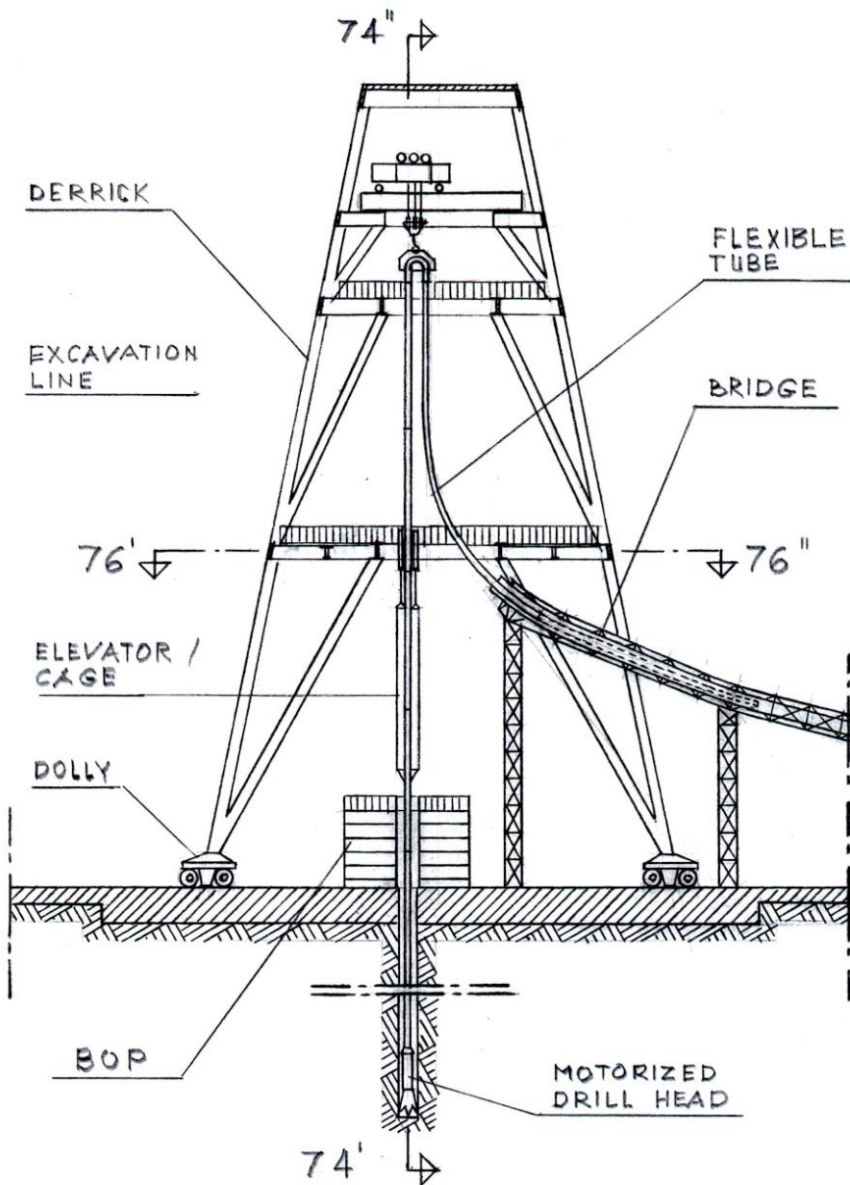
# Schematic Cross-sectional Plain view of a Derrick



- The casing of the wellbore can be build during the drilling process.



# Schematic Cross-sectional Side view of a Derrick

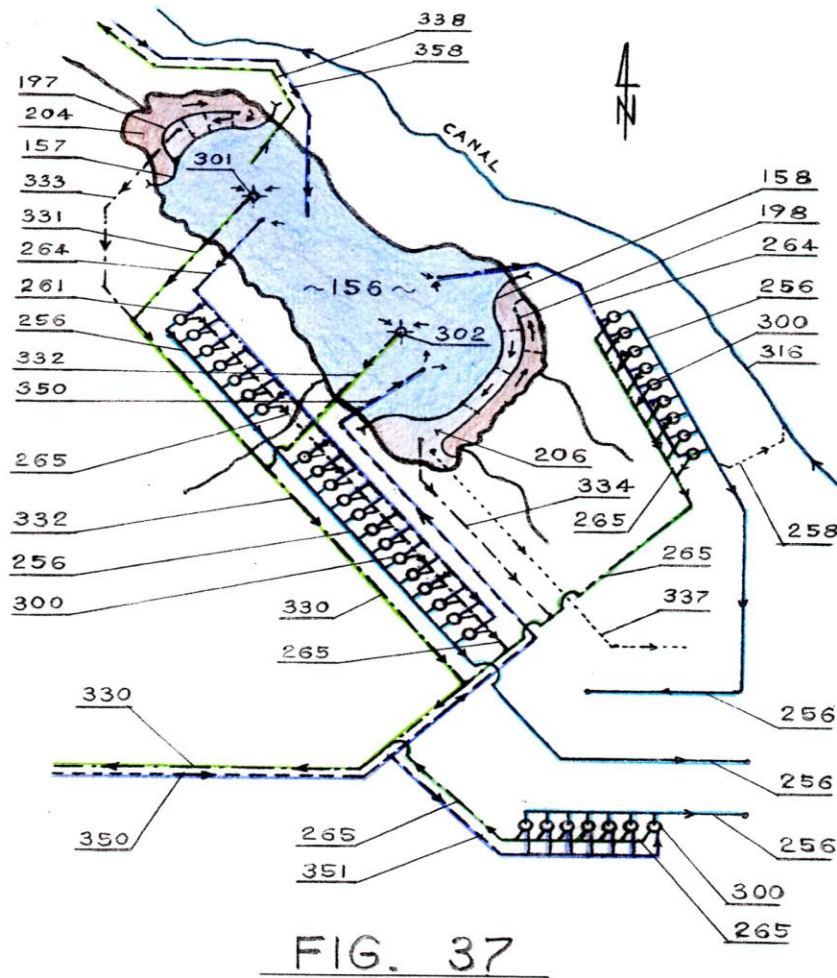


- A system for drilling faster, deeper and wider wellbore consist of motorized drill head; separate excavation line; separate fluid delivery line; and separate closed loop cooling line engaged with Power Unit on the ground surface.
- Presented drilling apparatus has retractable bits on the motorized drill head.
- The apparatus also incorporates an elevator system (cage) sliding over the drilling / excavation / heat exchange apparatus , delivering and installing casing sheets and concrete. The casing of the wellbore can be build during the drilling process.
- The diameter of the excavation line and rate of flow of mud and cuttings through it and the diameter of the fluid delivery line and rate of fluid flow through it are in balance requiring only limited fluid column at the bottom of the well bore.
- The excavation process continues regardless of the diameter of the drill head (wellbore); therefore this method eliminates well known drilling limitations relative to the depth and diameter of the wellbore.





# Proposal for Restoration of the Salton Sea – An alternative option with inflow and outflow pipelines



- **156 – Salton Sea.**
- **157 & 158 – Dikes forming ponds 204 & 206 – for collecting and treating farmland’s runoff water and providing wildlife sanctuary (wetland).**
- **330 – Outflow pipeline pumping out high salinity water from the Salton Sea and dispersing it into a vast Ocean.**
- **350 – Inflow pipeline bringing water from the Pacific Ocean (preferably San Diego area) to the Salton Sea.**
- **300 – Power Plants.**
- **256 – Potable water line.**



# Proposal for Restoration of the Salton Sea - Alternative cooling System -

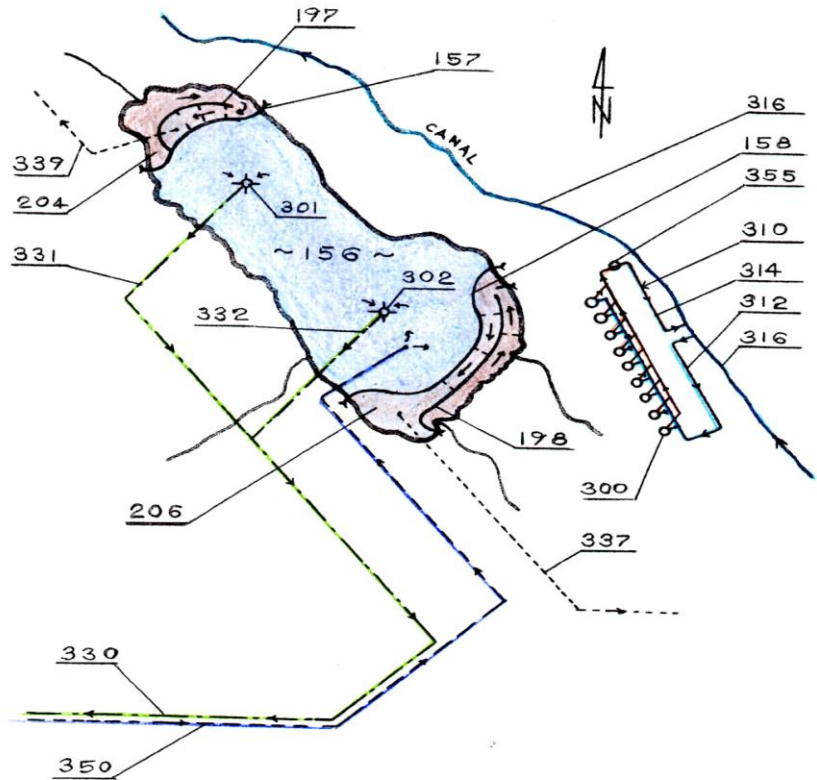


FIG. 38

- **156** – Salton Sea.
- **300** – Power Plants.
- **316** – Canal.
- **310** – Closed loop cooling system using water from canal.
- **312** – Inflow cooling line.
- **314** – Outflow cooling line.







# Schematic Plan View of a Power Plant for Production of Electricity and for Desalinization of the Salton Sea by using SCI-GHE System

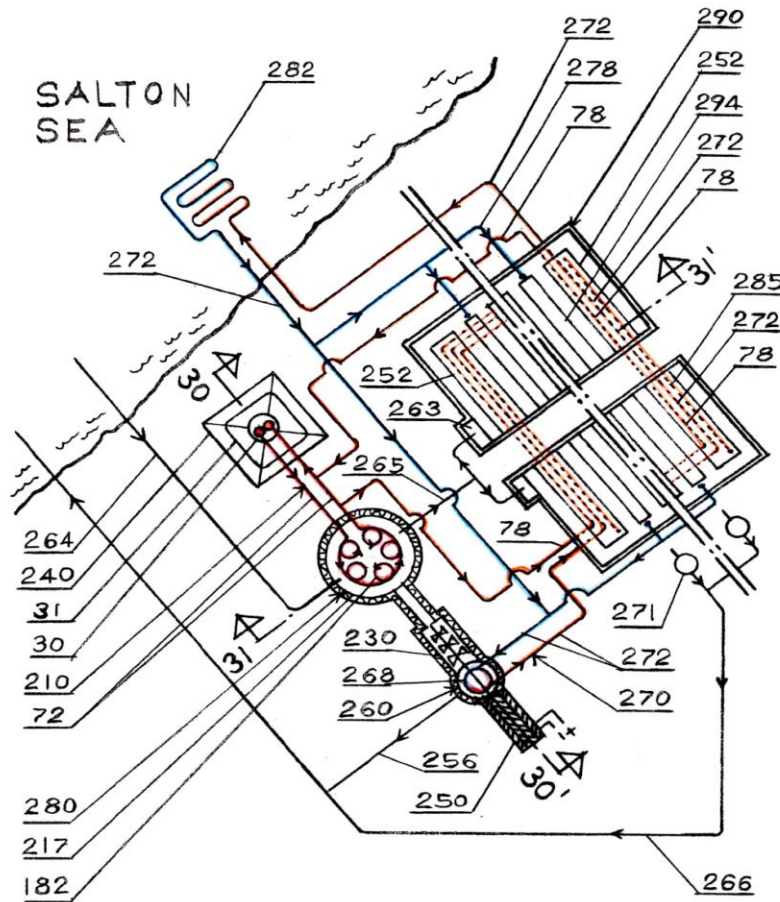
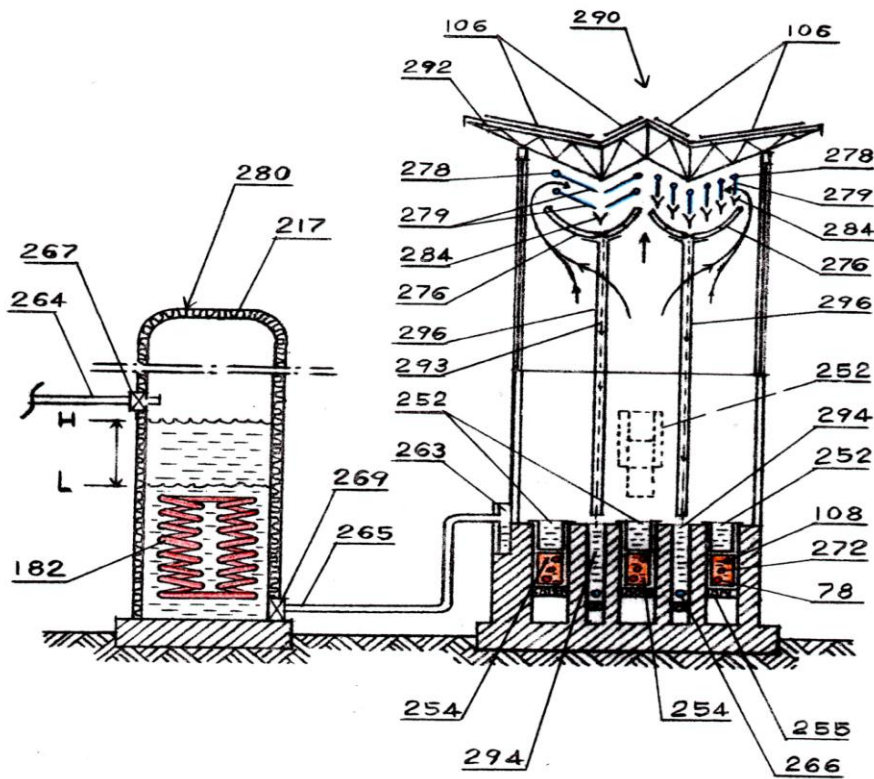


FIG. 29

- The power plant **280** for generation of electricity, consisting of: wellbore **30**; first closed loop system **210**; distiller **217**; turbines **230**; generator **250**; and a condenser **260**;
- Salty water from Salton Sea is injected into the boiler/evaporator **217** through a pipeline **264**.
- Fresh water from the condenser **260** is, optionally, returned to the Salton Sea through line **256**.
- Remaining salty water from distiller **217** is distributed through a pipeline **265** into desalination processing building **290**;
- Additional closed loop system **270** is used for cooling condenser **260**, heating salty water and cooling condenser in building **290**.
- Produced salt from removable pans **252** is periodically collected, loaded and transported.



**Schematic cross-sectional view of a Power Plant taken along line 31-31' of FIG. 29.**



**FIG. 31**

- Remaining, more concentrated, salty water, now level “L”, from distiller **217** is distributed through pipe line **265** into removable pans **252** in the desalination processing building **290**;
- Salty water in removable pans **252** is heated by system of pipes from first closed loop system **210** and from cooling condenser **260**.
- Evaporated moisture is condensed through system of condensers **279** at upper portion of the building and funneled through tubes **296** into fresh water channels **294**.
- Produced salt from removable pans **252** is periodically collected, loaded and transported.



