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(54) HARVESTING HYDROCARBONS FROM COAL, SHALE, PEAT AND LANDFILL SEAMS

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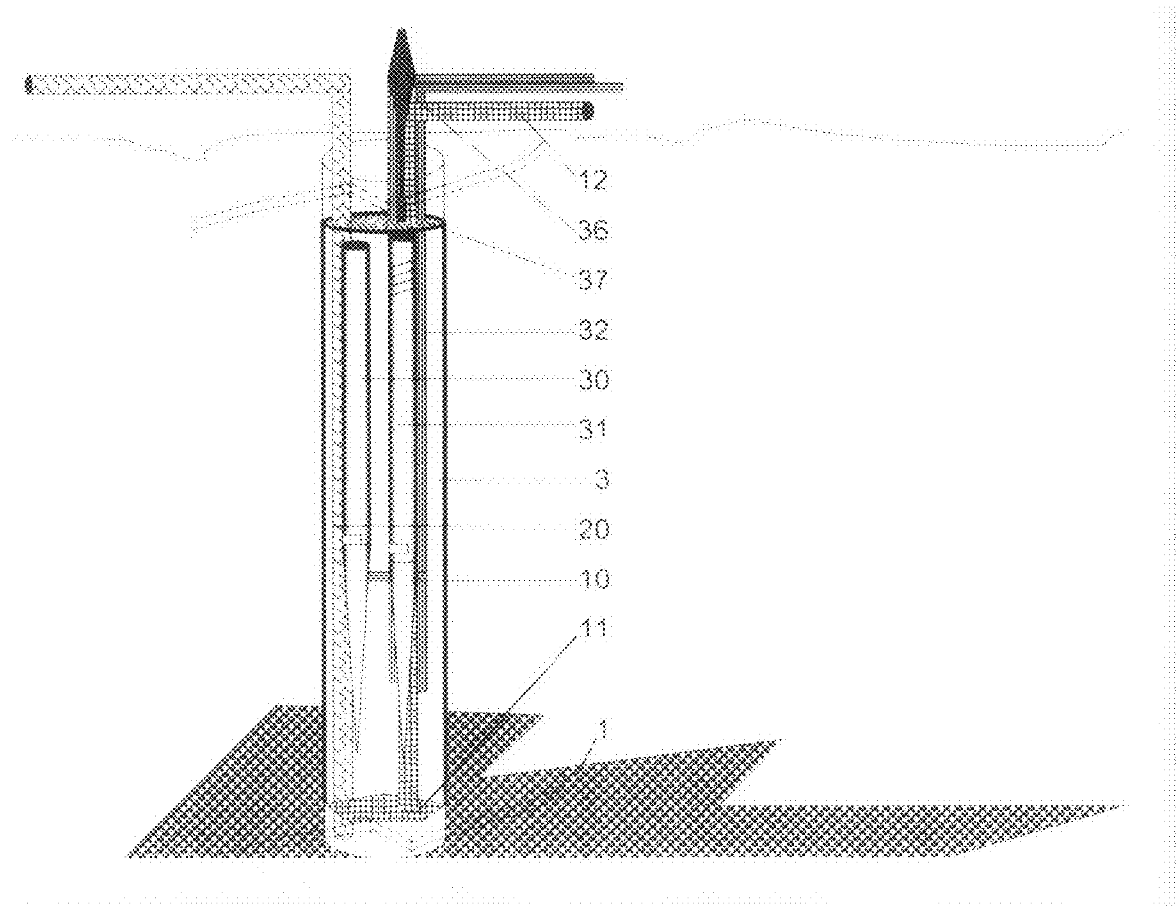
(57) ABSTRACT

A method of extraction of fuels and elements from coal, shale, peat and landfill seams is described which cuts the earth with only a main shaft which could measure half a meter diameter and with auxiliary narrow drillings of, say 10 centimeter diameter, widely spaced from the shaft. The coal, shale or peat seam is heated to the highest temperature of the hydrocarbon fraction desired to be extracted and the evaporated hydrocarbons are carried out of the shaft by Nitrogen gas. To enhance the extraction rate of the evaporated hydrocarbons, tonal input from two or more organ pipes vibrates the seam structure freeing the evaporated hydrocarbons allowing their escape into the shaft. As the extraction continues requiring inclusion of a greater area of the seam structure, narrow drillings are made and Liquid Nitrogen is inserted in the drillings reaching seam levels as Nitrogen gas which seeps into the seam. A gas-impenetrable sleeve prevents the Nitrogen gas from seeping into the soil or substrate between the ground level and the seams. Further expansion of the field moves the Nitrogen sourcing to the outer circle and inserts auxiliary heaters in the narrow drillings between the outer ring and main shaft bringing more of the seam to the desired extraction temperature. Extracted evaporated hydrocarbons are cold cracked allowing the fractionation of hydrocarbons into fuel types as heating oil, kerosene, gasoline, ethers, and fuel gas, methane, argon and rare gas segments. The thermal gradient of the extraction pipe is implemented by sourcing the Nitrogen from Liquid Nitrogen and running the pipes bundled with the extraction pipe condensing its contents by hydrocarbon fractions in vessels and gas drums depending on boiling points of fractions. Water is separated from the gasoline segment and purified by separation and freezing.