# Schematic cross-sectional view of an alternative heat exchange Thermo Solar system used in desalinization plant shown in FIGS. 29-31

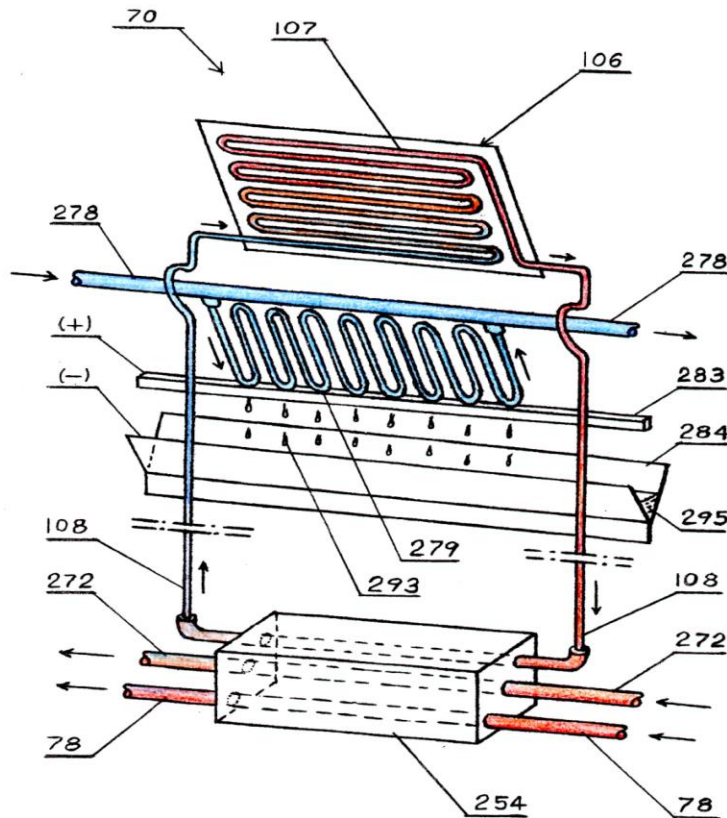


FIG. 32

- FIG. 32 illustrates a perspective cross sectional diagram of an alternative thermo-solar heat exchange system 70 to be used in desalinization plant shown in FIGS. 29-31.
- Here is illustrated, an optional solution, a thermo-solar panel 106 positioned on the roof of the desalinization processing building 290 to be used for heating heat exchange fluid in the containers 254 and indirectly heating salty water in pans 252 to induce evaporation.
- Evaporated moisture is condensed through system of condensers 279 at upper portion of the building and collected through pans 284.
- This system can function with geothermal support or independently.





## Proposal for Restoration of the Salton Sea Power Plants Southeastern Sector

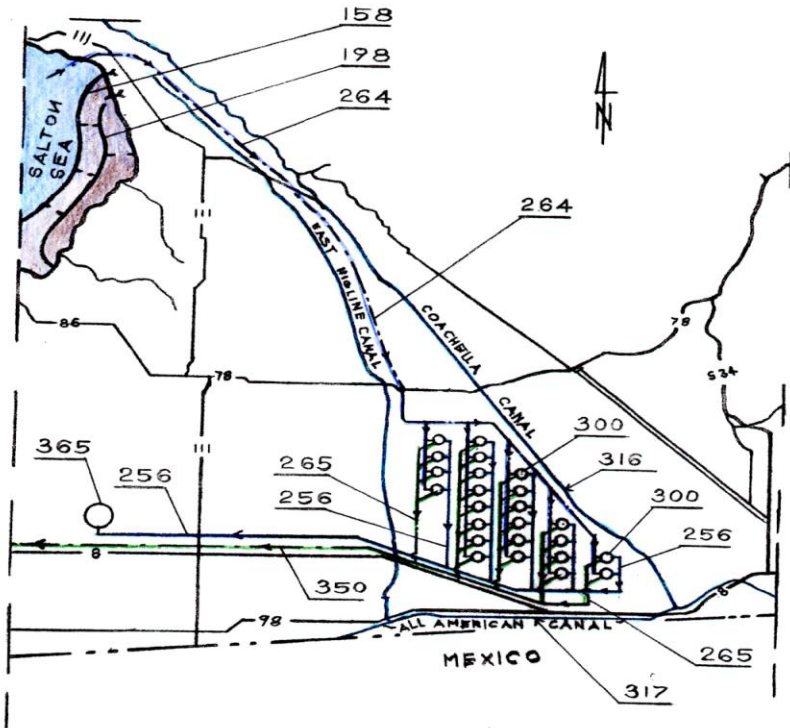
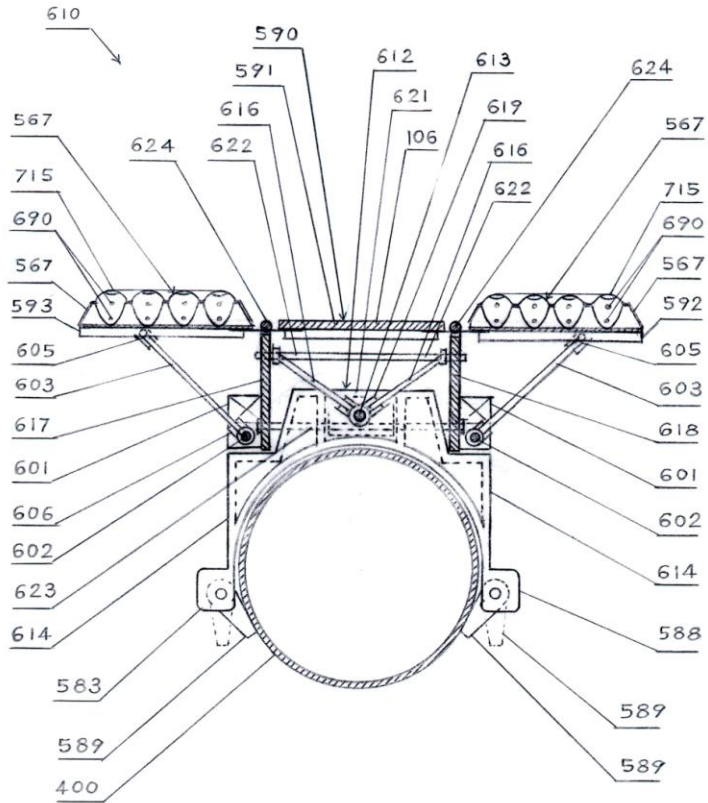


FIG. 39

- 156 – Salton Sea
- 158 & 198 – Dikes forming ponds for collecting and treating farmland's runoff water and providing wildlife sanctuary.
- 264 – Seawater from the lake.
- 300 – Power Plants Southeast Sector.
- 265 – High salinity line.
- 256 – Potable water line.



## Cross-sectional view of a solar panel assembly



- A Thermo Optical Solar (TOS) panel assembly **610** and its attachment system to the pipeline **400**.



## Cross-sectional view of a solar panel assembly

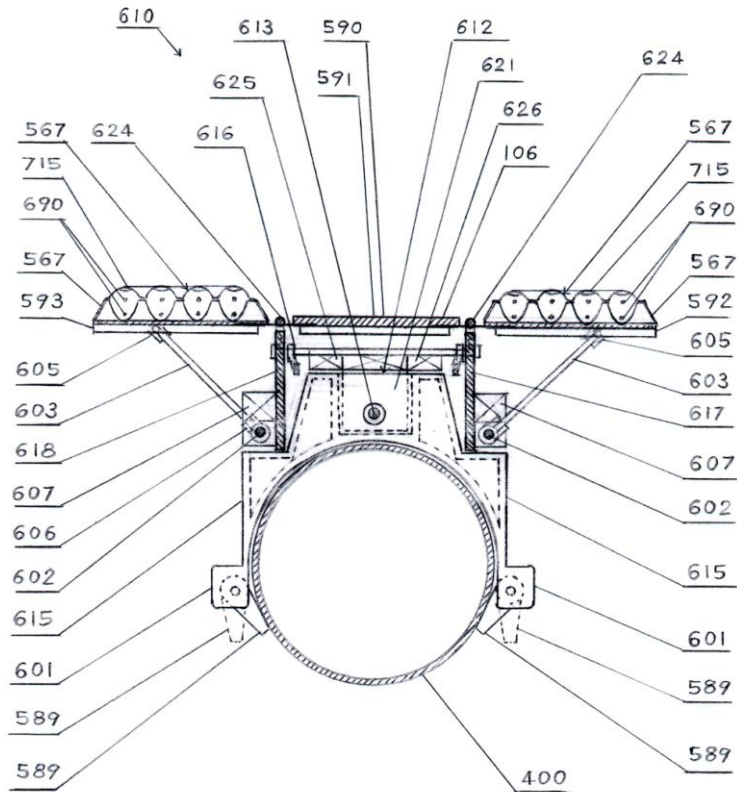


FIG. 101

- A Thermo Optical Solar (TOS) panel assembly **610** and its attachment system to the pipeline **400**.



# A side view of the solar panel assembly and its attachment system to the pipeline

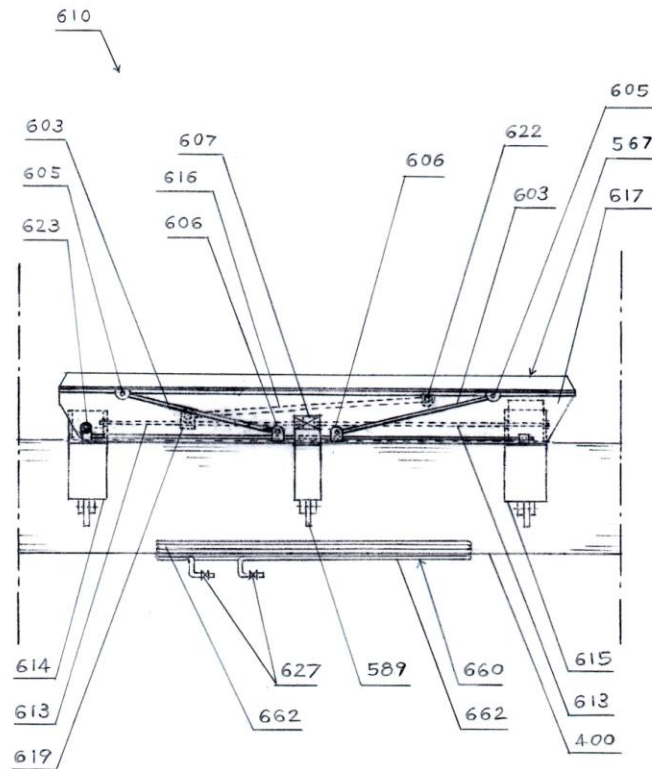


FIG. 103

- A side view of the solar panel assembly **610** and its attachment system to the pipeline **400** and its lifting mechanism **612** in horizontal position;
- The condenser **660** consist of bended metal pipeline **662** and connectors **627** which connect closed loop line of the thermo optical solar system **567** and **700**;





## A side view of the solar panel assembly and its attachment system to the pipeline

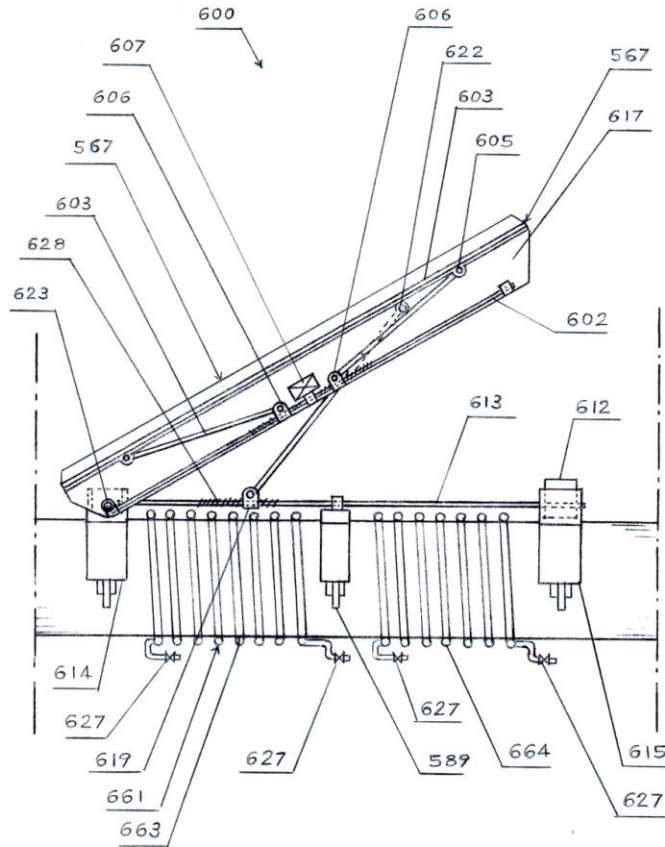


FIG. 104

- A side view of a solar panel assembly **610** and its attachment system **588** to the pipeline **400** with its lifting mechanism **612** in raised position;
- A condenser **661** installed around pipeline **400** to use coolness of the pipeline for condensation. The condenser **661** consist of bended metal pipeline **663** and connectors **627** which connect closed loop line of the thermo optical solar system **567** and **700**;



## Plain view of the solar panel assembly and its attachment system to the pipeline

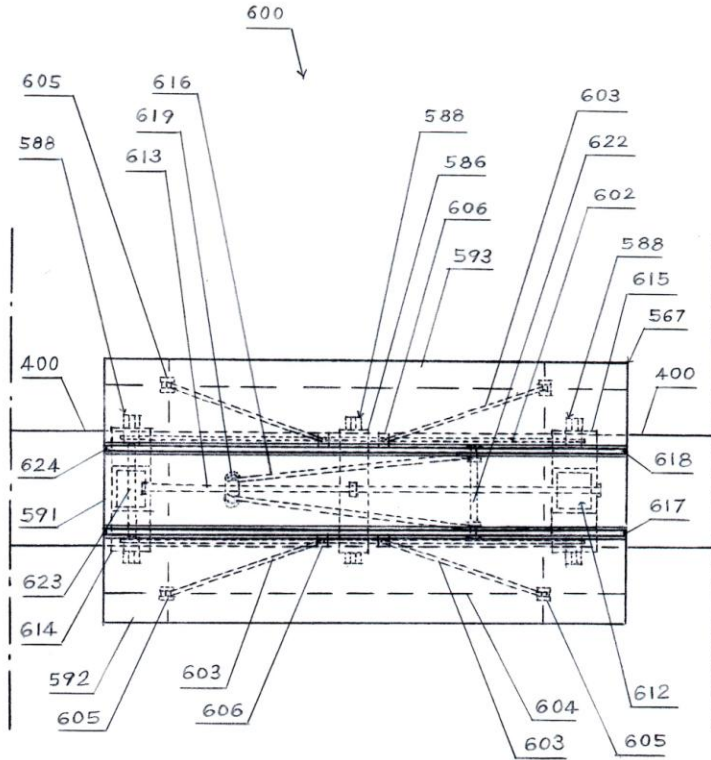


FIG. 105

- A plain view of a solar panel assembly **610** and its attachment system **588** to the pipeline **400** with its lifting mechanism **612** with solar panels which include central panel **591** and side panels **567** in horizontal position.



# A perspective view of a pipeline with solar panel assemblies attached to the pipeline in combination with a line of alternative solar system aside pipeline

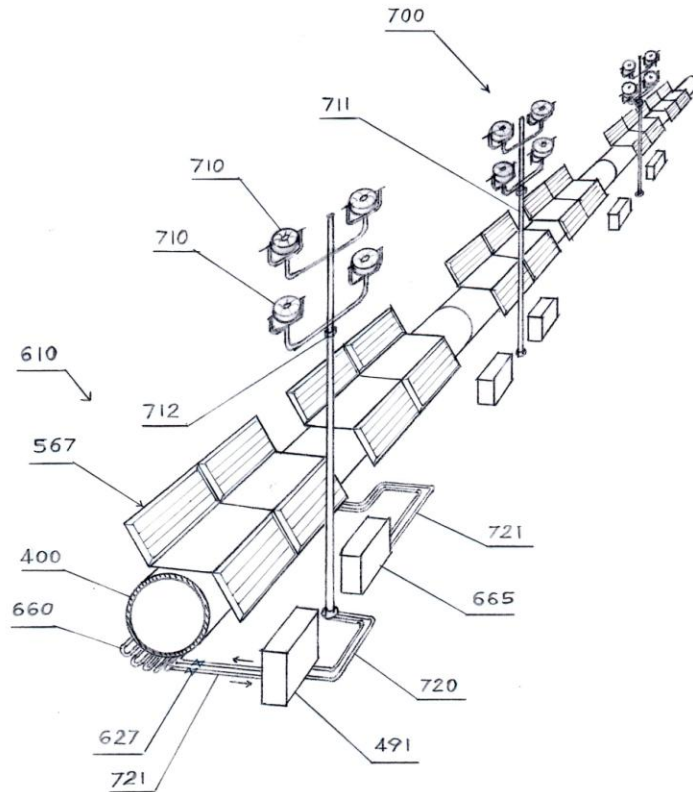


FIG. 106

- Perspective view of a pipeline with solar panel assemblies **610** attached to the pipeline in combination with a line of an alternative “thermo optical solar system” **700** aside pipeline.



## A cross-sectional view of a “thermo optical solar dish” 710

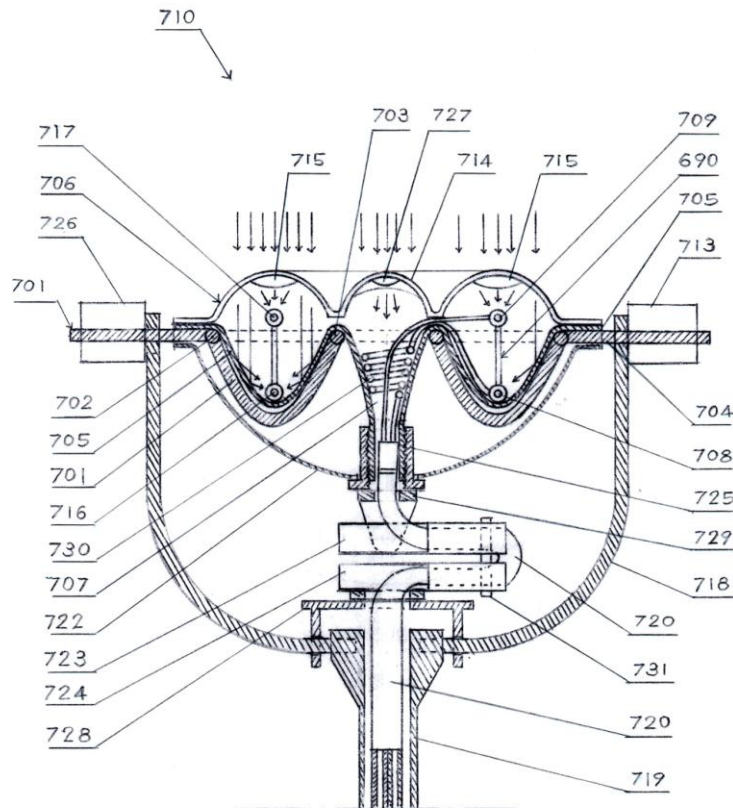


FIG. 107

- A cross-sectional view of a “thermo optical solar dish” **710** taken along line 107'- 107" of FIG. 108;
- The “thermo optical solar dish” **710** consist of: tubular frame **701** consisting of peripheral ring **702** and inner ring **703** which are connected with cross bars **704** formed in shape to support main dish **705**;
- When sunrays pass through transparent cover dish **706** reflects from reflective surface of the main dish **705** into focus point of the parabola **708** where first pipe-ring **716** of the evaporator **690** is positioned. In the focus point **708** high temperature is generated and heats working fluid passing through pipe-rings **716** of the evaporator **690**.





## A plain view of a “thermo optical solar dish” 710

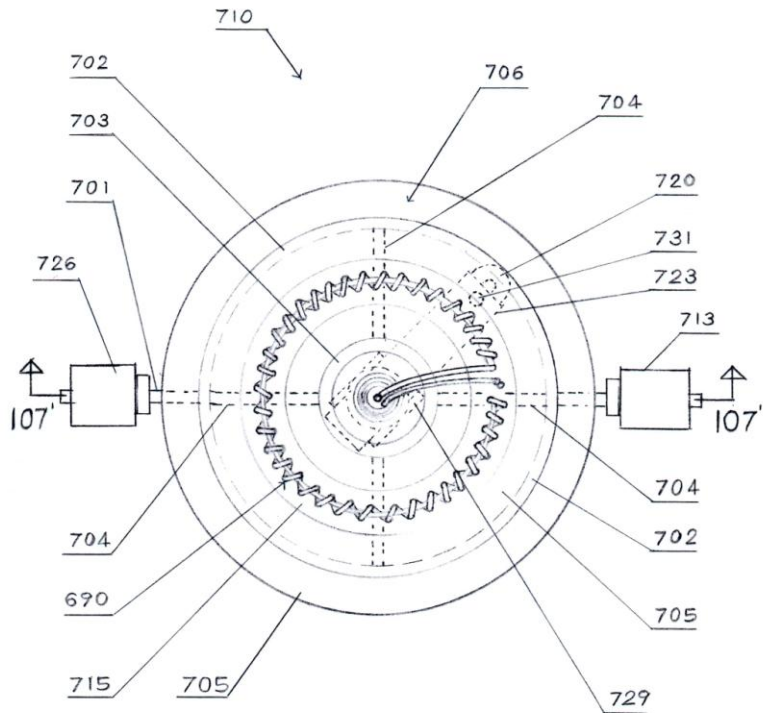


FIG. 108

- A plain view of a “thermo optical solar dish” 710.



## A side view of a “thermo optical solar dish” 710

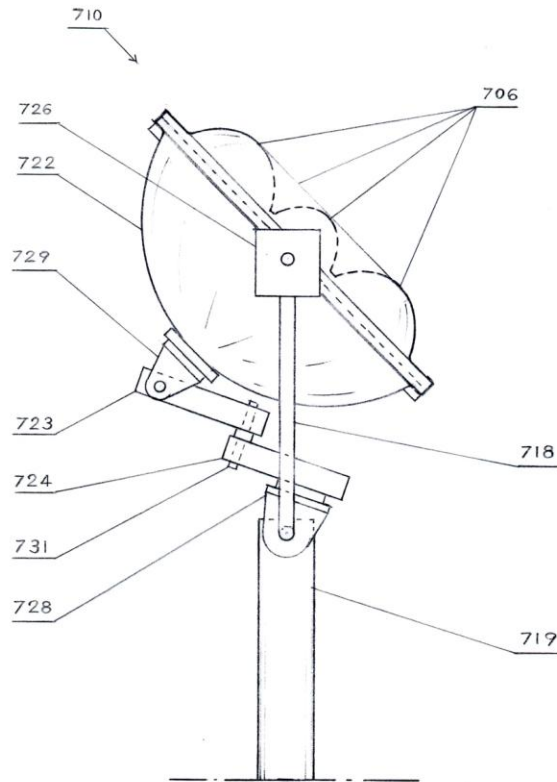


FIG. 109

- A side view of a “thermo optical solar dish” 710;



**A schematic diagram of the flow of the working fluid in the evaporator 790 of “thermo optical solar dish” 710**

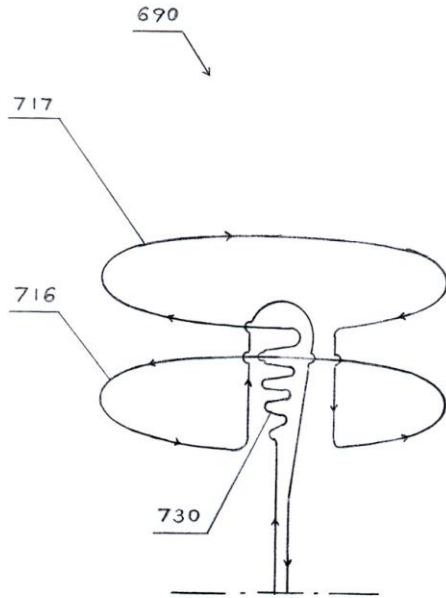


FIG. 110

- **A schematic diagram of the flow of the working fluid in the evaporator 790 of “thermo optical solar dish” 710;**



## Two alternative patterns of the evaporator 690 in the “thermo optical solar dish” 710

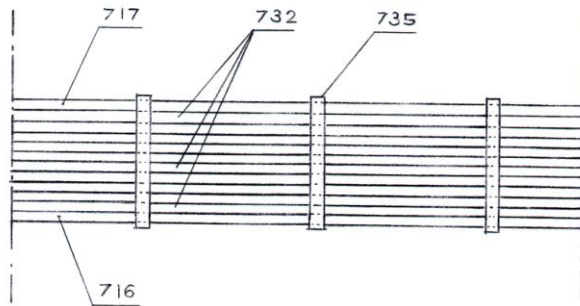


FIG. III

- Two alternative patterns of the evaporator **690** in the “thermo optical solar dish” **710**.

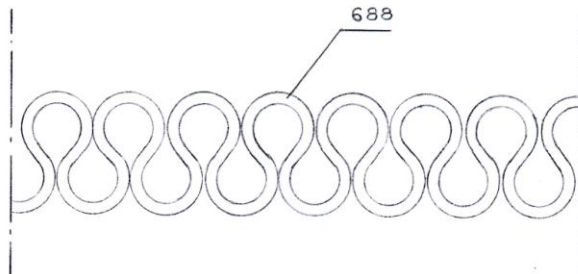
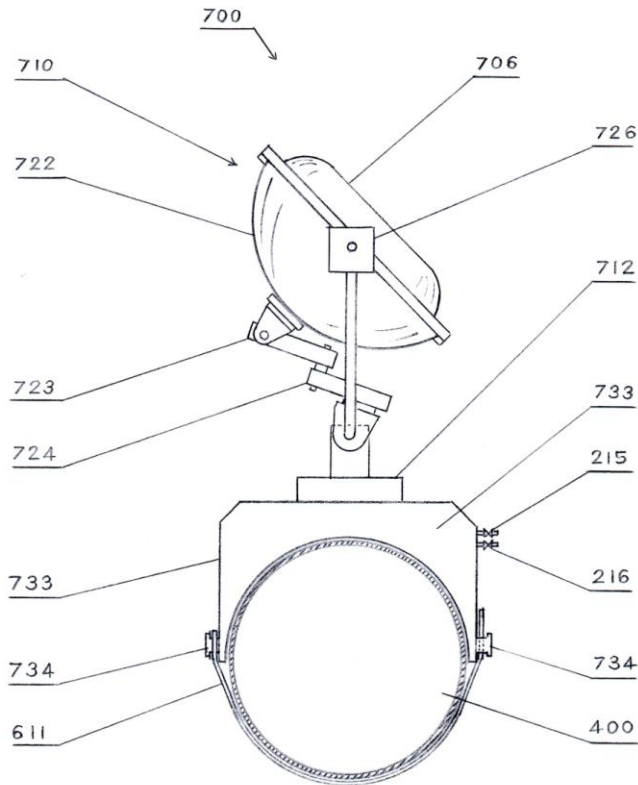


FIG. II2.





**Cross-sectional view of the “thermo optical solar dish” 710 assembled on the pipeline 400**

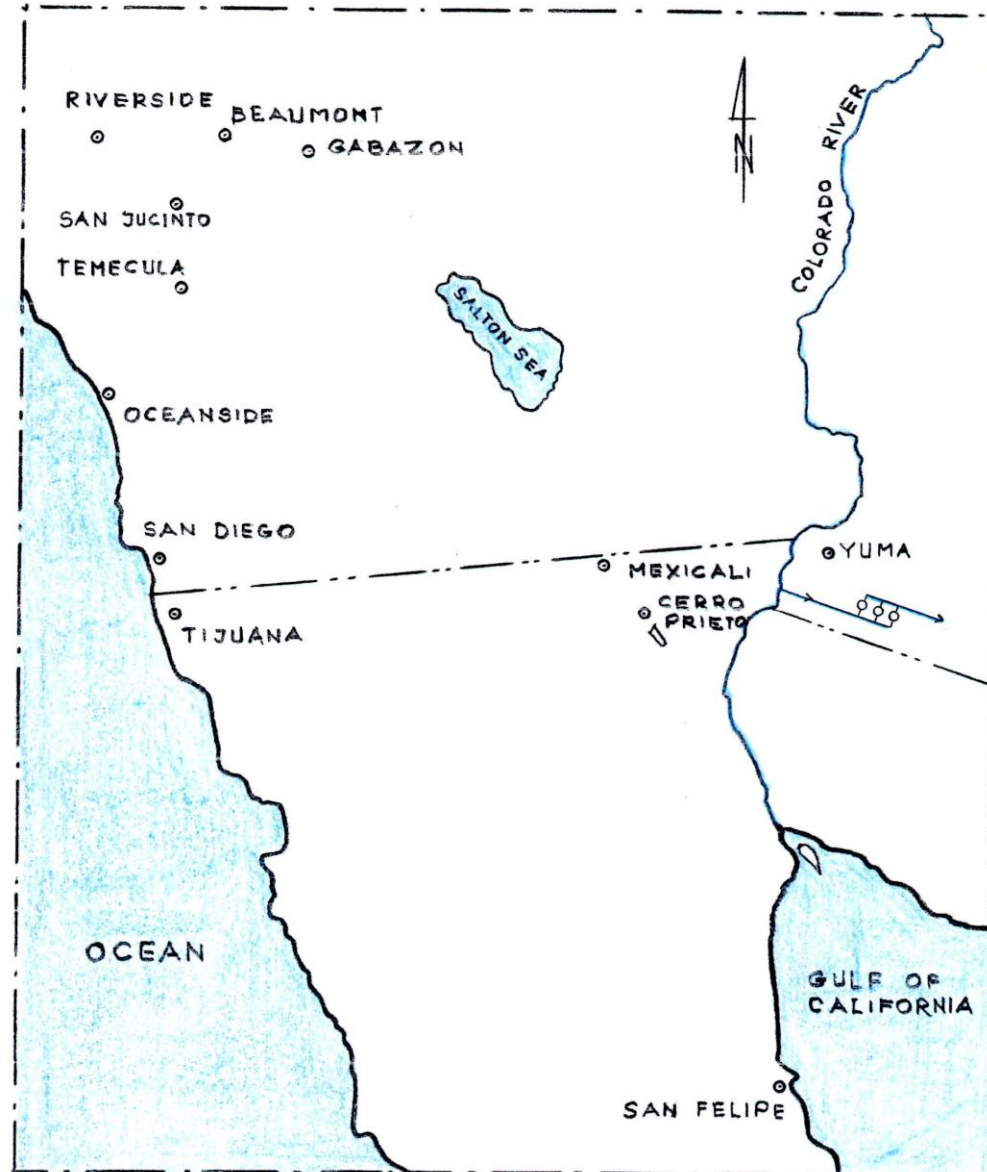


- Cross-sectional view of the “thermo optical solar dish” 710 assembled on the pipeline 400