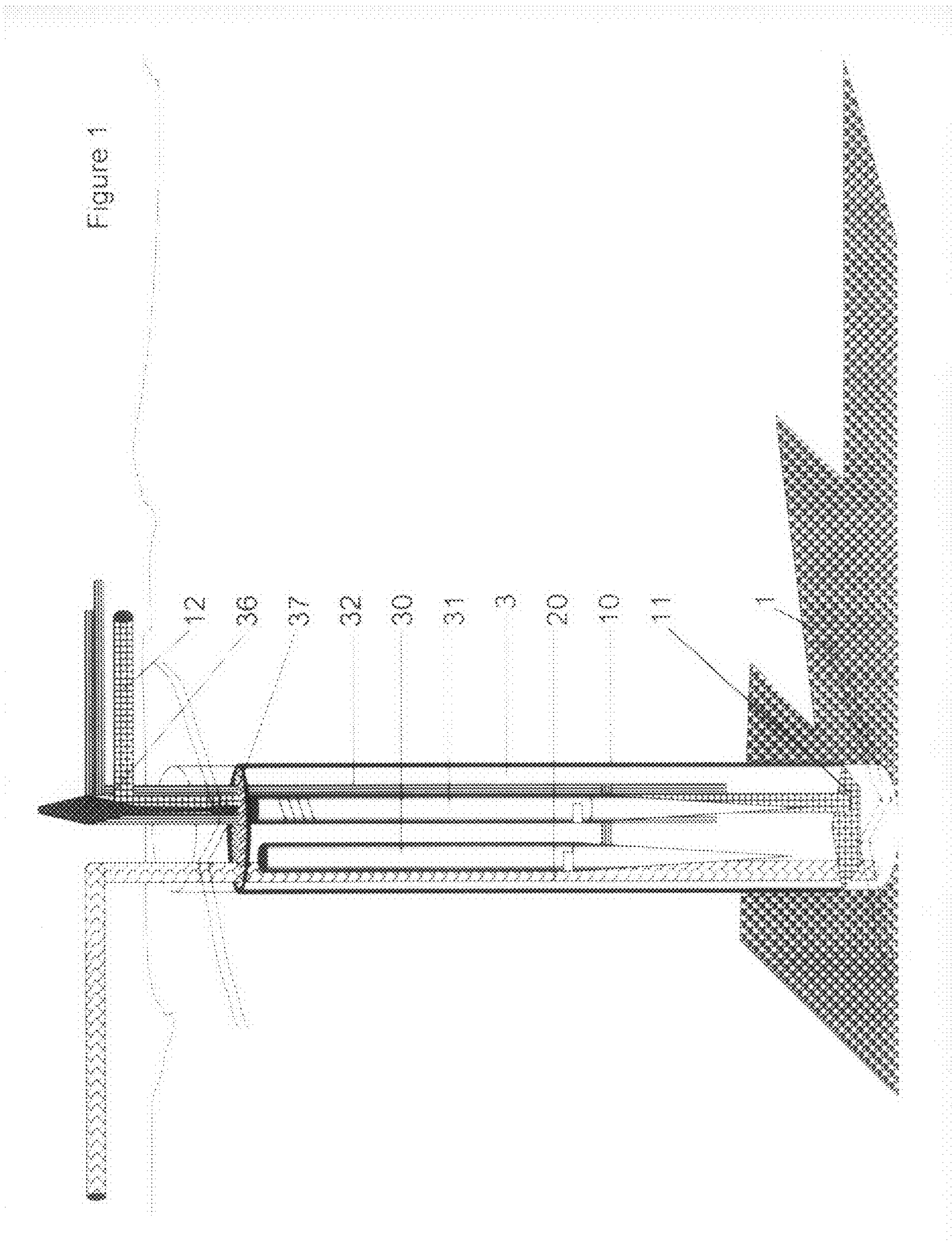


Figure 1

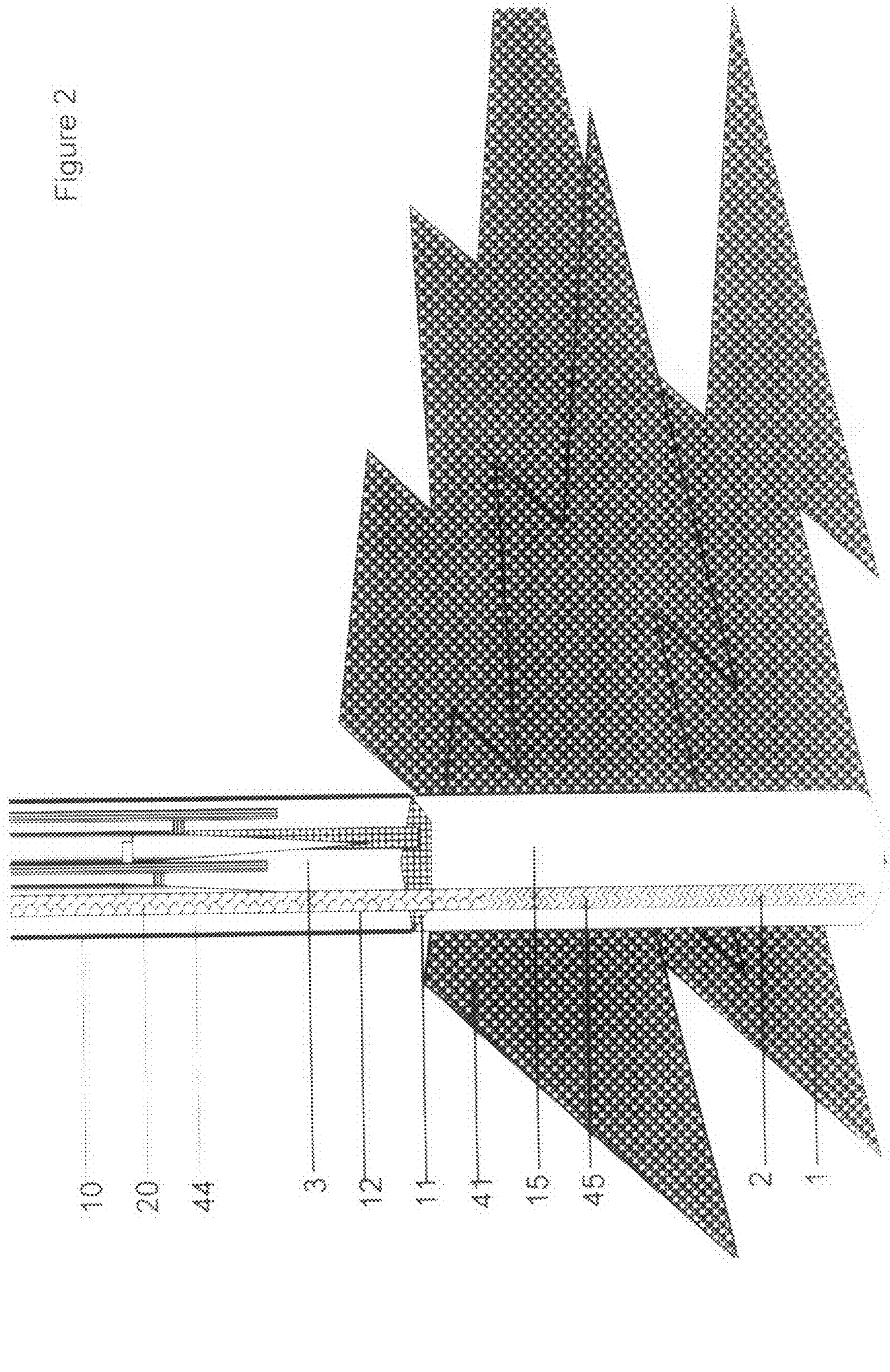
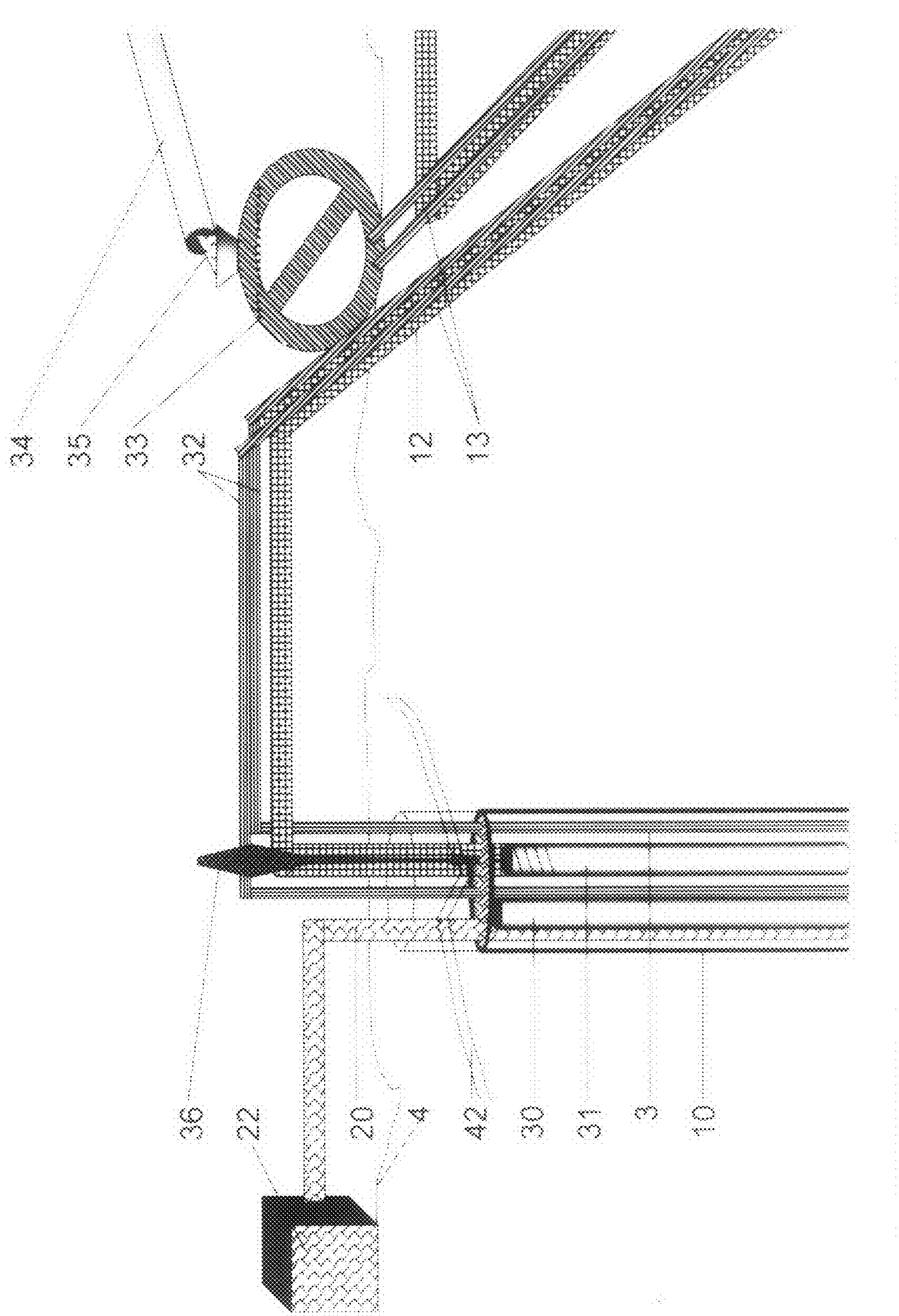


Figure 2

Figure 3



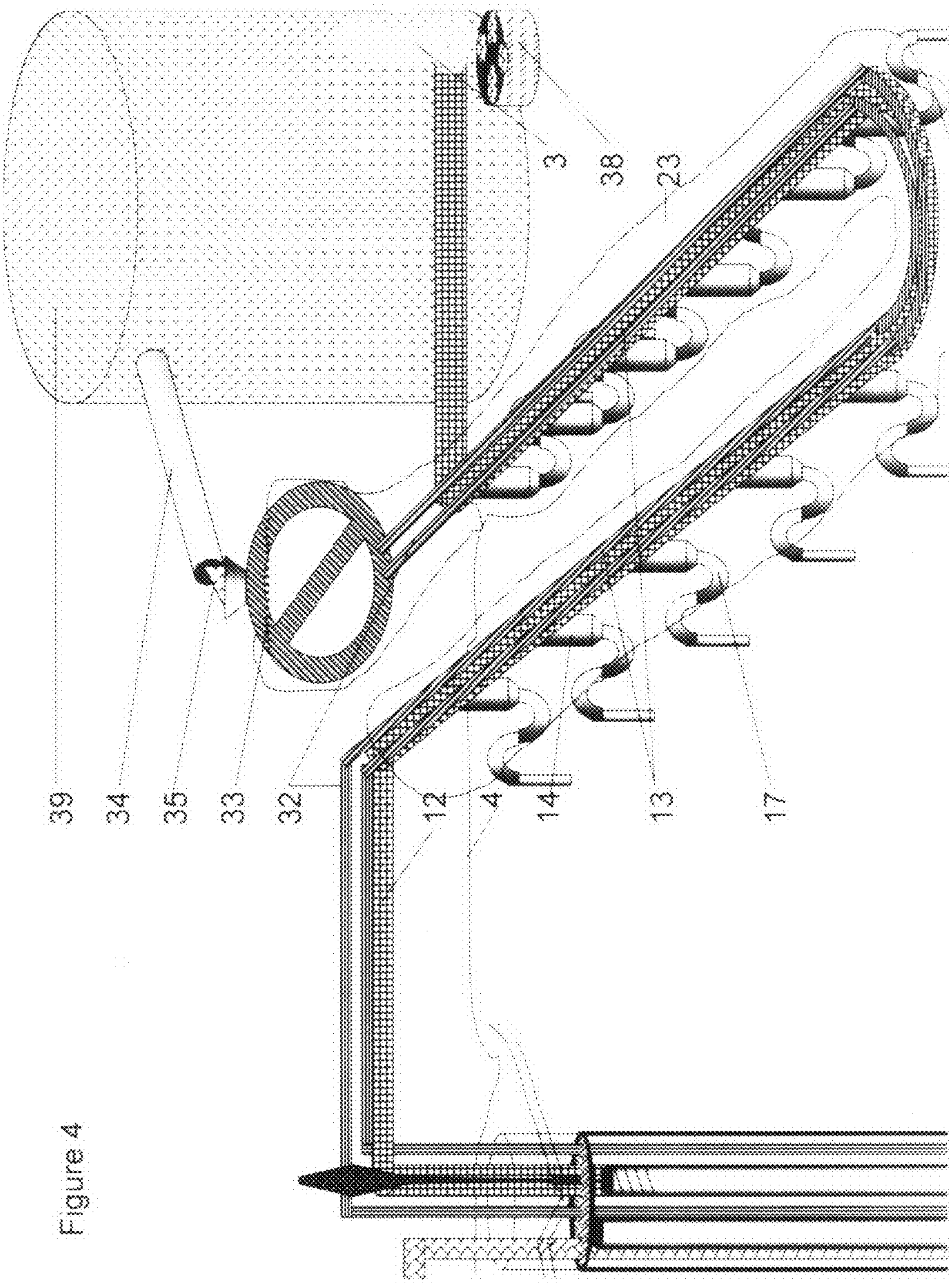


Figure 4

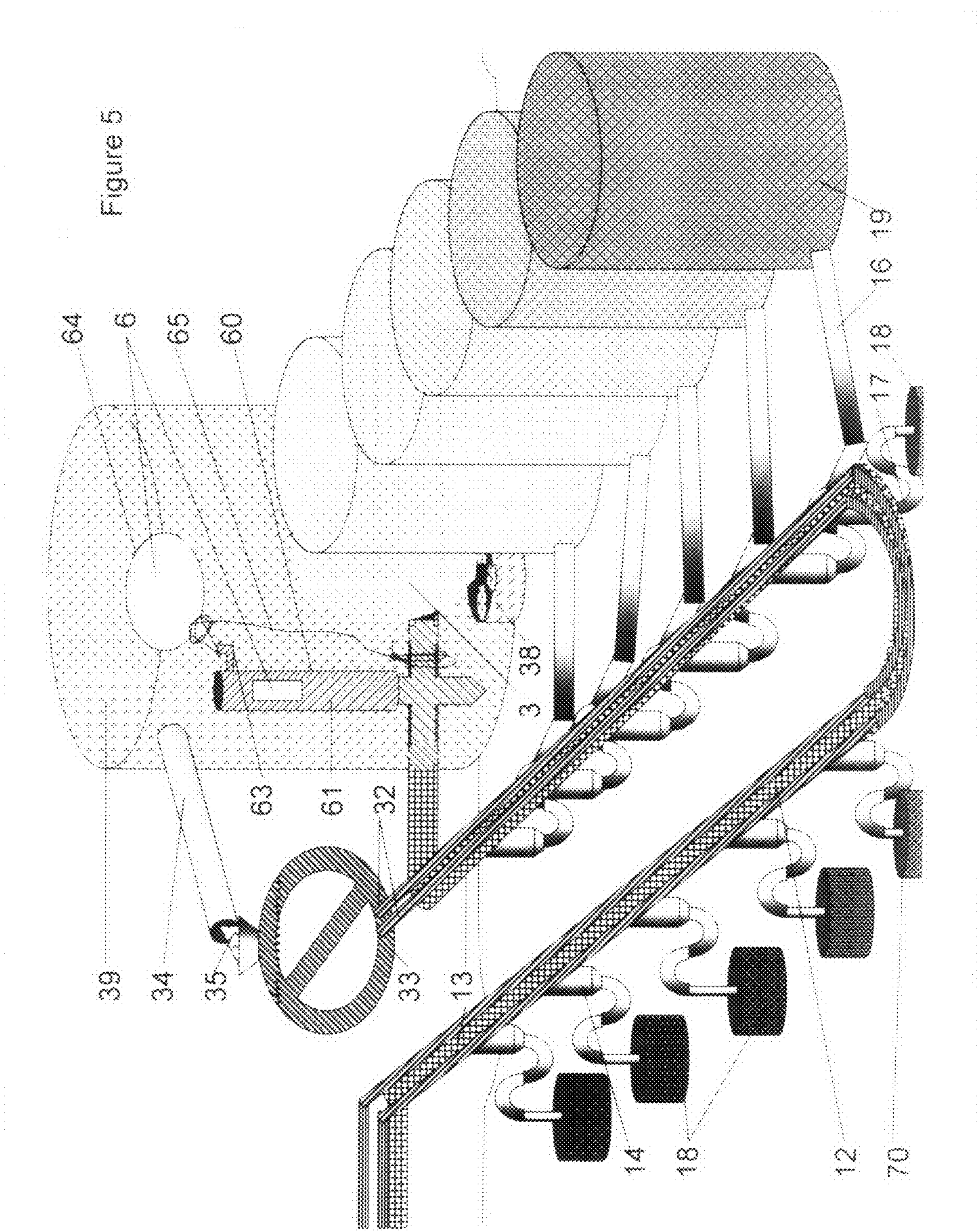
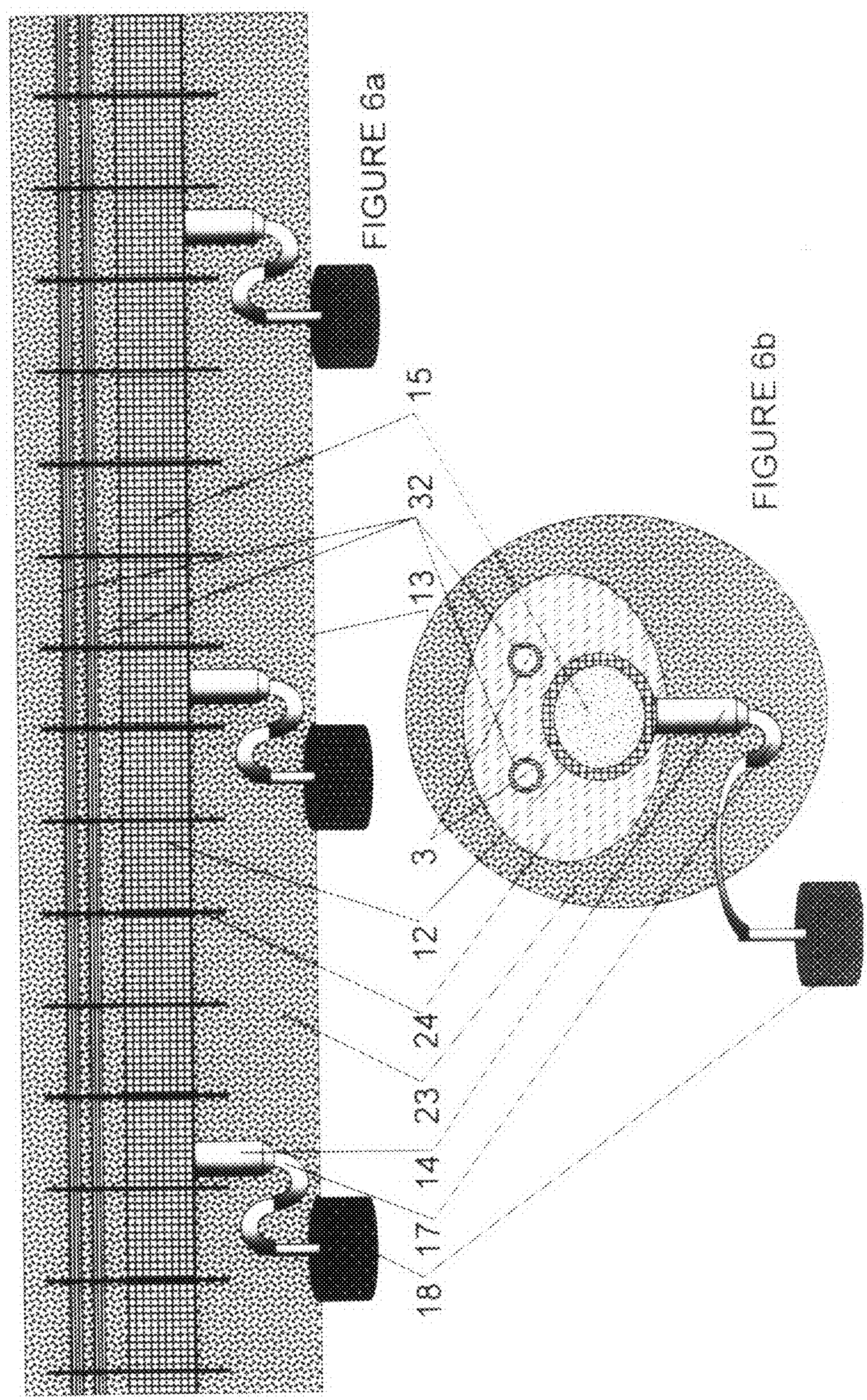


Figure 5

FIGURE 6



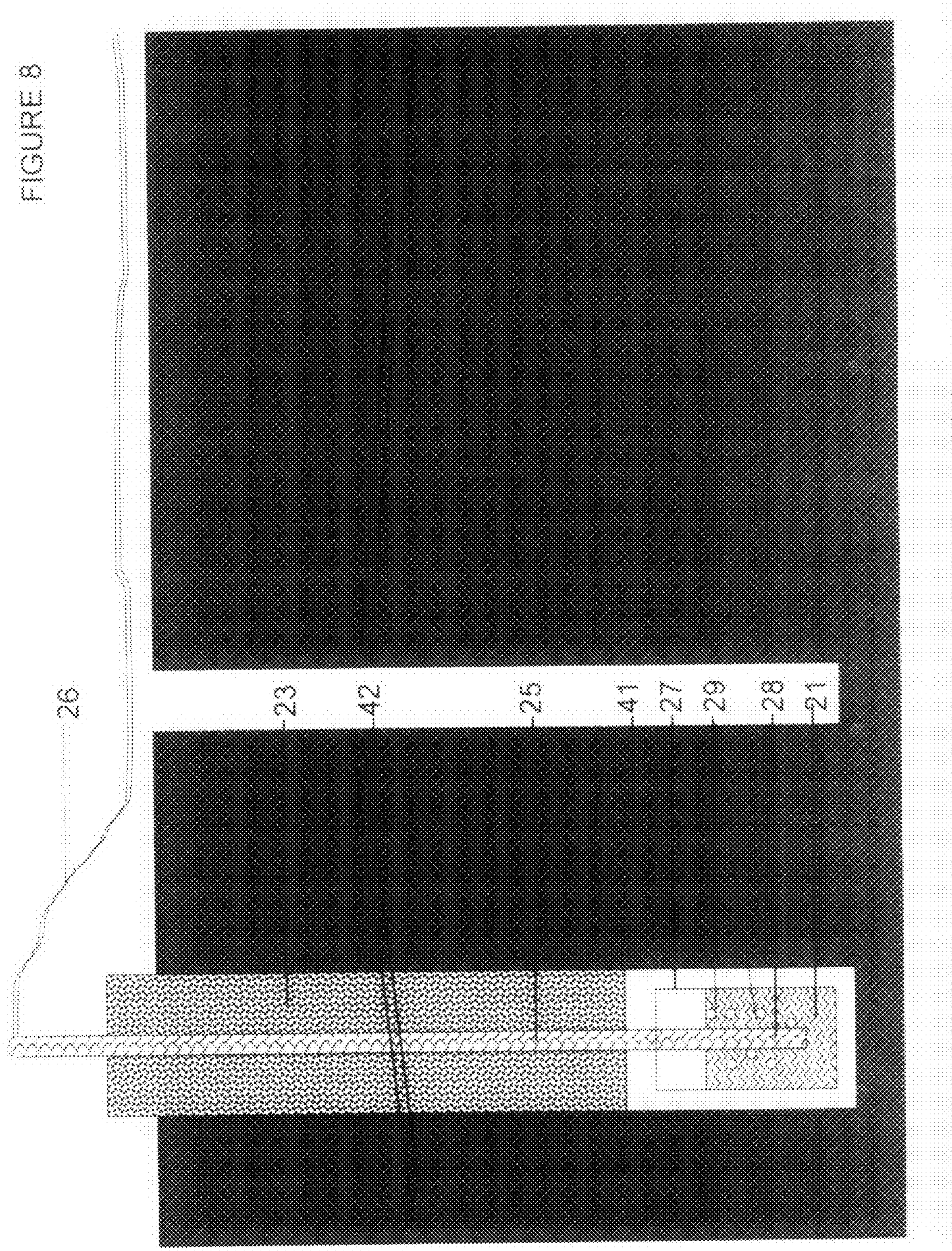


FIGURE 8

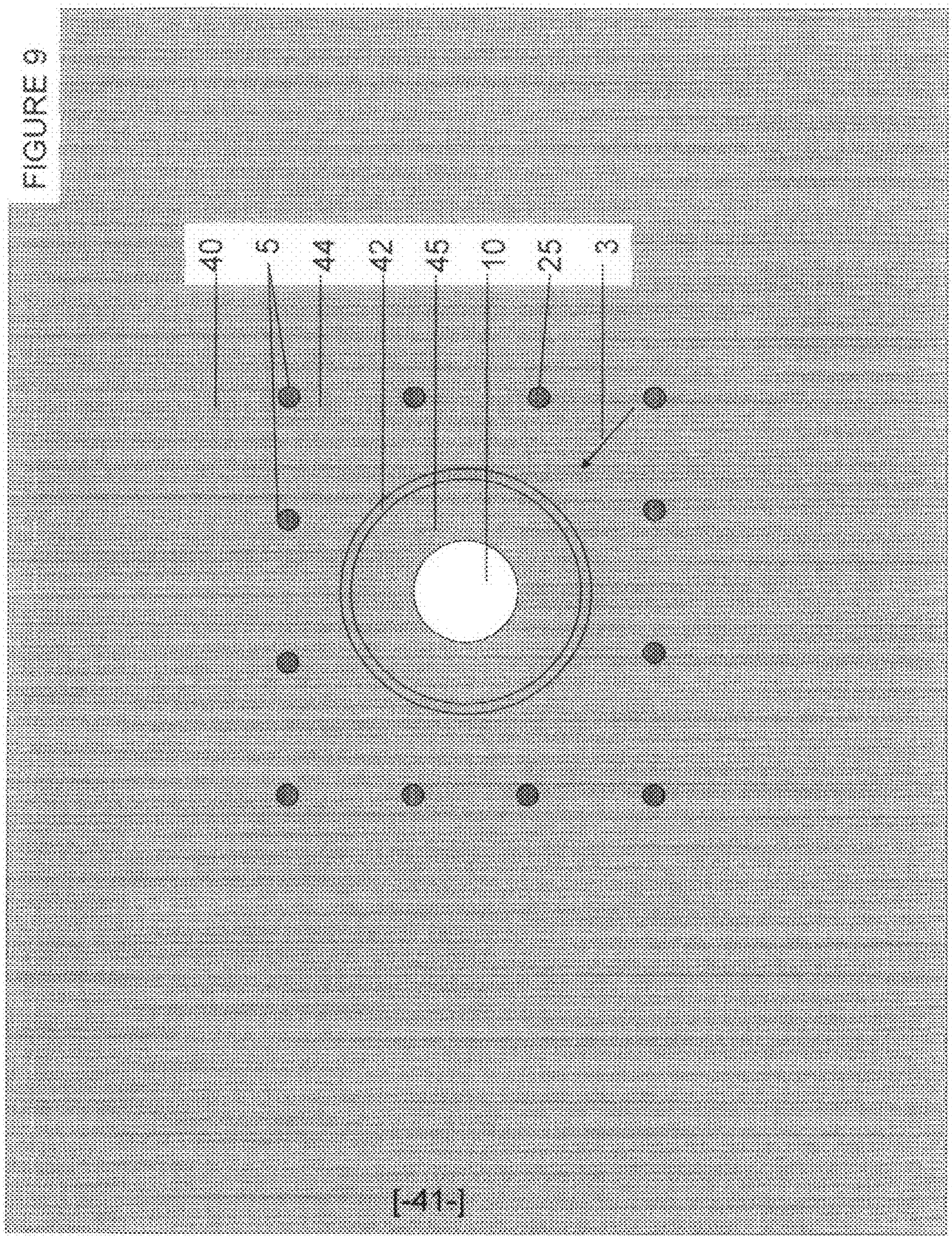


FIGURE 9

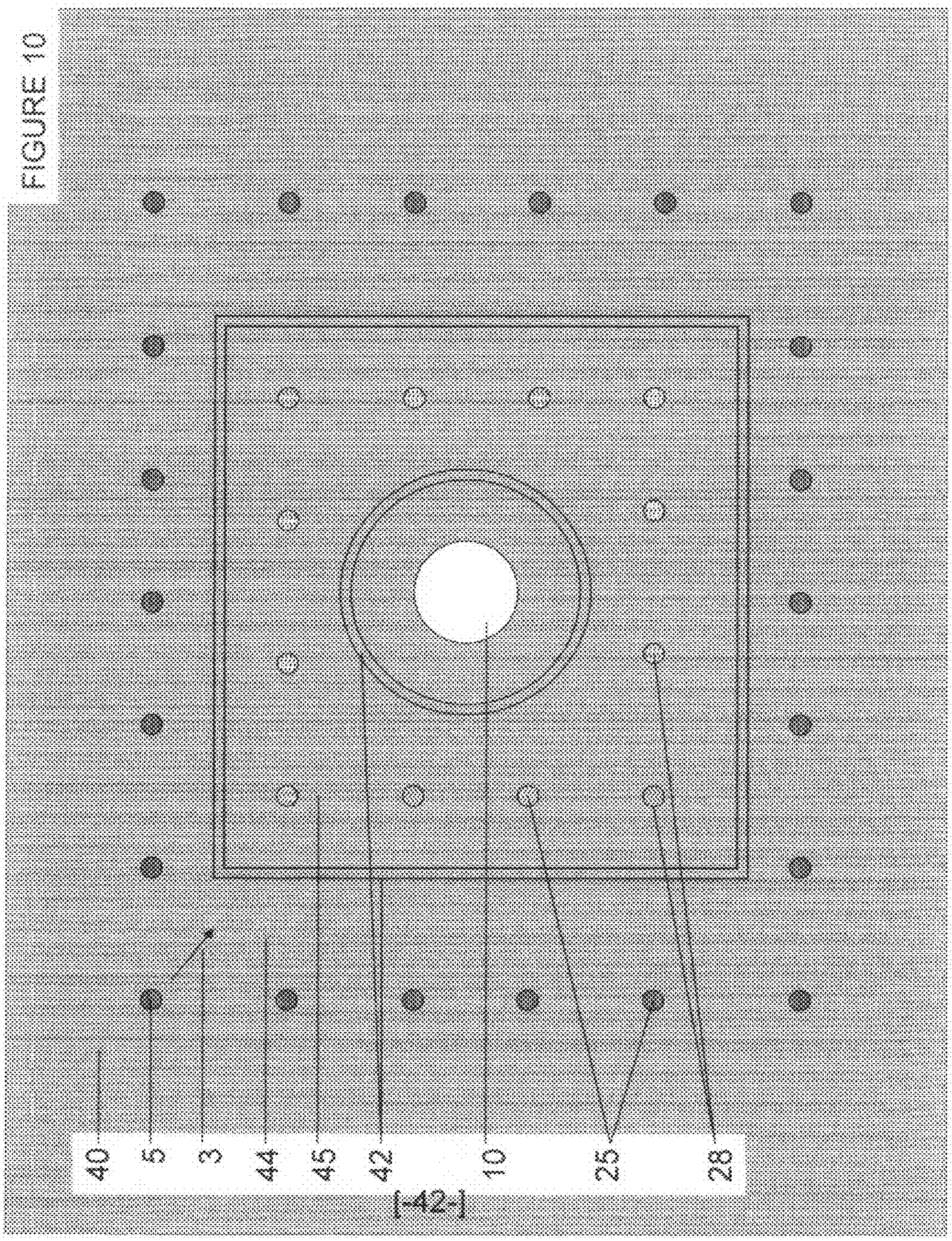


FIGURE 10

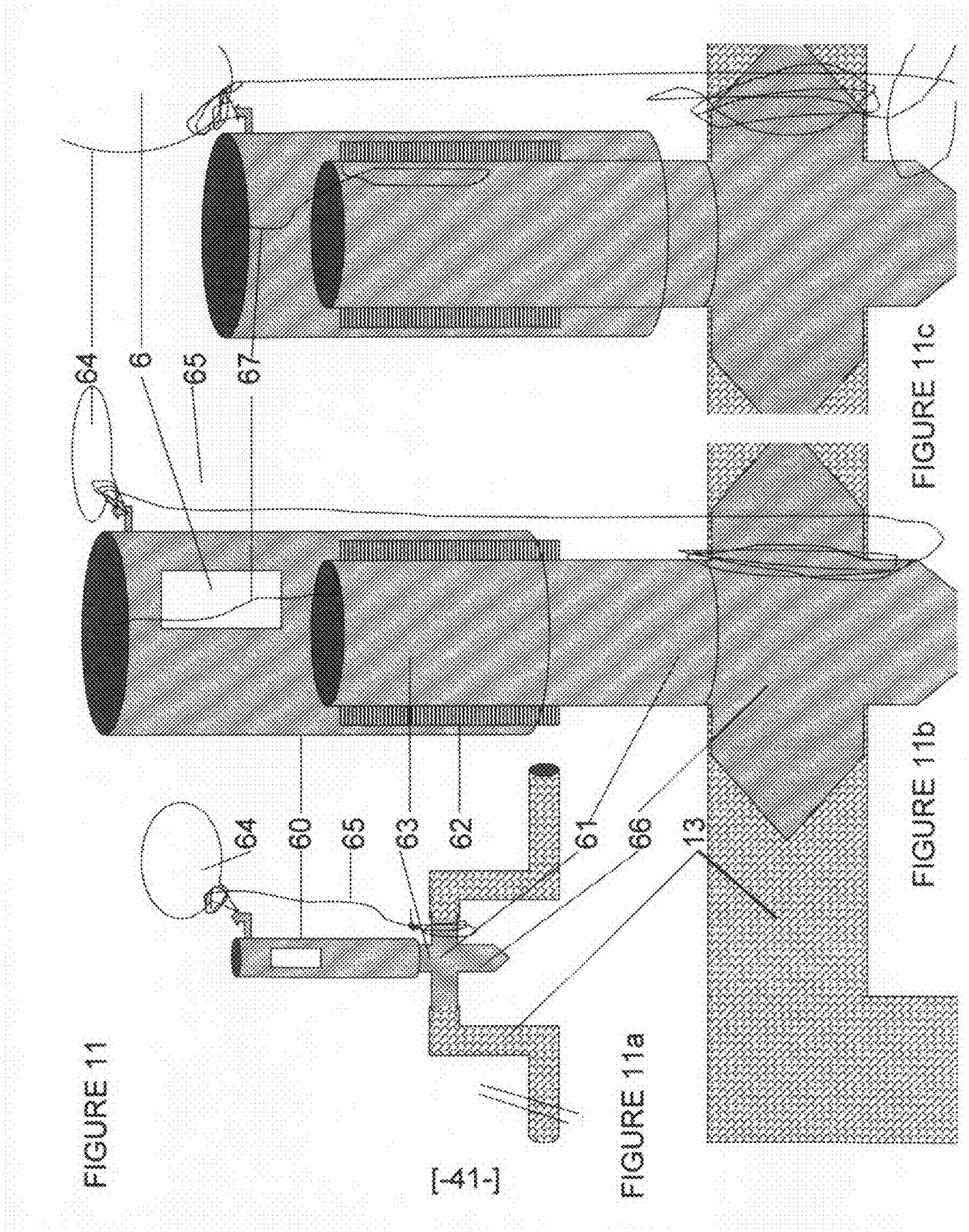


FIGURE 11

FIGURE 11a

FIGURE 11b

FIGURE 11c

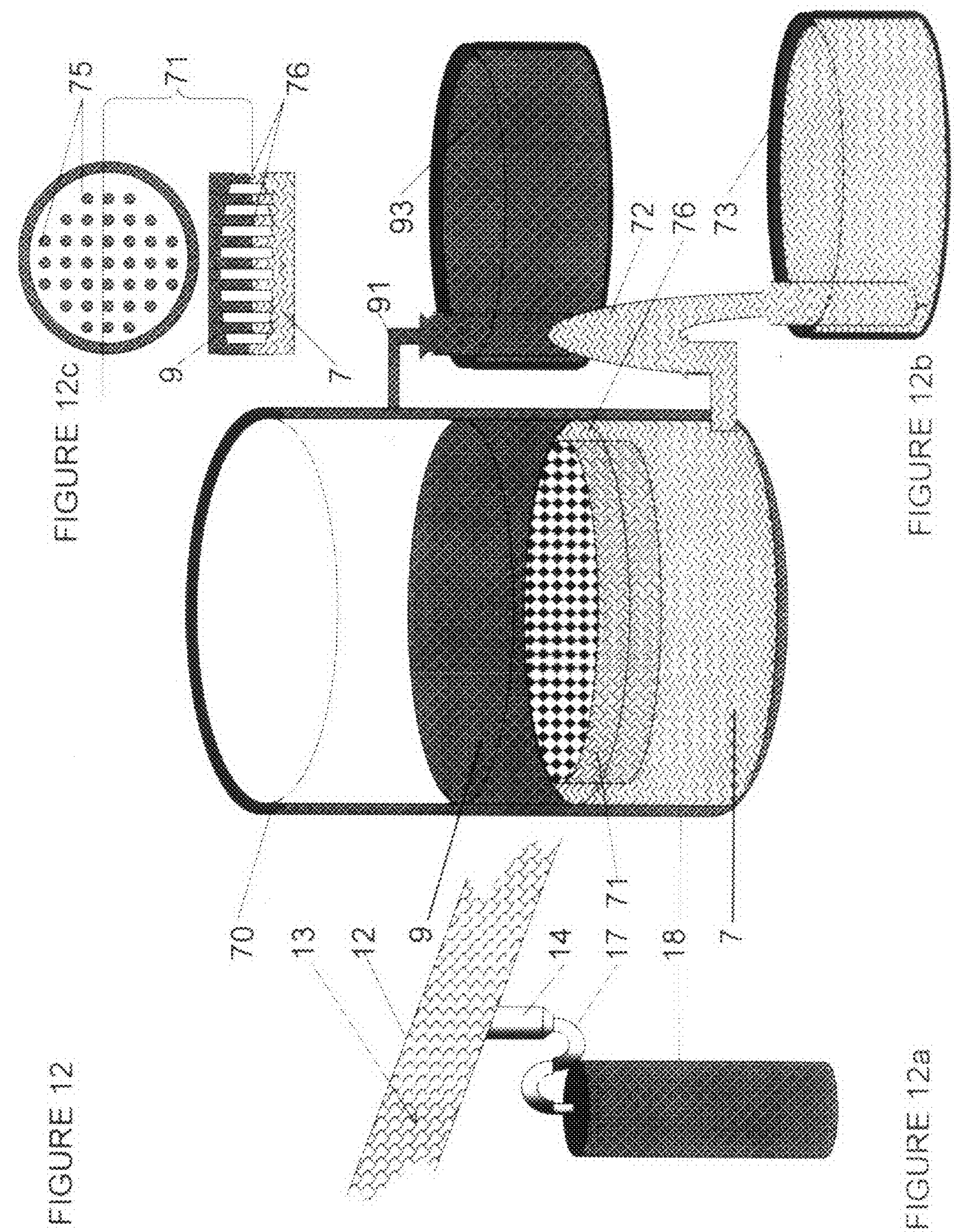


FIGURE 12

FIGURE 12a

FIGURE 12b

FIGURE 12c

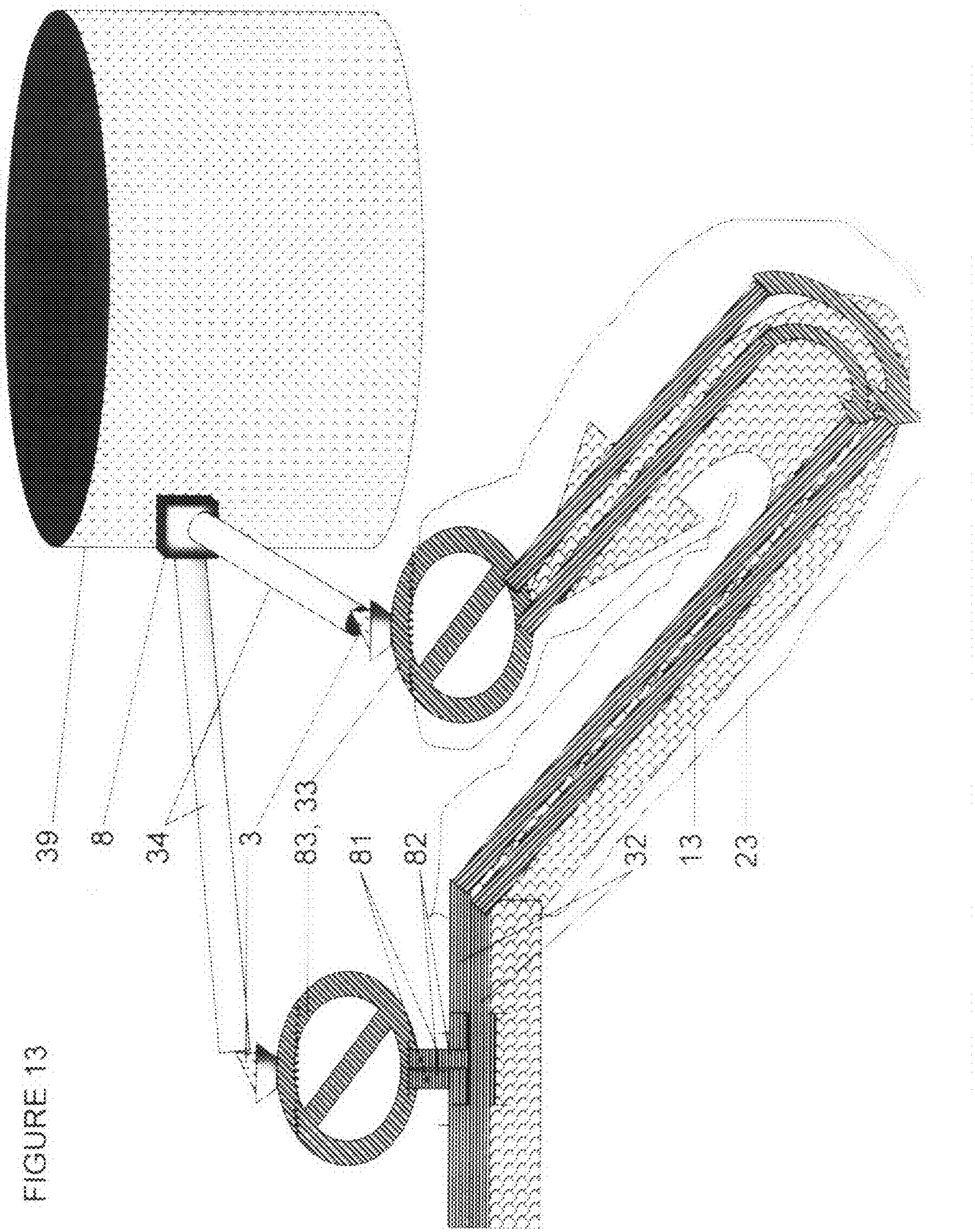


FIGURE 13

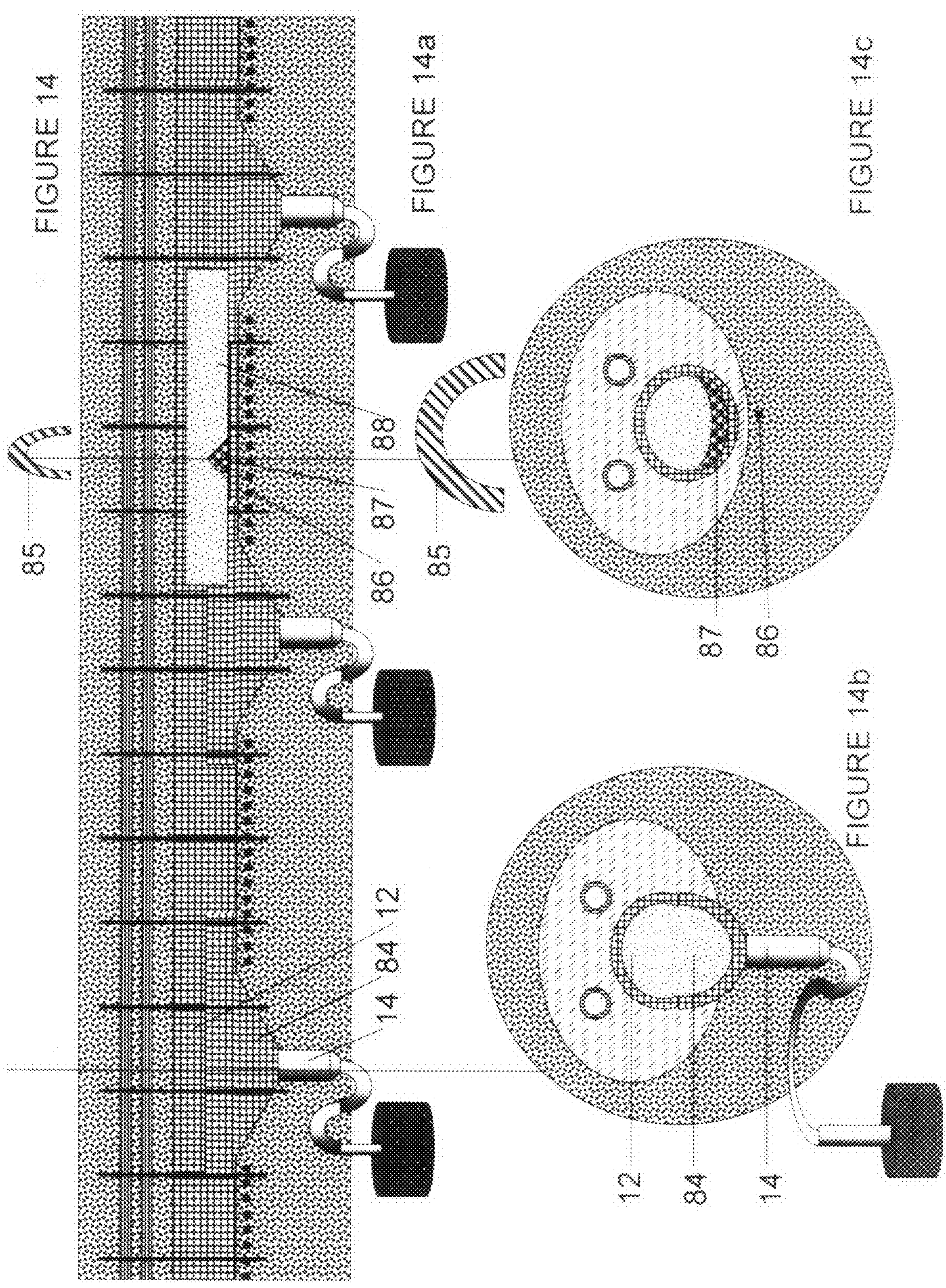


FIGURE 14

FIGURE 14a

FIGURE 14b

FIGURE 14c

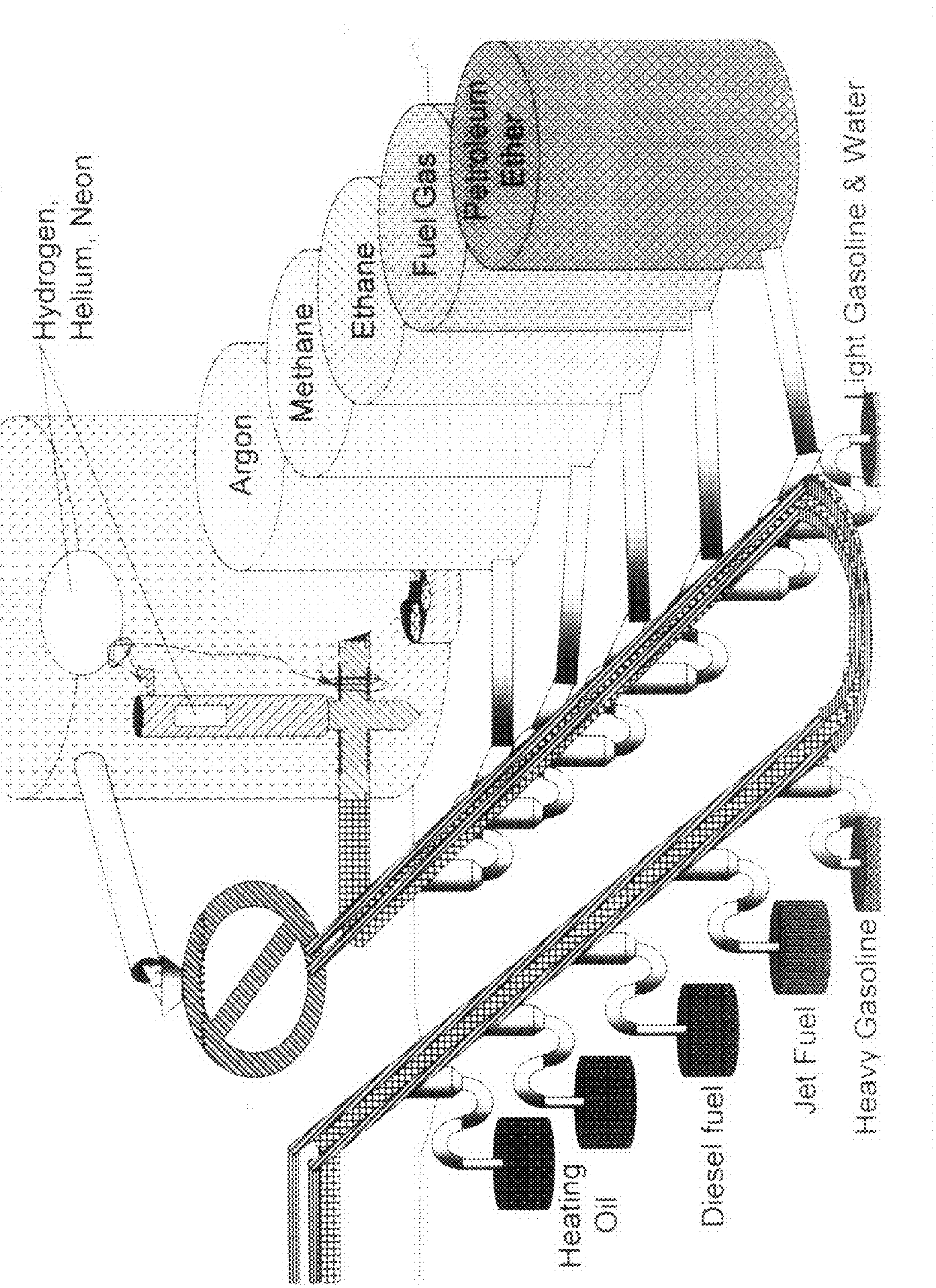