FIG. 113



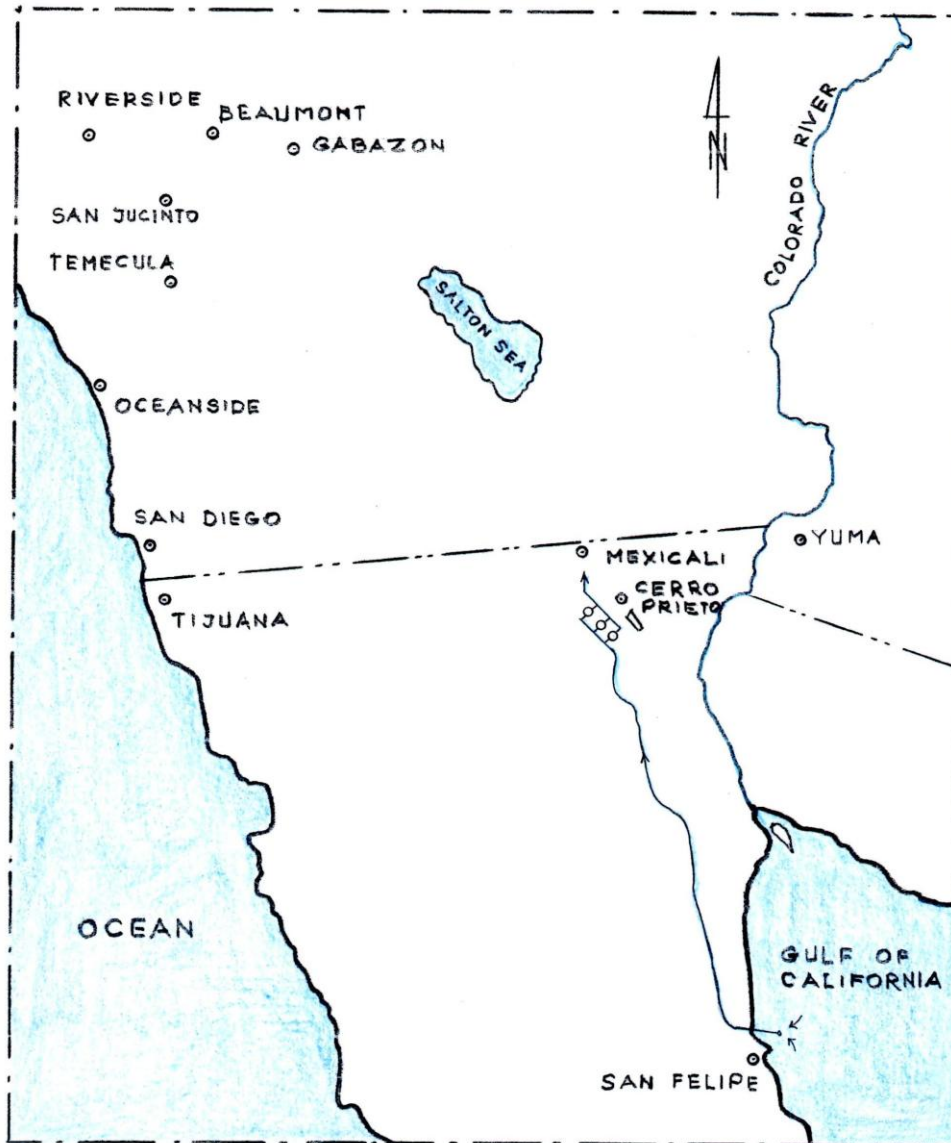
## Plain view map – Yuma, Arizona – Power Plants



- This map illustrates proposed location for power plants near Yuma, Arizona, which has prevalent geothermal sources;
- Power Plants using disclosed “Scientific Geothermal Technology” in this location would be profitable venture;
- It would generate needed electricity and distilled water as a byproduct using water from nearby Colorado river;
- Optionally, if water use from Colorado river is limited or prohibited then the distilled water could be returned into the Colorado river.



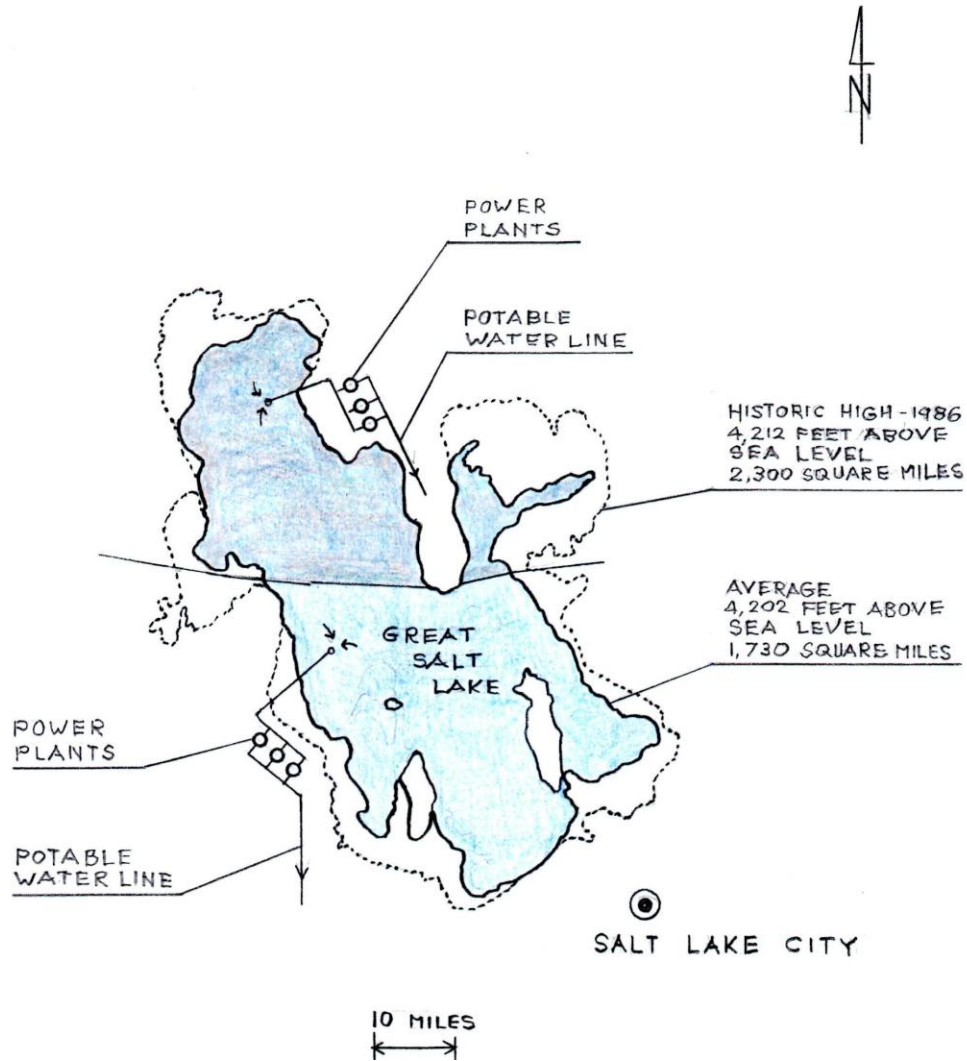
## Plain view map – Cerro Prieto, Mexico – Power Plants



- This map illustrates proposed location for power plants near Cerro Prieto, Mexico, which has prevalent geothermal sources;
- Power Plants using disclosed the “Scientific Geothermal Technology” in this location would be profitable venture;
- It would generate needed electricity by harnessing geothermal sources using seawater from nearby Gulf of California (Sea of Cortez);
- Distilled water produced as a byproduct could be distributed to the nearby city Mexicali which desperately need potable water;
- Production of lithium would be profitable venture too.



## Plain view map – Salt Lake City, Utah – Power Plants



- This map illustrates proposed locations for power plants near Salt Lake City, Utah which has prevalent geothermal sources;
- Power Plants using disclosed “Scientific Geothermal Technology” in this location would be profitable venture;
- It would generate needed electricity by harnessing geothermal sources using salty water from nearby the Great Salt Lake;
- Distilled water produced as a byproduct could be distributed to the nearby city or returned into lake;
- Production of lithium would be profitable venture too.





## **SPECIFIC BENEFIT TO THE SALTON SEA**

- **This proposal is a long-term solution for the Salton Sea and it can be considered as a “Project of the Century” in California;**
- **It would employ many people during construction and after construction;**
- **It would cost about \$10 billion, with the final result of “really” saving the Salton Sea and maintaining its water level of 1950s and 60s.**
- **Preventing further pollution of the lake by dividing lake in three sections;**
- **Importing seawater into central section, and providing conditions for tourism – Beaches, Resorts, Hotels, Motels, Front water properties, etc.**
- **Providing wildlife sanctuary. Birds can chose which section to inhabit;**
- **Harnessing prevalent geothermal energy with a “Scientific Geothermal Technology” using a complete closed loop system;**
- **Producing potable water as a byproduct without additional expenses for it;**
- **Generating revenue in hundred billion dollars in a few decades for our economy and it will continue so in the future.**



## Summary of the Preliminary Analyzes of Route #1

- Route #1 --- Corridor: San Felipe - Mexicali, Mexico, - Salton Sea.
- Elevation to overcome is 35 ' (10 m);
- Pipeline distance is about 150 miles;
  
- Cost estimate for pipeline: \$1.7 billion;
  
- Cost estimate for TOS: \$184.8 million;
  
- Route #1 would generate hydropower: 27.3 MWh;
  
- The Thermo Optical Solar System installed on pipeline would generate 1,058.79 MWh;
  
- Revenue generated from the Thermo Optical Solar (TOS) System installed on pipeline Route #1 would be at least \$114,349,320 per year;
  
- Revenue generated from the “Delta” hydro power plant would be \$13,759,200 per year;
- Revenue total: **\$128,108,520** per year;



## Summary of the Preliminary Analyzes of Route #2

- **Route #2** Corridor: Oceanside - Temecula – San Jacinto (existing tunnel) – Cabazon - Salton Sea;
- Elevation to overcome is 1,600' (488 m);  
2 cascades each with 279 m drop and 6 uphill pumping stations;
- Pipeline distance is about 160 miles;
- Cost estimate for pipeline: \$3.32 billion;
- Cost estimate for TOS: \$200 million;
- Energy needed for operation of the pipeline: 134.5 MWh;
- The Thermo Optical Solar System installed on pipeline would generate 1,058.79 MWh;
- Remaining 924.30 MWh can be sold to the grid;
- Revenue generated from the Thermo Optical Solar (TOS) System installed on pipeline Route #2 would be at least \$99,824,400 per year;



## Summary of the Preliminary Analyzes of Route #3

- **Route #3** Corridor: Oceanside - Temecula - San Jacinto - Beaumont – Salton Sea.
  
- Elevation to overcome: 2,700' (823 m).  
3 cascades each with 297 m drop and 9 uphill pumping stations;
- Pipeline distance: about 170 miles;
- Cost estimate for pipeline: \$3.5 billion;
- Cost estimate for TOS: \$209.44 million
- Energy needed for operation of the pipeline: 275.7 MWh;
- The Thermo Optical Solar System(TOS) installed on the Route #3 pipeline can generate 1,124.97 MWh;
- Remaining 849.27 MWh can be sold to the grid;
- Revenue generated from the Thermo Optical Solar (TOS) System installed on pipeline Route #3 would be at least **\$91,721,160** per year;





## Summary of the Preliminary Analyzes of Route #4

- **Route #4** Corridor: Oceanside - Temecula - Borrego - Springs –.Salton Sea.
- Elevation to overcome is 3,600' (1,097 m);  
4 cascades each with 292 m drop and 11 uphill pumping stations;
- Pipeline distance: about 100 miles;
- Cost estimate for pipeline: \$2.22 billion;
- Cost estimate for TOS: \$123,200,000 million;
- Energy needed for operation of the pipeline: 380 MWh;
- The Thermo Optical Solar System installed on route #4 pipeline can generate 661,7 MWh;
- Remaining 281.7 MWh can be sold to the grid;
- Revenue generated from the Thermo Optical Solar (TOS) System installed on pipeline Route #4 would be at least **\$30,423,600** per year.



## Summary of the Preliminary Analyzes of Route #5

- **Route #5** Corridor: Long Beach – Whitewater - Springs – Salton Sea.
- Elevation to overcome: 2,700' (823 m);  
3 cascades each with 297 m drop and 9 uphill pumping stations;
- Pipeline distance: about 200 miles;
- Cost estimate for pipeline: \$4.118 billion;
- Cost estimate for TOS: \$246,400,000 million;
- Energy needed for operation of the pipeline: 275.7 MWh;
- The Thermo Optical Solar System installed on route #5 pipeline can generate 1,323.49 MWh;
- Remaining **1,047.80 MWh** can be sold to the grid;
- Revenue generated from the Thermo Optical Solar (TOS) System installed on pipeline Route #5 would be at least **\$113,162,400** per year



## **CONSTRUCTION TIME SCHEDULE ESTIMATE**

- **Preliminary and exploratory work on all three necessary phases (I, II and III) could start right away;**
- **Soon after necessary permits are obtained, construction of first three phases (I, II and III) could start at the relatively same time and preferably finished in about two years.**
- **Phase IV could start soon after and preferably finished in two years.**
- **Phase V could start during construction of Phase IV and will be continues process in the future.**



## **ESTIMATED PRODUCTION CAPACITY OF ONE PROPOSED GEOTHERMAL POWER PLANT**

- **Proposed Geothermal Power Plant(s) the “Scientific Geothermal Technology” consist of 24 well-bores and 24 Binary Power Units;**
- **24 Binary Power Units x 4 MW = 96 MWh; ~ 100 MWh;**
- **Assumed price of \$60 per MWh;**
- **\$60 x 96 MWh = \$5,760 per hour;**
- **\$5,760 x 24h = \$138,240 per day;**
- **\$138,240 x 365 days = \$50,457,600 per year;**



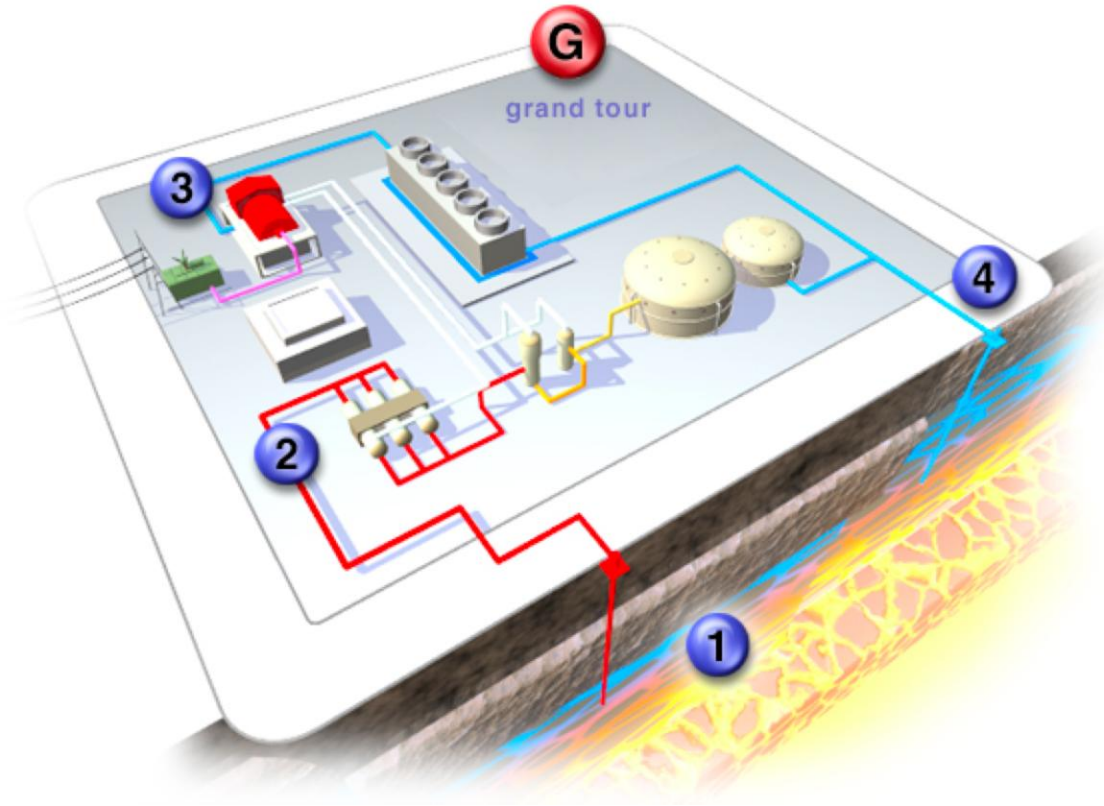


## ENERGY OVERVIEW IN GENERAL

- **As population on our planet increases** there is constantly increasing demand for electricity.
- **Nuclear, Oil and Coal** burning Power Plants with their **waste material** are **pollutant** with **serious consequences** for our environment and our existence.
- Most of renewable energy technologies including **PV solar and wind** have serious **limitations** such as weather conditions.
- **In summary** – It is well know that **enormous energy** is below our feet – whether it is a few miles **underground** or on the **surface** in locations such as **Hawaii**, the **Erta Ale** volcano, the **East African Rift**, etc. The question was, until now, how to **harness it expediently and efficiently?**