Hydrogen, Helium, Neon
Argon
Methane
Ethane
Fuel Gas
Petroleum Ether
Light Gasoline & Water
Heavy Gasoline
Jet Fuel
Diesel fuel
Heating Oil

Figure 15

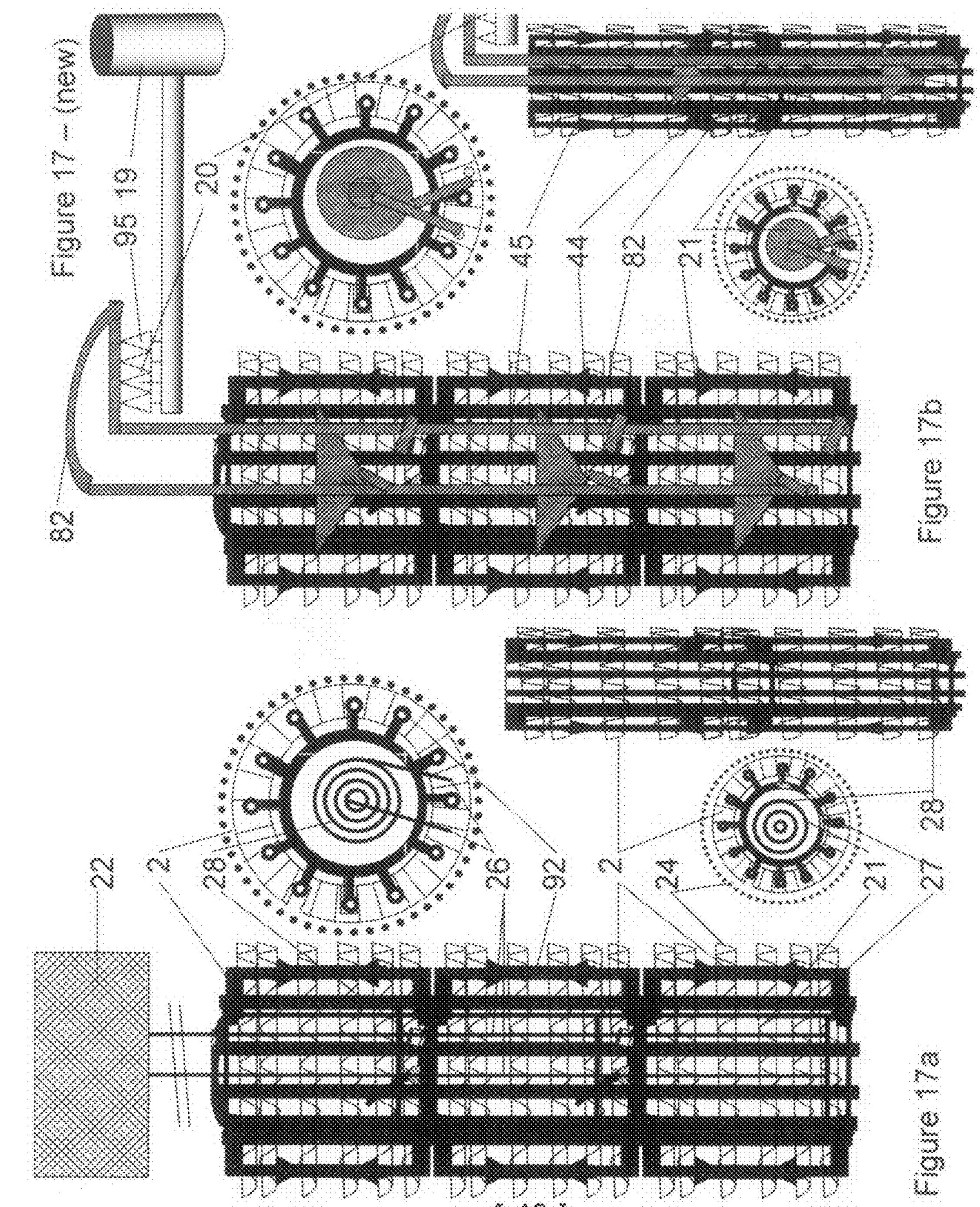


Figure 17 — (new)

Figure 17b

Figure 17a

HARVESTING HYDROCARBONS FROM COAL, SHALE, PEAT AND LANDFILL SEAMS

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The world's coal and shale reserves often pose difficulty in harvesting the fuel components. Extraction by mining is becoming increasingly dangerous because the easy to get coals have been mined and the shales have continued to be difficult to pull organics from with any degree of economic and procedural ease. Peat and landfill seam extraction of hydrocarbons should be handled in the same manner, though their deposits are more recent than coal and shale seams. The method here proposed should make the hard to access coals and in-ground shale safe and relatively easy and economical to extract the organics contained therein. The peat and landfill, because of their softness, may pose sinking problems which can be handled post extraction making them dry landfill.

[0003] Thermally, petroleum fractions have melting points from fuel gas at between minus 162° C. and plus 30° C. to lubricating oils melting over 300° C. Paraffin and asphalt melt at higher temperatures and may not be extracted in this method. To prevent heating flash in the extraction, pure Nitrogen gas is inserted in the extraction drilling and will be the carrier for the evaporated organics.

[0004] Economically, extraction is done with all personnel at ground level and the heat and tone causing the breakdown and evaporation of the light and medium weight organics. The method requires drilling, powering the heating element, and available Liquid Nitrogen to provide cold cracking cooling and pure Nitrogen gas for extraction.

[0005] Physiologically, the coal/shale field workers will have little exposure to the coal or shale gases since they are captured at the lower segment of the drilling and pulled out via pipes leading directly to the on-site cold cracking system that separates the organics into common condensation point materials. Full containers are replaced with empties, sealed and trucked away for the heavy molecule substances and the gaseous components can be compressed into gas tanks drawing the contents from the drums. Tonal vibrations are used to unsettle the buried sediments and release the trapped organics enhancing the harvest of petroleum chemicals from both coal and shale structures.

[0006] Convection at the coal or shale levels is created by inserting narrow drillings in ring patterns around the extraction drilling where the outer ring uses the coal mine fire equipment to insert pure Nitrogen gas into the layers being extracted. The first ring provides the external Nitrogen to push the evaporated petroleum into the extraction drilling. To expand the range of the extraction, a second ring of narrow drillings is made and the pure Nitrogen is inserted there while the inner ring holes are refitted with heating units comprise of, for instance, tube boilers with heating units inside them. To concentrate the pure Nitrogen gas input the upper portion of the drilling is fitted with an air sealing sleeve to reduce soil and rock layer absorption of the Nitrogen gas. To concentrate the heat in the inner narrow drillings, the narrow drilling is insulated to retain the heat emitted in the coal or shale layers of the earth at seam depths.

[0007] The present invention relates to cryo-technology providing pure Nitrogen gas cooling for the cold cracking process and providing the wind power to activate the vibrotonals to shake the volatile organics from their point of formation and storage to the drill location for drawing up to the surface, separating by cold cracking and collection. This will make inaccessible fuel resources available for present extraction increasing the overall active oil reserves to include previously "useless" territories. The peripheral insertion of the Nitrogen provides the inert carrier gas to transport the evaporated organics and provides fire protection preventing flash fire in the coal or shale layers.

[0008] 2. Discussion of the Related Art

[0009] Patent application Ser. No. of Denyse DuBrucq, Liquid Nitrogen Enabler, 11/706,723 section for coal mine fire control and condenser methods and Liquid Nitrogen Enabler Apparatus, Ser. No. 11/750,149 for the related apparatus. Similar methods are employed here for fire prevention, for the separator or cold cracking system, and for providing the Nitrogen carrier gas for the evaporated organics in coal, shale, peat and landfill layers.

SUMMARY OF THE INVENTION

[0010] In accordance with one aspect of the invention, the method of drilling into the coal and shale fields for extraction of fuel gas and liquid petroleum fractions. Extraction from one drilling should pull organics from an acre or hectare or more.

[0011] In another aspect of the present invention, the method includes shaking the substrate to loosen the organics from their long term entrapment allowing them to seep toward the heat source of the drilling.

[0012] In another aspect of the present invention, the method applies a contained heat source to the coal or shale layers heating them to evaporate the organic gases trapped in the underground. To safely carry these organic gases to the surface, the pure Nitrogen gas used in blowing the organ pipes mixes with and carries the organics from the depth of the drilling to the ground surface

[0013] In accordance with another aspect of the present invention, the method of using pure Nitrogen gas as the carrier prevents fires because it lowers Oxygen levels in the gas mixture as it is heated to evaporation temperatures and brought to the surface.

[0014] In accordance with another aspect of the present invention, the method carries the hot gas mixture to a cold cracking system that slowly cools the gas as it moves through a tube with traps to remove the organic material that condensed in that section of the tube. Monitored temperatures and a means to move the divisions between condensation temperatures results in quite pure distillates to be carried from the mine site to market. As the remaining gases have boiling points at room temperature and below, the cold of the condenser for Liquid Nitrogen pulls them down as liquids and, once through the trap, they evaporate and are collected in gas drums. The remaining Nitrogen and Rare Gas mixture allows vertical passage of Hydrogen, Helium and Neon and capture in Mylar balloons for separation later. The Nitrogen release location has a mixing fan to insure the Nitrogen does not remain pure in clouds, rather mixes it to near 78% of atmospheric gases which is the portion of air it occupies.

[0015] In accordance with another aspect of the present invention, the fractions of the extracted petroleum materials are separately collected and marketed as partially refined organics increasing the price levels of the unrefined extractions.

[0016] In accordance with another aspect of the present invention, this method expands the field of extraction by drilling narrow peripheral holes to apply Liquid Nitrogen as used in putting out coal mine fires. This provides pressure to fill the porous coal and shale layers with Nitrogen gas which carries the evaporants to the extraction drilling. The Nitrogen flooding also reduces the opportunity for fires or flashes during extraction.

[0017] In accordance with another aspect of the present invention, once the extraction is exhausted in the space served by the first ring of narrow drillings, another ring of narrow drillings away from the extraction hole are made and these holes provide the Liquid Nitrogen application as did the first narrow holes drilled. The first narrow holes are then converted to supplemental heating locations having narrow boilers inserted in the holes at the coal and shale depths and the top of the holes sealed with thermal insulation.

[0018] In accordance with another aspect of the present invention, the field of extraction is expanded by drilling another ring of narrow drillings where Liquid Nitrogen is inserted and converting the inner ring holes to auxiliary heating locations to keep the evaporants gaseous and able to be carried to the extraction drilling by the outer ring insertion of Nitrogen. This convection carriage of the desired organic material in gaseous form through the porous coal and shale is what allows this method of extraction to pull material from a large field of coal, shale, peat and landfill substrates under the ground.

[0019] In accordance with another aspect of the present invention, this method will be ecologically an improvement over current mining methods because it does not disturb the underground structure and is carried out with a small surface footprint over the coal and shale reserves and subsequent narrow drillings to expand the field of extraction.

[0020] In accordance with another aspect of the present invention, this method will allow selection of the carbon content of the extraction by the primary heat and the auxiliary heat temperature level. To extract petroleum to include fuel gas through gasoline substrates, the thermal temperature should be at 200° C. To include Kerosene as used in diesel and jet fuels, the thermal temperature must be 275° C. and heating oil, 375° C.

[0021] In accordance with another aspect of the present invention, this method will allow capture of the rare gases, helium, neon and hydrogen for later separation; provides means to separate water from the gasoline segment of the Cold Cracker processing ridding the hydrocarbons of the contamination and pulling forth clear water and purifying it by freezing the water slowly allowing it to rid itself of contaminants. Regulating the evaporation of Liquid Nitrogen between the primary output into the Cold Cracker and a secondary output into the Nitrogen pipes after the Cold Cracker keeps both the Cold Cracker segment outputs in the same range of temperatures on a continuous basis and allows the Nitrogen flow through the shaft via the organ pipes to maintain the working vibrational levels and sufficient Nitrogen carrier gas available for extracting the evaporated hydrocarbons.

[0022] These and other advantages and features of the invention will become apparent to those skilled in the art from the detailed description and the accompanying drawings. It should be understood, however, that the detailed description and accompanying drawings, while indicating preferred embodiments of the present invention, are given by way of illustration and not of limitation. Many changes and modifications may be made within the scope of the present invention without departing from the spirit thereof, and the invention includes all such modifications.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] Preferred exemplary embodiments of the invention are illustrated in the accompanying drawings in which like reference numerals represent like parts throughout, and in which:

[0024] FIG. **1** is a drawing showing the overall drill hole from the surface of the ground to the coal, shale, peat or landfill seams below with components of the heater, tonal input, Nitrogen and the extraction tube shown complete vertically, and partially above the ground surface.

[0025] FIG. **2** is a drawing showing the lower part of the drilling gauging better the distance at the bottom of the drilling where the heating of the reserve occurs making volatile organics evaporate and escape to the drilling location. The funnel catches the pressured Nitrogen and evaporants, which are drawn into a well-insulated vertical pipe, which once at the surface bends horizontally to enter the Cold Cracking system.

[0026] FIG. **3** is a drawing showing the surface equipment with a power source for the heating unit, a lever to tune one of the organ pipes. Nitrogen sourcing from a condenser which is fed with Liquid Nitrogen from a large dewar.

[0027] FIG. **4** is a drawing better defining the extraction tube Cold Cracking of the extracted organics where the segments of the evaporant condenses as the temperature lowers and the Nitrogen warms up while condensing the evaporants. The major fractions of Petroleum are drawn out of the Cracking tube with drain type trapped piping.

[0028] FIG. **5** is a drawing showing the containment of the fractions of the extracted petroleum for collection and taking to market. Also shown is the Liquid Nitrogen storage and feeding into the condenser which cools the cracking pipe and eventually supplies the organ pipes with pure Nitrogen gas.

[0029] FIG. **6** is a drawing showing the cross-sections of the condensing tube with the cold Nitrogen gas cooling the extraction tube so as to condense the organic evaporants on a thermal gradient into increasingly larger carbon chain molecules.

[0030] FIG. **7** is a drawing showing means of driving evaporants with Nitrogen gas placed in narrow drillings and instilling safety in the process by displacing Oxygen.

[0031] FIG. **8** is a drawing showing the second use of the narrow drillings, heating the extraction layer while being thermally insulated from the soil and rock over the extraction layer and the air above the drilling.

[0032] FIG. **9** is a diagram showing the first ring of narrow drillings surrounding the extraction drilling, which feed the Nitrogen gas into the system to carry the evaporated organics to the central drilling for extraction.

[0033] FIG. **10** is a diagram showing the expanded extraction field with several rings surrounding the extraction drilling where the outer ring of narrow drillings insert the Nitrogen gas into the systems and the inner rings of narrow drillings provide auxiliary heat to the coal, shale, peat or landfill layers being extracted of their selected organics based on the residual temperatures maintained during the extraction.

[0034] FIG. **11** is a drawing showing the final Cold Cracking step, capturing the rare gases by allowing these light molecular weight gases to rise into an inverted cylinder, which becomes lighter weigh as the rare gases fill the cylinder lifting it up. It is then lowered as these gases fill a mylar balloon, or other such reservoir, preserving this segment of the evaporated hydrocarbon mix from the coal, shale and peat seams.

[0035] FIG. **12** is a drawing showing the separation of water from the gasoline segment of the evaporated hydrocarbons in the Cold Cracker where the density of water is greater than that of hydrocarbons and thus settles to the bottom of an undisturbed vessel. The light gasoline is drained into a container and the water segment is siphoned out and then processed through freezing the water to gain purity from dissolved material.