## Schematic View of an Conventional Geothermal Plant

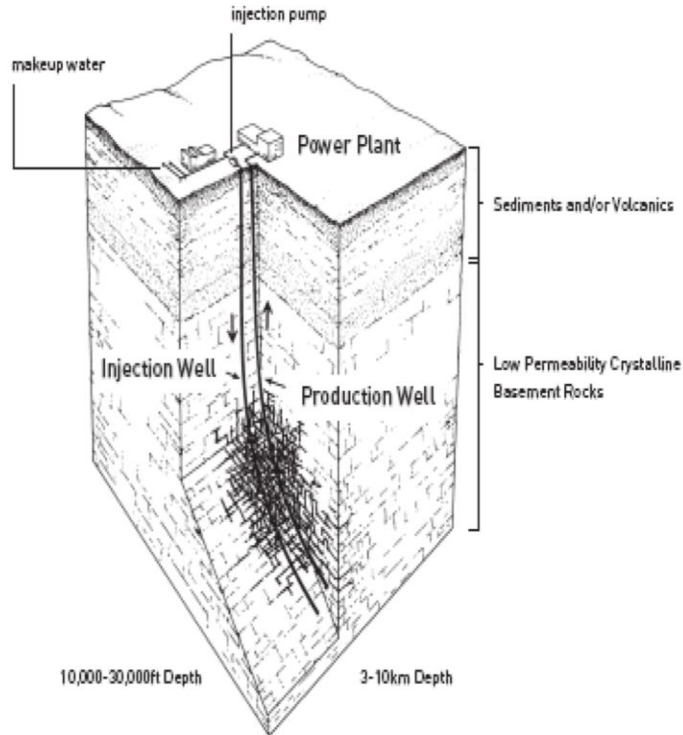


- **Location Limitations.**
- **Requires Hydrothermal reservoir.**
- **Maintenance issues with brine concentration, scaling and corrosion of equipment.**

Courtesy of CalEnergy – This illustration represents an existing geothermal power plant operation.



# Schematic View of an Enhanced Geothermal System (EGS)



## Requires:

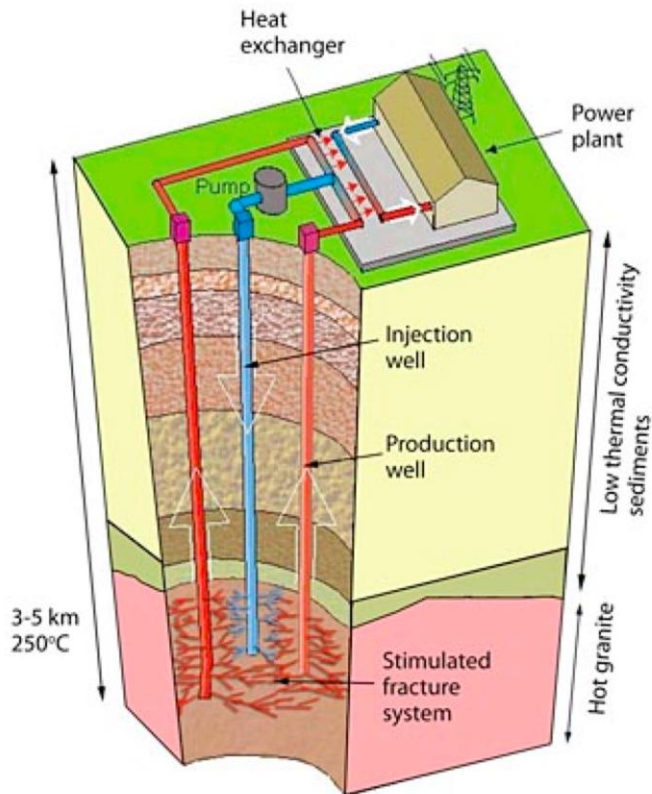
- **Permeability of hot rocks**
- **Horizontal rock formation**
- **Substantial amount of water to be injected and maintained**

This Illustration is a Schematic of a conceptual two-wells Enhanced Geothermal System in hot rock in a low permeability crystalline basement formation.

(Courtesy of: DOE - Energy Efficiency & Renewable Energy)



# Schematic View of an Enhanced Geothermal System (EGS)



## Requires:

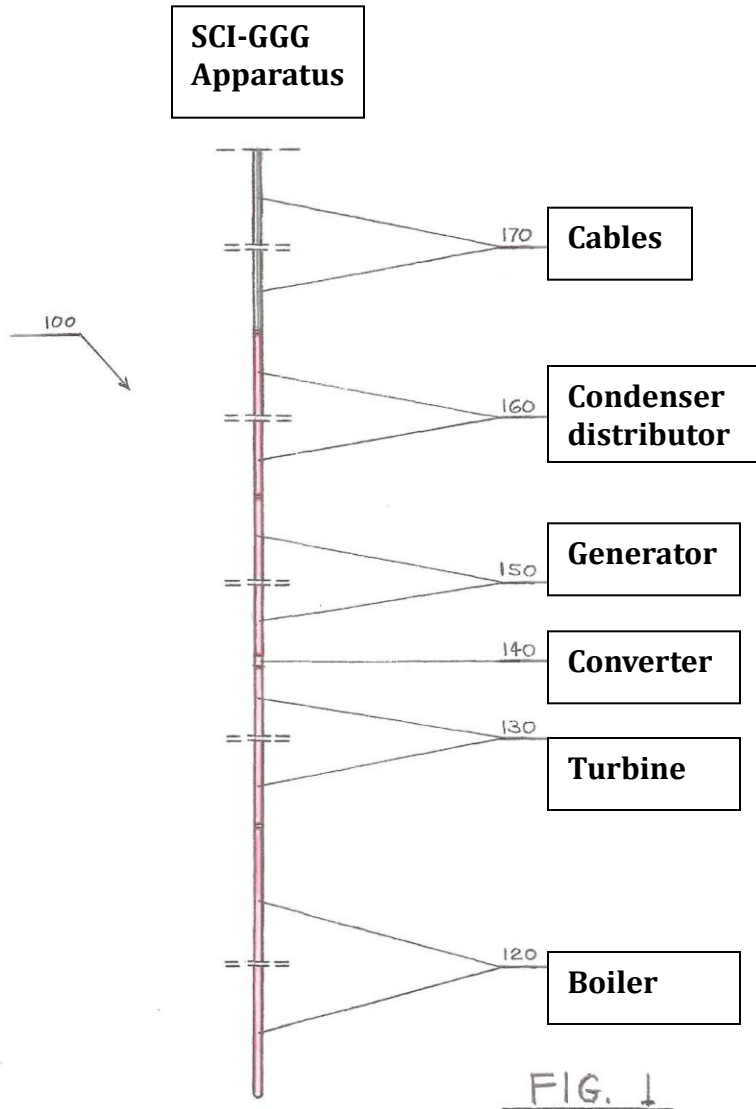
- **Permeability of hot rocks**
- **Horizontal rock formation**
- **Substantial amount of water to be injected and maintained**

This illustration is a schematic of another conceptual three-wells Enhanced Geothermal System in hot rock. 3D cutaway - diagram modified from ANU Hot Rock Energy website .  
(Courtesy of: <http://hotrock.anu.edu.au>)





# The “Self Contained In-Ground Geothermal Generator“ (SCI-GGG) system



The SCI-GGG system uses several completely closed loop systems and generates electricity down at the heat source and transmits it up to the ground level by means of electrical cables.

The SCI-GGG system consist of:

- A BOILER;
- A TURBINE;
- A CONVERTER;
- A GENERATOR;
- A CONDENSER DISTRIBUTOR;
- **CONDENSER** and COOLING system (not illustrated here); and
- **CABLES**

**EXHIBIT “ PP “**



GEOTHERMAL WORLDWIDE, INC.

# SCI-GGG System

2 of 17

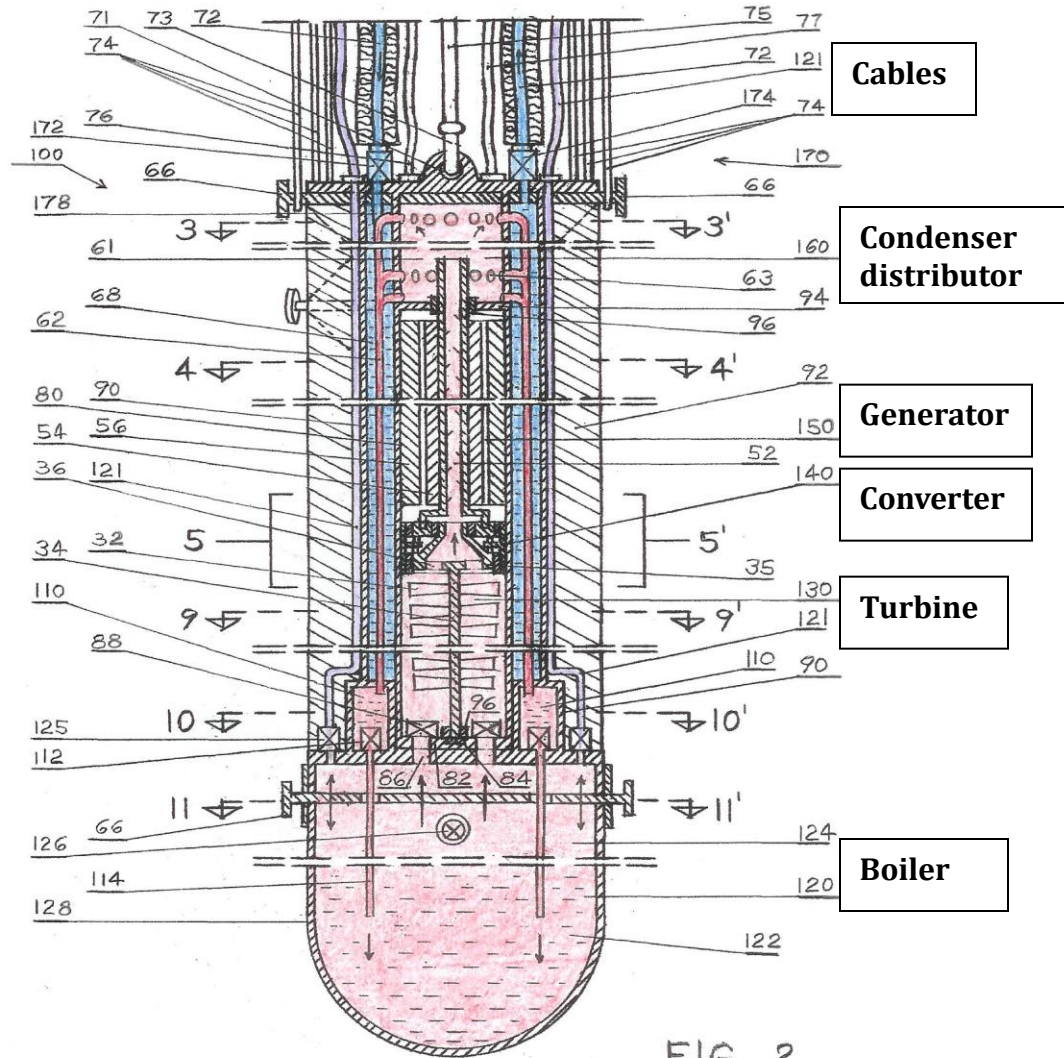
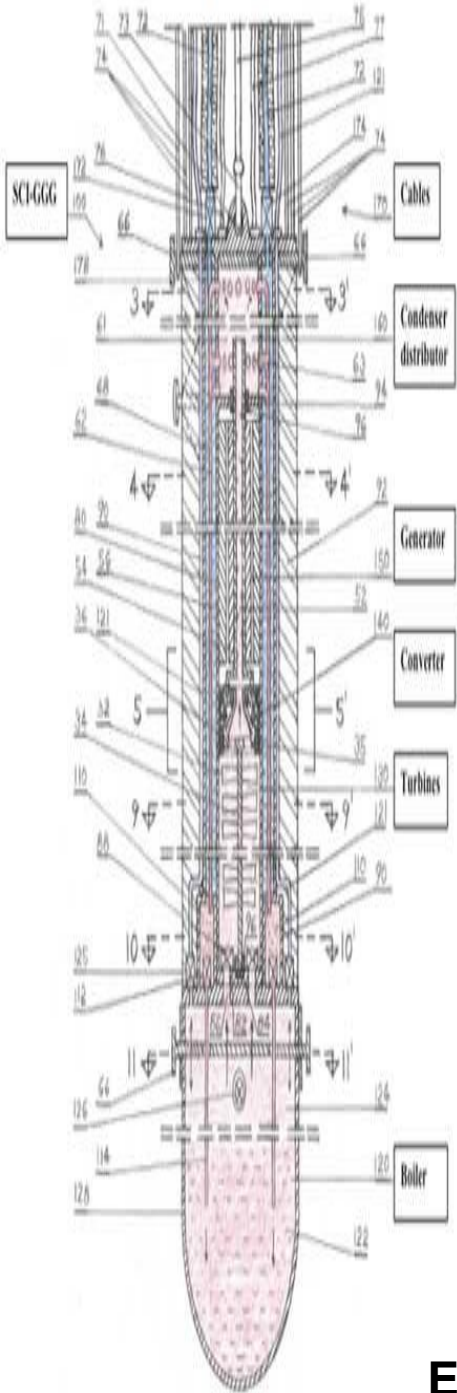


FIG. 2

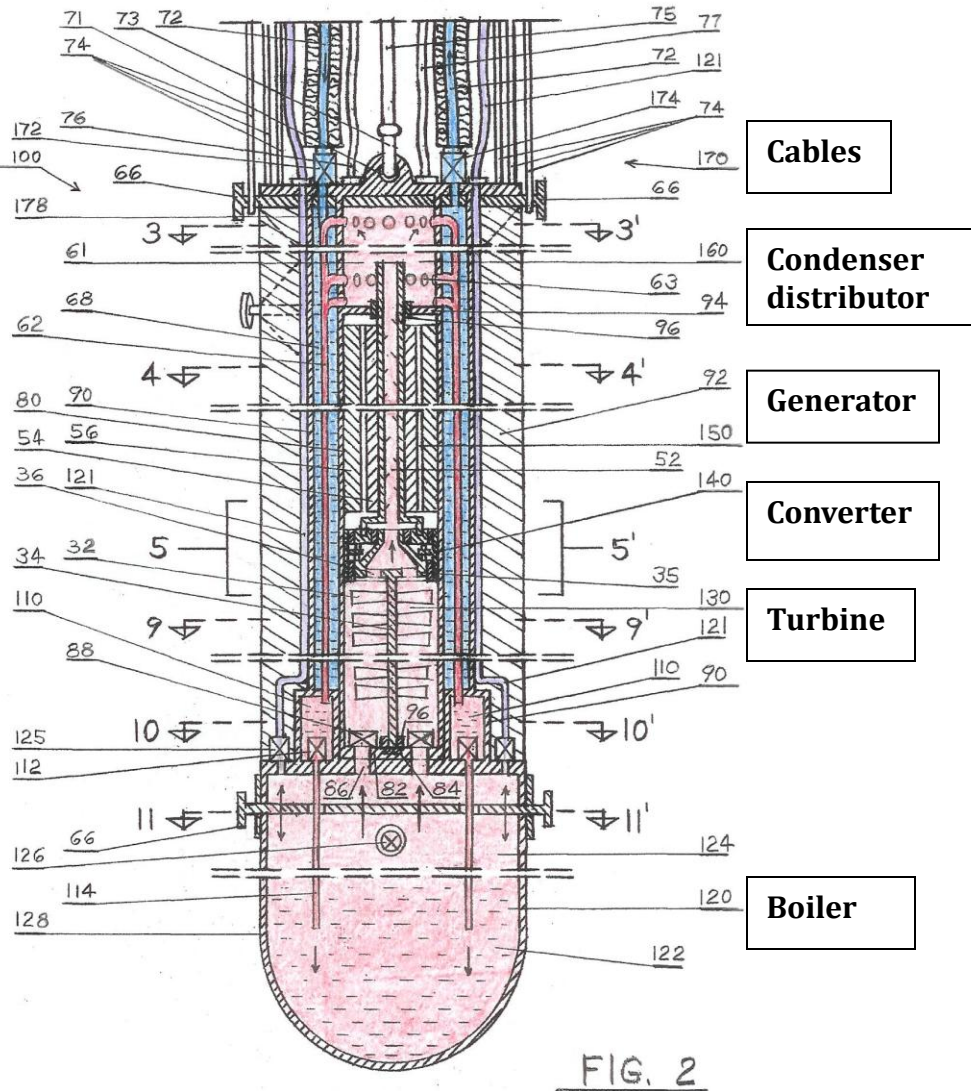
EXHIBIT " QQ "



GEOTHERMAL WORLDWIDE, INC.

# Self Contained In-Ground Geothermal Generator (SCI-GGG)

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The (SCI-GGG) method for harnessing geothermal energy for production of electricity consists of:

- Lowering a (SCI-GGG) apparatus into pre-drilled well bore at the source of heat;
- The (SCI-GGG) apparatus consists of: a boiler; a turbines; a converter; a generator; a condenser distributor; and a condenser that are arranged to function in confined spaces such as in a well bore.
- The SCI-GGGG absorbs heat from source of heat (hot rocks or reservoir) and generates electricity which is transmitted by cable to the ground surface to electrical grids for use in houses and industry.
- In the process of cooling the engine compartments with a separate closed loop system “Self Contained In-Ground Heat Exchanger” (SCI-GHE system), additional electricity is generated on the site.

**EXHIBIT “ RR “**



GEOHERMAL WORLDWIDE, INC.



# Self Contained In-Ground Geothermal Generator (SCI-GGG system)

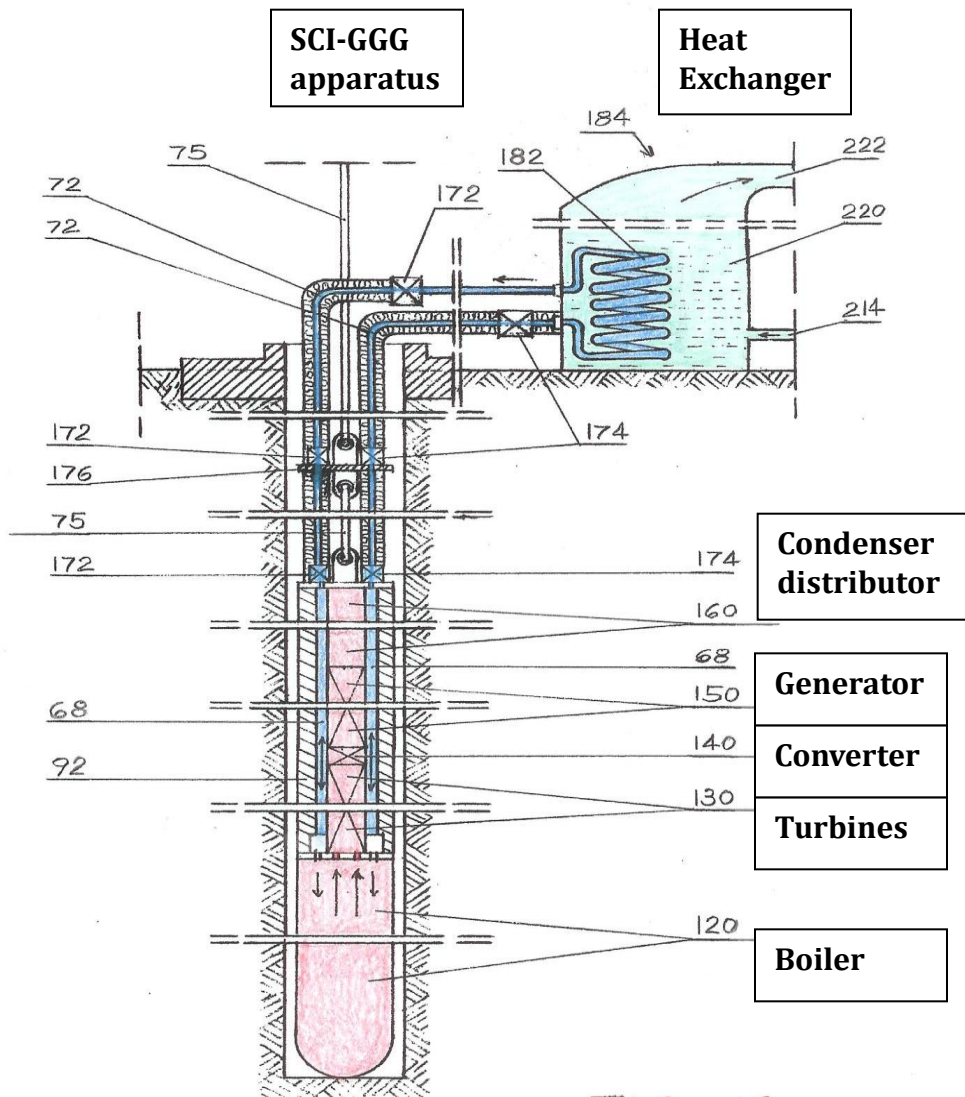


FIG. 12

- The SCI-GGG apparatus uses three (3) closed loop systems:
- A first closed loop systems (rosy color) circulates working fluid through a Boiler, Turbine, Generator, Condenser, and back through Boiler.
- A second closed loop systems (blue color) “the Self Contained In-Ground Heat Exchanger (SCI-GHE system)” circulates fluid through the condenser; thermally insulated hoses; and a Heat Exchanger coupled to the binary power unit on the ground surface.
- The “Self Contained In-Ground Heat Exchange” (SCI-GHE system) is an integral part of the SCI-GGG system and can be used separately as an independent Heat Exchanger.
- A third closed loop systems (greenish color) circulates working fluid through a binary power unit on the ground surface and generates additional electricity.





# The "Self Contained In-Ground Heat Exchanger" (SCI-GHE system)

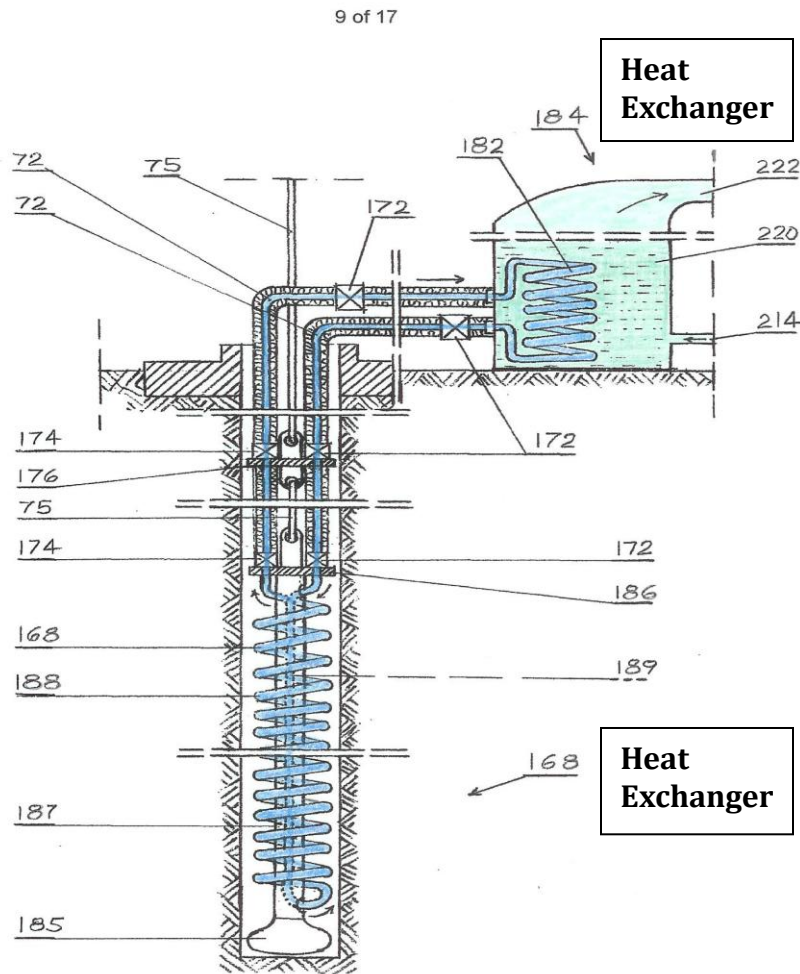


FIG. 13

## EXHIBIT "TT"

- The (SCI-GHE) apparatus is an integral part of the "Self Contained In-Ground Geothermal Generator" (SCI-GGG system) and is used separately as an independent Heat Exchanger apparatus.
- The (SCI-GHE) apparatus consist of: two coils (Heat Exchangers); a closed loop of thermally insulated pipes/hoses 72; at least one In-Line Pump 172; and a Binary Power Unit 184.
- The first coil (Heat Exchanger) 168 of the first closed loop systems is located at heat source and the second coil (Heat Exchanger) 182 is coupled into boiler of the Binary Power Unit on the ground surface which operates as a second closed loop system - the Organic Rankine Cycle (ORC) – which generates electricity.
- Alternatively, the (SCI-GHE) and/or (SCI-GHE) apparatus can be scaled to be used for extracting heat from abandon and marginal wells.
- The first coil (HE) at the bottom of well bore has vertical pipe and is structurally sound to support its weight.



# Scientific Geothermal Technology

## SCI-GGG and SCI-GHE systems - side by side

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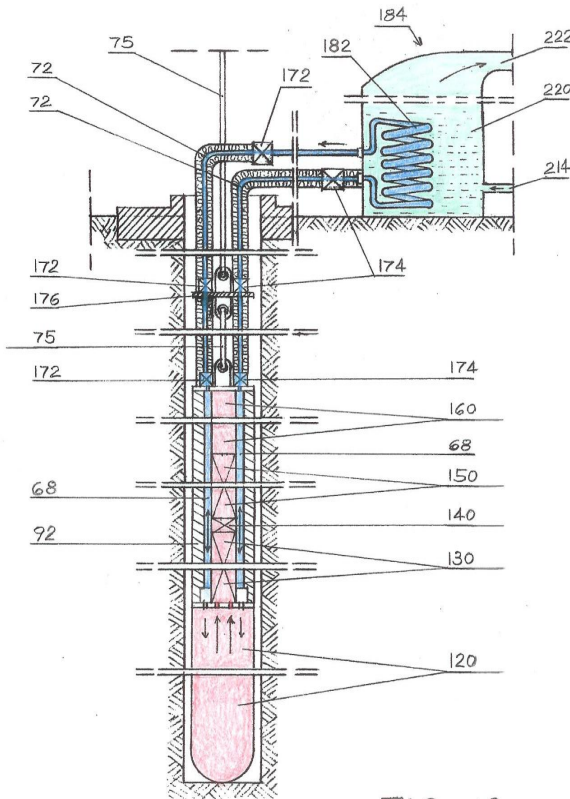


FIG. 12

**SCI-GGG system**

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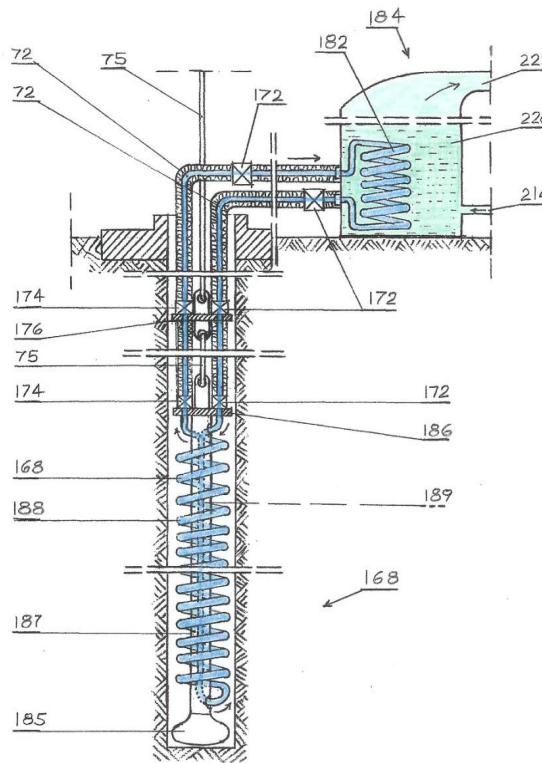


FIG. 13

**SCI-GHE system**

- The SCI-GGG system generates electricity down at the heat source and transmits it up to the ground level by means of electrical cables.
- The SCI-GGG system generate additional electricity on the ground surface.
- The (SCI-GHE) system is an integral part of the (SCI-GGG) system and can be used separately as an independent Heat Exchange Apparatus.
- The (SCI-GHE) system has, the less production capacity than (SCI-GGG) system but it is easier to build and maintain.
- The Scientific Geothermal Technology doesn't require hydrothermal reservoirs, although is not limited to dry hot rocks.

**EXHIBIT "UU"**



GEO THERMAL WORLDWIDE, INC.