[0036] FIG. **13** is a drawing showing the details of Nitrogen insertion in the system having a regulator that balances the output of Liquid Nitrogen between the condenser feeding the Nitrogen pipes going through the Cold Cracker and the auxiliary condenser feeding the Nitrogen pipes after the Cold Cracker and before entering the Shaft. This keeps both the Cold Cracker thermal segments stable and the needed flow of Nitrogen in the shaft to both produce the vibrations by passing through the organ pipes and appropriate levels to handle the carrier function for emerging evaporated hydrocarbons.

[0037] FIG. **14** details the tuning of the thermal segments of the Cold Cracker whereby one method is to have thermodetectors planted in the insulation monitoring the temperature of the extraction pipe. A partial block is placed at the desired break between the condensation temperatures that is adjustable, as a bag of iron spheres movable with external magnets to the desired location. The extraction pipe is expanded downward to drain the liquid contents of that segment of the pipe into the drain trap and container.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0038] Turning now to the drawings and initially to FIGS. **1**-**3**, showing the center, lower section and top of the drill hole for extracting fuel hydrocarbons from coal, shale or peat. In FIG. **1**, the coal, shale, peat or landfill seam **1** is vibrated with sound at both the frequency of the standard organ pipe **30** and the frequency difference beats created by the adjustable frequency organ pipe **31** that can vary widely with the tuning of the adjustable pipe. The purpose of this ground stimulation is to get motion throughout the seam **1** such that the heat evaporated hydrocarbons can escape the structure of the seam. The pipes **30**, **31** are blown with pure Nitrogen gas **3** which is carried into the extraction drilling **10** by Nitrogen pipes **32**, one for each organ pipe. The Nitrogen gas is sealed in the shaft **10** by seal **37** so it can act as the carrier gas for the evaporated hydrocarbons. The funnel **11** below the organ pipes catches the hydrocarbon enriched Nitrogen and draws it out of the shaft **10** enclosed in a thermally insulated pipe **12** carrying the hydrocarbon enriched Nitrogen **15**.

[0039] FIG. **2** shows the lower portion of the shaft **10** with the heat energy source **20** passing down through the funnel **11** and the heating element **2** heats the coal, shale, peat, or landfill seams **1**. The middle section of the shaft is the cool zone **44** and the lower is the hot zone **45**. Convection in the shaft **10** forces the pressure imposed Nitrogen **3** activating the organ pipes and allows it to flow to the hot zone **45** around the gaps between the funnel **11** and the walls of the shaft. Evaporants **15** from the seams **1** enter the hot zone and are taken out of the shaft via the gaseous escape pipe **12** which pulls the hot gases rising with the heat out of the shaft. The evaporants **15** in the seams **1** escape the seam as the tonal output of the organ pipes cause the seam structure to vibrate.

[0040] FIG. **3** presents the top of the shaft **10** showing the around level **4** and a spacing **42** indicating the workings of the shaft contents can be well below the surface of the around. The power source for the heater **22** is on the ground powering the heat energy source **20** which passes down to the bottom of the shaft. The tonal adjustment **36** for the adjustable tone organ pipe **31** sticks up so it can be controlled from the top of the shaft. The Nitrogen pipes **32**, one for each organ pipe **30**, **31** get their Nitrogen **3** from the condenser **33** where Liquid Nitrogen **35** is evaporated into Nitrogen gas and passes through the Cold Cracker **13** which heats the Nitrogen before entering the shaft. The gaseous escape pipe **12** comes up the shaft and passes under the Nitrogen pipes **32**.

[0041] FIG. **4** elaborates on the Cold Cracker **13** showing the gaseous escape pipe **12** coming from the shaft. The tank of Liquid Nitrogen **39** feeds Liquid Nitrogen **35** down the Liquid Nitrogen pipe **34** and into the condenser **33** which is insulated **23** throughout the Cold Cracker **13** providing cooling for the evaporated hydrocarbon/Nitrogen mix **15** coming through the gaseous escape pipe **12**. The coldest Nitrogen cools the last, low carbon chain hydrocarbons left in the gaseous escape pipe **12**. As the Nitrogen gas warms, it condenses the longer carbon chain hydrocarbons to where the longest as collected in the Cold Cracker **13** closest to the shaft **10**. To separate the Kerosene from the gasoline and petroleum ethers and fuel gases segment output pipes **14** draw the condensed hydrocarbons in sections of the pipe **12**. These liquids pass through the trap **17** and go to storage shown in FIG. **5**. The final output of the gaseous escape pipe **12** is the Nitrogen gas **3** left in the pipe which is dispersed being mixed with air by a fan **38**.

[0042] For safety and to prevent clouding of pure Nitrogen **3**, a tan **38** is employed to mix the Nitrogen with the residual air so there is no opportunity for people or animals to develop Nitrogen Asphyxiation or Nitrogen Coma, a reflex of the lungs when Oxygen is not available and Carbon dioxide cannot be exchanged in the lungs. Breathing stops, but the heart keeps pumping and one loses consciousness. There are about six minutes from when one is so stricken until he or she or an animal would die. With these Nitrogen employing methods, one should be aware of the possibility of this condition and, if finding a person down, one should think first to apply artificial respiration with a good mix of air present and, if the person recovers, all is well. If he or she does not recover, then call 911 and do the CPR-type work to recover a person from a heart attack. And if that fails, check for stroke or other difficulties. Shortly the medics will arrive.

[0043] FIG. **5** completes the Cold Cracking apparatus by having the segment output **14** and trap **17** allow the condensed liquids to flow into containers **18** if the hydrocarbon is liquid at ambient temperatures or gas drums **19** if the hydrocarbon fraction is a gas. The gas drums **19** are fed with an outsource pipeline **16**. The final separation **60** in the sequence is collection of the rare gas segment—Hydrogen, Helium and Neon—light weight gases **6** collected in an inverted container **61** and drawn off through the extraction tube **63** into a mylar balloon **64** held to the ground with a tether line **65**. It also shows the remaining gas in the gaseous escape pipe **12**. Also defined is the cold source for condensing the hydrocarbons with the tank of Liquid Nitrogen **39** feeding through a pipe **34** Liquid Nitrogen **35** into the condenser **33** which feeds its cold Nitrogen gas **3** into the Nitrogen pipes **32** that cool the gaseous escape pipe **12** as it enters the Cold Cracker **13**.

[0044] FIG. **6** defines the Cold Cracking System **13** structure with the insulated cover **23** enclosing the Nitrogen pipes **32** carrying the warming Nitrogen gas **3** to the shaft. Radiator tabs **24** transfer the cold from the Nitrogen pipes **32** to the gaseous escape pipe **12** carrying the Hydrocarbon/Nitrogen mix **15**. As the mix is cooled, first the high number carbon molecules condense and the liquid runs into the segment output **14** and through the trap **17** and into the container **18**. Viewing the containers **18** in FIG. **6**A, the patterns indicate lighter and lighter condensation coming into the containers at each segment output **14**. The gas contents of the pipes defined in FIG. **6**B are included but not shown in FIG. **6**A. This method of separation of output at the drilling site brings high prices for the extraction process because the chemicals emerging are defined in melting point ranges. The major fractions of petroleum assumed to be included in the extractions from the drilling include from heaviest to lightest: Heating oil with boiling (condensing) points between 275-375° C.; Kerosene between 175-275° C.; Gasoline between 40-200° C.; Petroleum ether between 30-60° C.; and Fuel gas at −162-+30° C. Fortunately, Liquid Nitrogen evaporates at −195.8° C. so even the Methane Gas can be captured which condenses at −162° C.

[0045] FIG. **7** shows a method of inserting Nitrogen in the periphery of the coal, shale or peat seam **1**. One drills narrower holes, 10 centimeter diameter, maximum, around the periphery of the drill site. These allow one to add Nitrogen **3** to the mix by putting in the Liquid Nitrogen Enabler coal mine fire fighting equipment **5** including a four liter dewar **50** with an apparatus for slow flow from the dewar **51** which fills a dump bucket **52** with Liquid Nitrogen which, when full, dumps the Liquid Nitrogen **35** into the sieve with spaced small holes **53** which separates the Liquid Nitrogen drop into tiny droplets that evaporate rapidly as they fall from the sieve. The cold Nitrogen gas **3** flows to the bottom of the drilling and seeps into seam **1** so it carries the evaporated hydrocarbons **15** into the evacuation drilling or shaft **10** shown in FIGS. **1-3**. When the dewars **50** are taken for filling, the drilling hole top is sealed with a bowling ball. A plastic sleeve **37** is inserted down the drilling covering the walls above the coal, shale, or peat seams. When the dewars are in place, they seal the top of the hole as well preventing the Nitrogen from flowing out of the narrow drill hole and insuring that it seeps into the porous seam structure to carry the evaporated hydrocarbons to the shaft. This operation does two things. First, it reduces the amount of Oxygen available in the hydrocarbons lowering, and hopefully eliminating, the chance of starting a coal mine fire, shale fire or peat fire. Second, it helps carry the evaporated hydrocarbons to the collection and extraction site.

[0046] FIG. **8** shows an auxiliary heating of the coal, shale or peat seam **1**. As the draw of hydrocarbons into the shaft **10** continues, the periphery of the extraction range grows. The holes that held the coal mine fire apparatus **5** can next be equipped with an auxiliary heating unit **2**. The heating unit is powered by the energy source and the wiring to the heaters **26** are shown. The hole heating unit **2** consists of the heat energy source **20** which extends the depth of the hole with its heating element **28** in a boiling can **27** that has a fluid in it **21** which boils at the temperature desired to heat the seam **1**, as, if one wanted to extract all hydrocarbons from fuel gas to heating oil, one would heat it to 275° C. and to include heating oil extraction, 375° C. The whole apparatus is lowered down the narrow drilled hole **25** and insulation **23** is placed in the hole to insure no heat loss to the surface occurs. This will help heat a larger region of the seam **1** to increase the area or space underground from which the evaporated hydrocarbons emerge. To keep the Nitrogen flow going from the peripheral regions, new holes are drilled for the coal mine fire units **5** further from the shaft **10**. As that area is exhausted, the heating units can occupy two circles of holes and a third circle of narrow drills is made for another placement of the coal mine fire units. This can continue with many circles of heating units rimmed by one circle of Nitrogen inserting coal mine fire units.

[0047] FIG. **9** shows the initial circle of coal mine fire units **5** around the shaft **10** shown from the ground surface **40**. The shaft heating unit is heating the coal, shale or peat seam **1** so close to the shaft **10** is the hot zone **45**. The Liquid Nitrogen flowing from the coal mine fire units **5** are cool so the periphery is the cool zone **44**. This schematic does not represent the true distance of sourcing the Nitrogen **3** as shown by the distance spacer **42**. The vector arrow shows the flow direction of the Nitrogen gas from the narrow drillings **25** to the shaft **10**.

[0048] FIG. **10** illustrates the expanded periphery of the draw of hydrocarbon extraction with distances larger than shown as indicated by spacers **42** where the shaft **10** is surrounded by narrow drillings **25** containing heating units **28** closest to the shaft **10** and the furthest ring containing the coal mine fire units **5** supplying Nitrogen **3** to the seams carrying the evaporated hydrocarbons to the shaft **10** for extraction. The hot zone **45** is expanded to include all the rings of heaters **28** and the cold zone **44** includes the final ring of coal mine fire units **5**. Nitrogen **3** flow is indicated by the vector arrow from the coal mine fire units **5** to the shaft **10**. This schematic also is showing the layout from the ground surface **40**.

[0049] FIG. **11** shows in FIG. **11***a* a means to preserve for marketing the rare gases that emerge from the coal, shale and peat seams as the last component of the Cold Cracker **13**. The rare gas extractor **61** is comprised of an inserted elbow pipe insertion **66** placed in the Cold Cracker piping **13** which has a vertical pipe **63** to release the rare gases **6** into the inverted rare gas container **60**. As the rare gas **6** fills the inverted container **60**, it becomes lighter weight and rises on the vertical pipe **63** as shown in FIG. **11***b*. Brushes **62** on the outer wall of the vertical pipe **63** keep the inverted container **60** properly vertical. To save these light gases, the rare gas extractor **61** opens and allows the rare gas **6** to flood the mylar balloon **64**, which lowers the inverted container **60** on the rare gas release tube **63** as shown in FIG. **11***c*. The trigger to open the valve on the rare gas extractor **61** is the tether line **67** attaching to the inside top of the rare gas container **60** and the inner wall of the vertical pipe **63**. When the tether line **67** is tight because the rare gases have lifted the container **60** so high the line is tight, the valve opens on the extractor **61** and the rare gases enter the mylar balloon **64**. As it does the container lowers, loosening the tether line, the valve has a time delay to allow the rare gases to enter the balloon. When the top of the container **60** strikes the vertical tube **63**, the valve shuts allowing rare gases to accumulate again in the rare gas container **60**. When the balloon is filled it is held to the ground with the tether line **65**. Once the mylar balloon **64** is filled, it will be removed from the rare gas extractor, and its opening folded and sealed as is common practice in use of these balloons. The balloon **64** is kept on the tether line **65** as it is stored and carried to market. Rare gases **6** contained are hydrogen, helium and neon. Argon, another noble gas, may be captured as the final part of the Cold Cracker final gas drum since its condensing temperature is higher than that of the Liquid Nitrogen and Nitrogen gas just after evaporation will liquefy Argon so it runs through the trap and evaporates in the gas drum as shown in FIG. **5**.