# A Proposal for Temporary Cooling Dysfunctional Reactor at Fucushima Daiichi Nuclear Power Complex by using SCI-GHE System

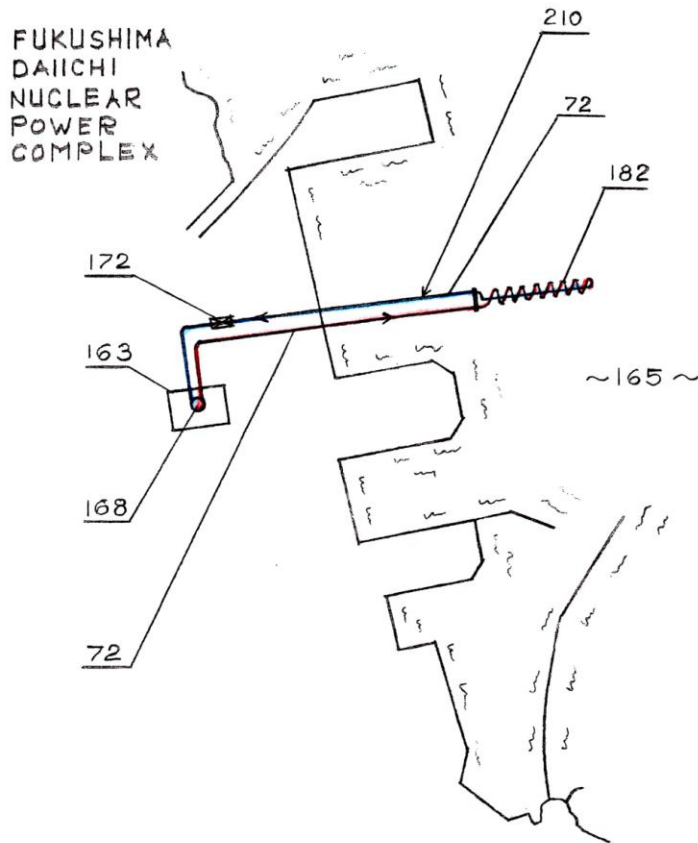


FIG. 25

## EXHIBIT "VV"



GEOHERMAL WORLDWIDE, INC.

- FIG. 25 illustrate dysfunctional nuclear reactor 163, Ocean 165 and universal closed loop heat exchanger system 210.
- The first heat exchanger 168 is lowered into dysfunctional nuclear reactor 163 and the second heat exchanger 182 is submerged into nearby Ocean 165.
- Heat is extracted from dysfunctional overheating nuclear reactor 163 through the first heat exchanger 168 and transferred through closed loop line 72, to the second heat exchanger 182, and dispersed safely into the Ocean 165.
- Heat exchange fluid in closed loop system 210 is not in direct contact with radioactive material in dysfunctional nuclear reactor 163 or the Ocean 165.
- Multiple units of the closed loop system 210 can be deployed.
- Although a temporally solution, if needed, Portable Binary Power Unit, can be inserted into closed loop system 210.





# Cross-sectional view of a Power Plant for Production of Electricity from heat source such as Oil Well Flare Stacks by using SCI-GHE System

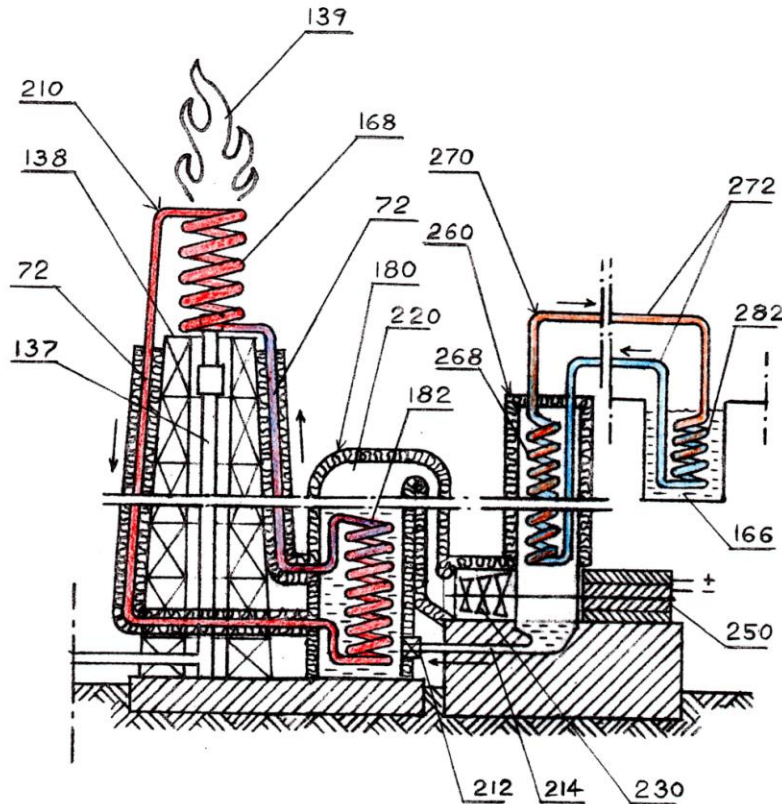
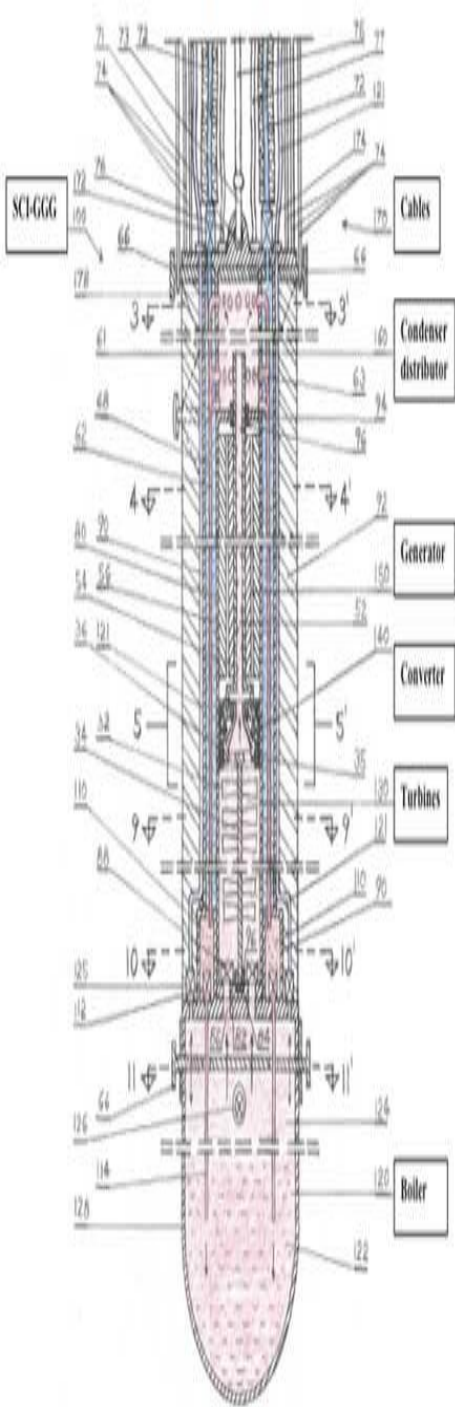


FIG. 27

- Flare stack 137 has support structure 138.
- The heat exchange system 210 with the first heat exchanger 168 positioned on top of the supporting structure 138 and the second heat exchanger 182 coupled into boiler/evaporator 220 of the binary power unit 180.
- Heat from flame 139 is extracted through the first heat exchanger 168 and transferred through thermally insulated line 72 to the second heat exchanger 182.
- Binary power unit 180, has a boiler 220, turbines 230, a generator 250, and condenser 260.
- Condenser 260 is cooled with additional closed loop system 270 consisting of the first heat exchanger 268, closed loop line 272 and the second heat exchanger 282 which can be submerged into nearby source of cold water.



## Maintenance of the SCI-GGG system

- **Basic maintenance of the apparatus – monitoring temperature, managing levels of fluids and lubrication, can be managed from the ground surface through service lines.**
- **Extensive maintenance – such as replacement of bearings, turbine, generator or fixing leak(s) – requires removal of apparatus, refurbishment or replacement and then reinsertion into the wellbore.**



## Advantages of the "Scientific Geothermal Technology" the (SCI-GGG) & (SCI-GHE) systems (I):

1. **Generates electricity constantly 24 hours per day** regardless of weather condition on the ground surface.
2. **Needs a single well** bore to function and doesn't need a hydrothermal reservoir although it is not limited to dry hot rocks.
3. **The (SCI-GGG) and/or (SCI-GHE) apparatus** can be **scaled** to be used for **extracting heat from abandon and marginal wells.**
4. Uses **several closed loop systems** and at no time is there any contact with the environment by the working fluid or the heat exchange fluid therefore it **doesn't pollute the environment.**
5. **Eliminates** any concern of **"fracking"** (Hydraulic Fracturing).
6. **Eliminates** the issues of injection water.
7. **Eliminates** the issues of concentration of brine, **filtration, separation,** equipment **corrosion, scaling,** and ground **water pollution.**



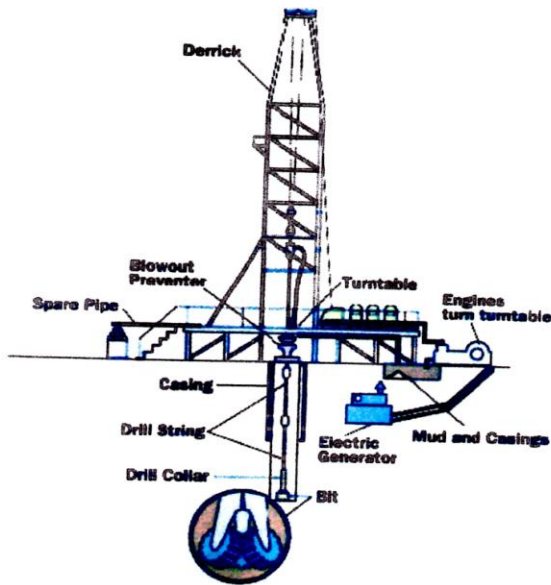
## Advantages of the "Scientific Geothermal Technology" the (SCI-GGG) & (SCI-GHE) systems (II):

8. **Modular implementation** of the "Scientific Geothermal Technology" systems create immediate revenues and allowed continuation of buildups of additional modular units.
9. When eventually cooling of the rocks happen then **additional drilling** could be performed, **periodically** or **at once**, until **equilibrium** of heat absorption and heat replenishment is **achieved** rather than start drilling at a new location nearby. The **extended depth** will result in **hotter rock** formations and **higher heat flux**. Eventually, a point will be reached where heat extraction and heat replenishment will be in **balance - equilibrium**.
10. Necessary heat can be reached and used from any location and **every country has the potential** to access that limitless heat source and **produce electricity** by implementing the "Scientific Geothermal Technology" systems.
11. By implementing "Scientific Geothermal Technology " systems, we can **stop polluting** our planet with nuclear, coal and oil burning power plants and their toxic waste and **start producing electricity** from abundant **self sustaining geothermal source** for energy needs for our **current and future generations**.





# Schematic view of an Contemporary Oil Rig Drilling System



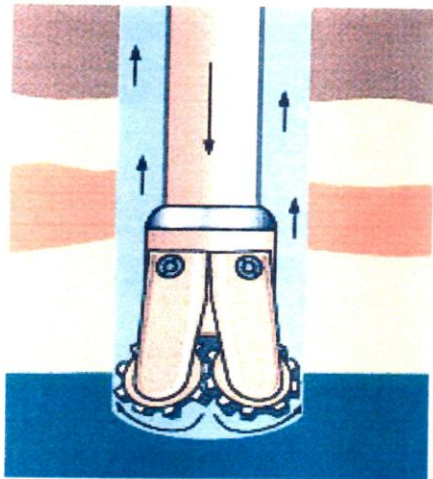
Here are illustrated major systems of a land oil rig:

- **Power System** – Large diesel engines
- **Mechanical system** – driven by electric motors; hosting system; turntable;
- **Rotating equipment** – Swivel; kelly; turntable or rotary table; Drill string; drill bit(s);
- **Casing;**
- **Circulation system;**
- **Derrick;**
- **Blow Out Preventer;**

(Photo courtesy of the Energy Institute.)



# Schematic view of an Contemporary Oil Rig Drilling System



Here is illustrated a drill bit:

- **Mad circulation system;**
- **Mad is injected through pipe and through several orifices at drill bit circulates up between pipe and wall of the well bore providing necessary stream for cutting to be excavated;**
- **By increasing size of the drill bit (well bore) and / or by increasing dept of the well bore it requires tremendous increase of pressure inside pipe and corresponding stream up;**
- **Contemporary drilling system have limitations how wide and deep wellbore can be drilled;**

**EXHIBIT “ZZ”**

(Photo courtesy of the Energy Institute).



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# Schematic view of an Apparatus for Drilling Faster, Deeper, and Wider Well Bore

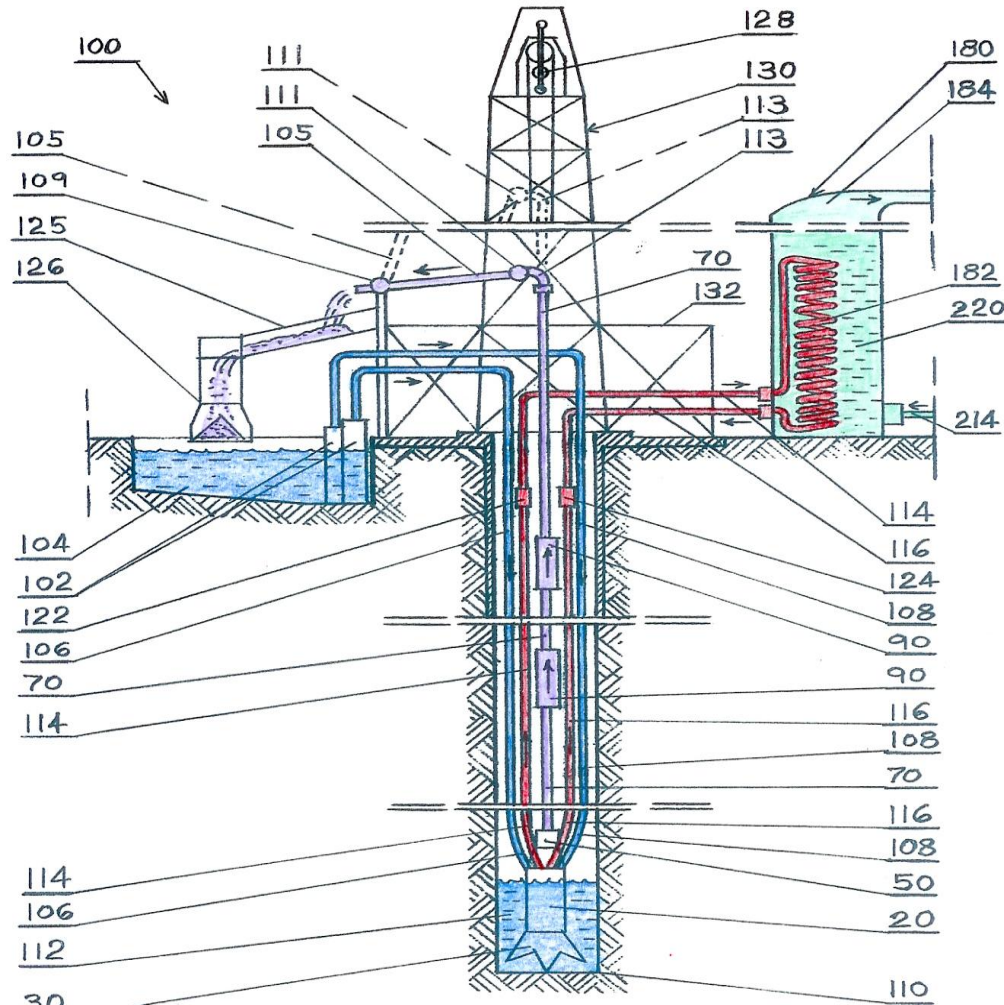


FIG. 1

The apparatus and method for drilling deeper and wider well bores consist of:

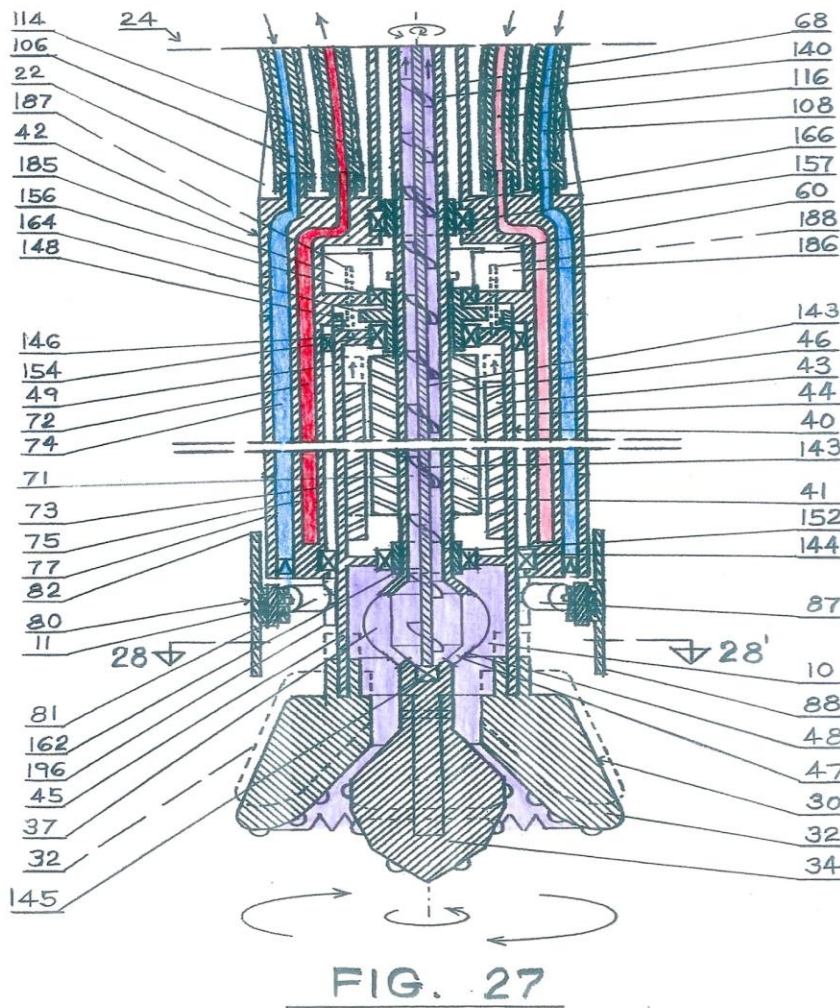
- A Motorized Drill Head for cutting and shredding ground material;
- A separate excavation line;
- A separate fluid delivery line;
- A separate close loop engine cooling line;
- The excavation line consists of multiple connected stationary segments of the main excavation pipe with periodical segments of an In-Line excavation pump;
- Optionally, whole excavation pipeline can consist of multiple segments of an In-Line excavation pump;

**EXHIBIT "AAA"**



GEOTHERMAL WORLDWIDE, INC.

# Schematic view of an Motorized Drill Head of an Apparatus for Drilling Faster, Deeper, and Wider Well Bore



- The diameter of the excavation line and rate of flow of mud and cuttings through it and the diameter of the fluid delivery line and rate of fluid flow through it are in balance requiring only limited fluid column at the bottom of the well bore.
- Fluid column may exist through whole well bore to sustain it during drilling process, but not for excavation reasons.
- The excavation process continues regardless of the diameter of the drill head (wellbore);
- Therefore this method eliminates well known drilling limitations relative to the depth and diameter of the wellbore.

**EXHIBIT "BBB"**



GEOTHERMAL WORLDWIDE, INC.



## **MISSION STATEMENT:**

- **Our mission at Geothermal Worldwide, Inc., is to license our IP – and support the integration of its processes:**
- **"Self Contained In-Ground Geothermal Generator (SCI-GGG);**
- **"Self Contained In-Ground Heat Exchanger" (SCI-GHE);**
- **"In-Line-Pump/Generator";**
- **"Apparatus for drilling deeper and wider well-bores" to the interested and capable parties worldwide;**
- 
- **Thermo Optical Solar (TOS) system;**





US007849690B1

(12) **United States Patent**  
**Lakic**

(10) **Patent No.:** US 7,849,690 B1  
(45) **Date of Patent:** Dec. 14, 2010

(54) **SELF-CONTAINED IN-GROUND  
GEOTHERMAL GENERATOR**

(76) **Inventor:** Nikola Lakic, 45-191 Elm St., Indio, CA  
(US) 92201

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(\*) **Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 818 days.

\* cited by examiner

*Primary Examiner*—Hoang M Nguyen  
(74) *Attorney, Agent, or Firm* Schmeiser, Olsen & Watts  
LLP

(21) **Appl. No.:** 11/770,543

(22) **Filed:** Jun. 28, 2007

(57) **ABSTRACT**

**Related U.S. Application Data**

(60) Provisional application No. 60/922,440, filed on Apr. 7, 2007, provisional application No. 60/927,336, filed on May 2, 2007.

(51) **Int. Cl.**  
*F03G 7/00* (2006.01)

(52) **U.S. Cl.** ..... 60/641.2; 290/1 A; 290/2

(58) **Field of Classification Search** ..... 60/641.2; 641.4; 290/1 A; 2

See application file for complete search history.

(56) **References Cited**

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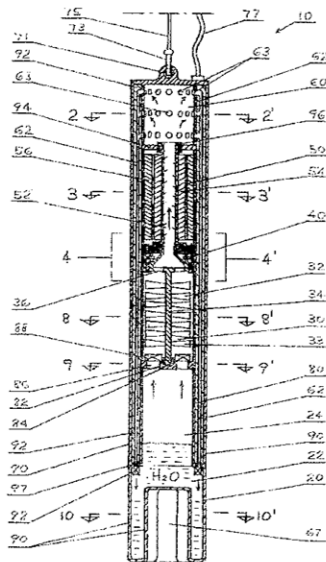
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22 Claims, 14 Drawing Sheets

A method of using geothermal energy to produce electricity by lowering a geothermal generator deep into pre-drilled holes below the Earth's surface. A geothermal generator includes a boiler, a turbine compartment, an electric generator, a condenser and an electric cable. The geothermal generator also includes an internal cylinder, an external cylinder and a plurality of tubes disposed between the internal cylinder and the external cylinder. The plurality of tubes is part of the condenser. In a method of using the geothermal generator, water contained within the boiler is converted to high-pressure, super heated steam due to heat contained within a pre-drilled well below the earth's surface. The steam is used to produce electric energy, which is transported to the ground surface by the electric cable.

➤ **US Patent Issued on:  
December 14, 2010;**

➤ **Title: Self Contained In-Ground  
Geothermal Generator;**



**GEOTHERMAL WORLDWIDE, INC.**



US008281591B2

(12) **United States Patent**  
**Lakic**

(10) **Patent No.:** US 8,281,591 B2  
(45) **Date of Patent:** Oct. 9, 2012

(54) **SELF CONTAINED IN-GROUND  
GEOTHERMAL GENERATOR**

(76) Inventor: **Nikola Lakic**, Indio, CA (US)

(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1035 days.

(21) Appl. No.: **12/197,073**

(22) Filed: **Aug. 22, 2008**

(65) **Prior Publication Data**

US 2011/0169274 A1 Jul. 14, 2011

**Related U.S. Application Data**

(63) Continuation-in-part of application No. 11/770,543, filed on Jun. 28, 2007, now Pat. No. 7,849,690.

(51) **Int. Cl.**

**F01K 27/00** (2006.01)  
**F03G 7/00** (2006.01)

(52) **U.S. Cl.** ..... 60/641.2; 60/641.1; 60/641.4

(58) **Field of Classification Search** ..... 60/641.1-641.5  
See application file for complete search history.

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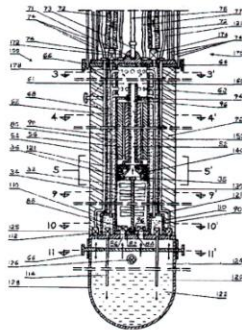
*Primary Examiner* — Thomas Denion  
*Assistant Examiner* — Christopher Jetton

(74) *Attorney, Agent, or Firm* — Schmeiser, Olsen & Watts LLP

(57) **ABSTRACT**

A self contained geothermal generator includes a boiler, a turbine compartment, an electricity generator, a condenser and an electric cable. The condenser includes a distributor chamber, a peripheral chamber and plurality of tubes disposed between the chambers. The peripheral chamber of the condenser surrounds and cools turbine, elective generator and selector of the condenser departments. The condenser cools and converts exhausted steam back in liquid state and returns it back into boiler for reheating. In a method of using the geothermal generator, water contained within the boiler is converted to high-pressure, super heated steam due to heat from hot rocks contained within a pre-drilled well below the Earth's surface. The steam is used to produce electric energy which is transported up to the ground surface by the electric cable. A plurality of geothermal generators may be used in a "binary" power plant through system of several heat exchangers.

13 Claims, 15 Drawing Sheets



➤ **US Patent Issued on:  
October. 9, 2012;**

➤ **Title: Self Contained In-Ground  
Geothermal Generator; and**

➤ **Several Patent Pending  
Applications**



**GEOTHERMAL WORLDWIDE, INC**



US008713940B2

(12) **United States Patent**  
**Lakic**

(10) **Patent No.:** US 8,713,940 B2  
(45) **Date of Patent:** May 6, 2014

(54) **SELF-CONTAINED IN-GROUND  
GEOTHERMAL GENERATOR**

(76) Inventor: **Nikola Lakic**, Indio, CA (US)

(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 262 days.

(21) Appl. No.: 13/053,029

(22) Filed: **Mar. 21, 2011**

(65) **Prior Publication Data**  
US 2011/0167819 A1 Jul. 14, 2011

**Related U.S. Application Data**

(63) Continuation-in-part of application No. 12/197,073, filed on Aug. 22, 2008, now Pat. No. 8,281,591, and a continuation-in-part of application No. 11/770,543, filed on Jun. 28, 2007, now Pat. No. 7,849,690.

(51) **Int. Cl.**  
**F03G 7/00** (2006.01)

(52) **U.S. Cl.**  
USPC ..... 60/641.2; 60/641.1; 60/641.4

(58) **Field of Classification Search**  
USPC ..... 60/641.1-641.5  
See application file for complete search history.

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*Primary Examiner* — Thomas Denion

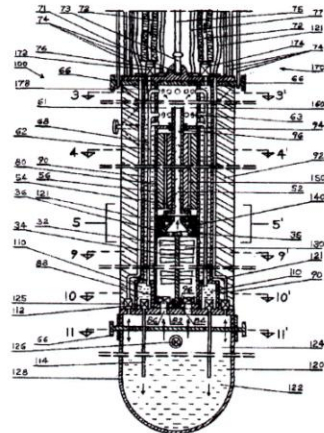
*Assistant Examiner* — Kelsey Stanek

(74) *Attorney, Agent, or Firm* — Schmeiser, Olsen & Watts LLP

(57) **ABSTRACT**

A method of using geothermal energy to produce electricity by lowering a geothermal generator deep into a pre-drilled well bore below the Earth's surface. A self contained geothermal generator includes a boiler, a turbine compartment, an electricity generator, a condenser and an electric cable. The condenser includes a distributor chamber, a peripheral chamber and plurality of tubes disposed within the peripheral chamber. The peripheral chamber of the condenser surrounds the turbine, electric generator and distributor chamber departments and is cooled with a separate closed loop system. The condenser cools and converts exhausted steam back in liquid state and returns it back into the boiler for reheating. Water contained within the boiler is converted to high-pressure, super heated steam due to heat from hot rocks contained within a pre-drilled well bore. The steam is used to produce electric energy which is transported up to the ground surface by the electric cable.

7 Claims, 17 Drawing Sheets



- **US Patent Issued on:  
May 6, 2014;**
- **Title: Self Contained In-Ground  
Geothermal Generator;**
- **Several Patent Pending  
Applications;**







US009206650B2

(12) **United States Patent**  
**Lakic**

(10) **Patent No.:** US 9,206,650 B2  
(45) **Date of Patent:** Dec. 8, 2015

(54) **APPARATUS FOR DRILLING FASTER, DEEPER AND WIDER WELL BORE**

USPC ..... 175/215, 25, 339, 320, 102, 324  
See application file for complete search history.

(76) **Inventor:** Nikola Lakic, Indio, CA (US)

(56) **References Cited**

(\* ) **Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 779 days.

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(22) **Filed:** Mar. 19, 2012

**Prior Publication Data**

US 2012/0292112 A1 Nov. 22, 2012

**Related U.S. Application Data**

(63) Continuation-in-part of application No. PCT/US2010/049532, filed on Sep. 20, 2010.

(60) Provisional application No. 61/276,967, filed on Sep. 19, 2009, provisional application No. 61/395,235, filed on May 10, 2010, provisional application No. 61/397,109, filed on Jun. 7, 2010.

*Primary Examiner* — Daniel P Stephenson  
(74) *Attorney, Agent, or Firm* — Schmeiser, Olsen & Wats LLP

- (51) **Int. Cl.**
- E21B 4/00* (2006.01)
- E21B 7/00* (2006.01)
- E21B 10/26* (2006.01)
- E21B 17/18* (2006.01)
- E21B 21/01* (2006.01)
- E21B 21/12* (2006.01)

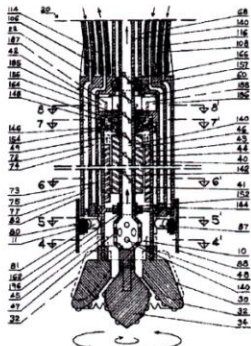
(57) **ABSTRACT**

An apparatus and method for drilling deeper and wider well bores is provided. The apparatus includes a motorized drill head for cutting and shredding ground material; a separate excavation line; a separate fluid delivery line; and a separate close loop engine cooling line. The excavation line consists of multiple connected stationary segments of the main pipe with periodical segments of an in-line excavation pump. Alternatively, in another embodiment, excavation line consists of multiple connected segments of the main stationary pipe with rotating continuous screw inside. The close loop cooling line consists of one heat exchanger in the motorized drill head and one on the ground surface in the binary unit where fluid is cooled and in process electricity produced which can be used as a supplement for powering drill head, pumps, equipment, etc.

(52) **U.S. Cl.**  
CPC ..... *E21B 10/26* (2013.01); *E21B 7/002* (2013.01); *E21B 7/005* (2013.01); *E21B 17/18* (2013.01); *E21B 21/01* (2013.01); *E21B 21/12* (2013.01)

(58) **Field of Classification Search**  
CPC ..... E21B 21/08; E21B 21/12; E21B 21/00; E21B 17/18; E21B 10/18; E21B 10/38; E21B 17/203; E21B 4/02; E21B 7/068; B08B 9/035

29 Claims, 39 Drawing Sheets



➤ **US Patent Issued on:  
December 8, 2015;**

➤ **Title: APPAEATUS FOR  
DRILLING FASTER, DEEPER  
AND WIDER WELL BORE;**

➤ **Several Patent Pending  
Applications;**



**GEOHERMAL WORLDWIDE, INC**

## RELEVANT QUOTES

- **“We cannot solve our problems with the same thinking we used when we created them”.**

*~ Albert Einstein (1879-1955) ~*

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- **“All truth passes through three stages:**

- **First, it is ridiculed;**
- **Second, it is violently opposed; and**
- **Third, it is accepted as self-evident”.**

*~ Arthur Schopenhauer (1788-1860) ~*