[0050] FIG. **12** shows the manner the Cold Cracker separates water, boiling and condensing at 100° C., from the gasoline fraction of the hydrocarbons, condensing at between 40 and 200° C. This segment is split into two components, heavy gasoline between 200° C. and 120° C. and light gasoline between 119° C. and 40° C. which includes the water condensation. The container **18** collecting the light gasoline segment is shown with the segment output **14** attached to the gaseous escape pipe **12** in the Cold Cracker **13** with its trap **17** and container **18** is illustrated in FIG. **12***a*. Details of this particular container **18** are shown in FIG. **12***b*. These include a float lighter than water **71** which has spaced holes and rides between the liquid of the light gasoline **9** and the water **7** keeping the interface calm and undisturbed as the added condensed materials enter the vessel. This water/gasoline separator **70** has the float **71** defined by rounded shape with a pattern of holes **75** shown in FIG. **12***c* in the vessel **18** and a siphon tube **72** draining the water **7** from the vessel into a water container **73**. When the volume of the cylinder is close to full, the light gasoline extractor **91** allows the gasoline fraction **9** to empty into the light gasoline container **93**. Not shown here are: the trigger floats noting the height of the gasoline **9** and the float **71** which properly high and spaced opens the light gasoline extractor **91** to drain some of the gasoline, and the float height that triggers the water siphon tube **72** to drain emptying some water into the water container **73**; and the final water purifying process of slowly freezing the water in cubes and lower its temperature well below freezing such that the contaminants are eliminated from the water crystal of the ice. Surface contaminants can be removed by wiping or lifting the ice cube from its container where the rejected contaminates remain or a quick pure water rinse. This purifying process is common. In the oceans, when ice bergs form, the salt and organics in the water are eliminated from the ice crystals and left in the ocean water. Tasting ice from an ice berg and sea water just beside the ice berg will allow one to experience the difference of contamination, the ice berg being more like fresh water and the sea water, salty. FIG. **12***c* defines the float **71** between the light gasoline **9** and water **7** segments which has spaced holes **75** holding the liquid relatively calm so the gasoline/water separation **76** easily reforms after condensation pours into the container **18**.

[0051] FIG. **13** shows the physical features of the regulated Liquid Nitrogen **3** flow with the regulator **8** on the tank of Liquid Nitrogen **39** feeding two Liquid Nitrogen pipes **34**, one feeding the Cold Cracker **13** condenser **33** and the other feeding the secondary Nitrogen input **80** with condenser **83** feeding Nitrogen gas into the one-way valves **82** allowing Nitrogen gas **3** to enter the Nitrogen insertion elbows **81** inserting the Nitrogen into the Nitrogen pipes **32** which, of course, drive the organ pipes and carry the evaporated hydrocarbons out of the shaft. This system keeps the thermal levels of the segments of the Cold Cracker constant because the thermostats imbedded in the Cold Cracker **13** at the segments drive the regulator to determine if any or how much Nitrogen gas should be fed into the Nitrogen pipes to keep shaft functions at needed levels when the Cold Cracker segment temperatures are kept at the determined levels to get appropriate fractions of the hydrocarbons extracted from the coal, shale or peat seam at the location of the shaft and zone surrounding which is enabled by the rings of auxiliary heaters and the outer ring forcing Nitrogen gas into the coal, shale, peat or landfill seam.

[0052] And, finally, FIG. **14** shows further definition of the condensing tube and its cooling from the Nitrogen gas lines shown in FIG. **6** where the condensing tube is expanded downward **84** to implement draining into drain tube **14** with the radiator plates **24** elongated to accommodate this expansion and keep the thermal conditions constant. FIG. **14***a* shows the side view of a length of the piping and FIG. **14***b* defines this drain accommodation. A vertical line shows where the cross section is taken. A second vertical line leading to FIG. **14***c* shows the thermal tuning of the condensing system where the constantly round condensing pipe sections have thermodetectors **86** along the distance allowing one to tune the system at desired temperatures to define the condensing material at that interval by placing a sack of iron balls **87** at the division temperature between two condensing drains. A magnet **85** is used to move the sack of iron balls **87** to that location where the temperature in the condensation tube **12** matches the junction temperature between the two hydrocarbon groups being collected. A cutaway **88** in FIG. **14***a* condensation tube **12** shows the side view of this divider **87** between drains. This method is used between the collection zones of all the hydrocarbon and noble gas groups collected by condensation. The magnets can be driven manually or by an automated process. When the manual method is used, the instrument tracking the thermodetectors can signal the thermal change in any of the junctions so the supervisor on duty can adjust the location of the sack of iron balls with the magnet. Once these dividers are placed, the thermodetectors in one section will have a common temperature among the detectors more so than without the divider. Automated, the electromagnet in that pipe segment can go on so the change of location of the sack of iron balls is made and the condensation progresses. It can be expected that there may be changes in hydrocarbon contents over time in the extracting process which will necessitate adjustments at various times, even varying as to when one segment junction needs adjusting from when another segment junction needs adjusting.

[0053] FIG. **15** is included to show where each of the extracted components from the coal, shale, peat and landfill seams are collected including: Rare Gases as Hydrogen, Helium, and Neon; Argon; Methane; Ethane; Fuel Gas; Light Gasoline and Water (separated in second stage); Heavy Gasoline. Jet Fuel; Diesel Fuel; and two sections of Heating Oil. This array of components isolated will probably be a maximum sized group of isolated elements, molecules and molecule mixtures.

[0054] This clean method of hydrocarbon extraction should allow the readily burnable parts of coal, shale and peat be extracted from underground with minimal disturbance of the site and with little chance of sinking surface structure after the extraction. It may replace surface mining as we know it, eliminate underground coal mining as we know it, and bring hydrocarbons from some situations where mining would not be practical or economical because of the difficulty of extraction of the material, as is the case presently with shale deposits.

[0055] This completes the statement of invention.

Therefore I claim:

1. A method of extracting evaporated hydrocarbons from a coal, shale, peat, or landfill seam using a primary shaft drilling comprising the steps of:

a. cooling the coal, shale, peat or landfill seam to brittle with Liquid Nitrogen to enable vibration shock to open the seam formation for hydrocarbon extraction,
b. heating the coal, shale or peat seam with a contained heat source at the seam level in the lower parts of the main shaft;
c. vibrating the coal, shale or peat seam with single frequency sound, and with harmonic beating of a matching size, but adjustably tuned sound using two or more organ pipes;
d. applying Nitrogen gas to the shaft environment initially using it to activate the organ pipes, then to be an inert carrier of the evaporated hydrocarbons emerging from the seam into the shaft, and, at the same time, serve as a fire suppressant so the mining operation does not ignite a coal mine, shale or peat seam fire; and
e. keeping the Nitrogen gas pressure such that the shaft functions are kept at required levels of vibrations and carrying the evaporated hydrocarbons out of the shaft and into processing.

2. The method according to claim **1**, wherein the heating unit raises the coal, shale, peat or landfill seam temperature to the highest temperature of the longest carbon content hydrocarbons desired to be extracted determining the range of hydrocarbon fractions being extracted from the seam.

3. The method according to claim **1**, wherein the cue or harmonic vibration rate causing the highest extraction rate for the evaporated hydrocarbons from the coal, shale, peat or landfill seams into the shaft for extraction.

4. The method according to claim **3**, wherein the adjustable organ pipe can be manually adjusted or driven to scan harmonics and enter matched tuning with the fixed tone organ pipe.

5. The method according to claim **1**, further comprising the carriage of the evaporated hydrocarbons with Nitrogen gas heated to the highest temperature of the heaviest hydrocarbon desired to be extracted.

6. The method according to claim **5**, further comprising the collection of the hot Nitrogen/Hydrocarbon into an isolated extraction tube taking these gases hot from the shaft.

7. The method according to claim **1** of regulating Nitrogen flow such that the thermal segments of the Cold Cracker are kept at constant conditions so the separated hydrocarbons are accurately refining the output into reliable fractions of hydrocarbons.

8. A method of extracting evaporated hydrocarbons from a coal, shale, peat or landfill seam using a primary shaft drilling, and as the extraction continues, secondary narrow drillings to enable continued evaporated hydrocarbon extraction comprising the steps of:
a. drilling narrow secondary holes and applying a pulsed application of Liquid Nitrogen through a spaced hole sieve making Nitrogen droplets that evaporate rapidly as they drop down the hole releasing Nitrogen gas into the coal, shale, peat or landfill seam. Initially this can freeze to brittle the coal seam in this area allowing vibration cracking of the seam structure. As it heats up, the hydrocarbons evaporated are carried to the main drilling in the gaseous Nitrogen flow and as the ring of these units freezes it keeps the ground water from entering the active extraction zone.
b. forcing the Nitrogen gas to seep into the seam only by covering the soil and rock above the seam with a gas impervious sleeve.
c. increasing the sequence of rings of holes, keeping the furthest hole for the application of the Liquid Nitrogen the hydrocarbons evaporated are carried to the main drilling in the gaseous Nitrogen flow and as the ring of these units freezes it keeps the ground water from entering the active extraction zone, and applying a heating unit to the holes where earlier the Liquid Nitrogen was applied.
d. regulating the temperature of the narrow drilling heaters to the desired temperature, as that of the highest temperature of the highest carbon count molecules of the fraction of hydrocarbons desired to be extracted.

9. The method according to claim **8**, wherein the Nitrogen sourcing insures the Nitrogen gas evaporating from the Liquid Nitrogen seeps into the coal, shale, peat or landfill seam by keeping the top of the drilling sealed and lining the drilling to the seam levels with Nitrogen gas-impenetrable material.

10. The method according to claim **8**, further comprising the heating of the inner narrow drillings by insulating the narrow drilling down to the coal, shale or peat seam so all the heat produced affects the temperature of the seam only.

11. The method according to claim **8**, wherein the heating unit in the narrow drillings is controlled by an enclosed liquid boiler at the temperature desired by selection of the liquid in the boiler where the heating element is immersed to boil at the temperature desired to heat the seam.

12. The method according to claim **8**, which prevents ignition of the seam by containing the heating element in a boiler and flooding the porous seam with Nitrogen which is the carrier for the evaporated hydrocarbons.

13. A method of separating the hydrocarbon fractions by Cold Cracking comprised by the steps of:
a. initiating the infusion of Nitrogen gas by evaporating Liquid Nitrogen in a condenser which feeds directly into two or more pipes delivering Nitrogen gas, one organ pipe per Nitrogen pipe;
b. running the Nitrogen pipes over the evaporated hydrocarbon/Nitrogen extraction pipe in an insulated packet including the Nitrogen pipes and the extraction pipe with radiator plates to transfer the thermal temperature between the cold pipes of Nitrogen gas and hot gas of the extraction pipe;
c. segmenting the extraction pipe by placing draining pipes with traps in sections of the extraction pipe to drain out condensed liquids and allow their flow into a collecting vessel;
d. accommodating both hydrocarbon fractions which are liquids at normal temperatures and hydrocarbon fractions which are gaseous at normal temperatures;
e. enabling collection of the rare gases, Hydrogen, Helium and Neon, by allowing their rising into a tube and capturing them in an inverted container which allows by their containment in mylar balloons their storage and movement to market and final separation, one from another;
f. separating the light gasoline from water in the collection cylinder with a float with holes to keep the separation from turmoil in the solution when adding condensed liquid mix; and
g. further removing contaminants from the water by slow freezing so the crystal structure of the freezing water eliminates other materials.

14. The method according to claim **13**, wherein the cold Nitrogen tubes emerging from the condenser for evaporating

Liquid Nitrogen intersect with the extraction tube at its coolest point and flows warming to its hottest point as it is insulated coming from the shaft causing the extraction pipe to have a thermal gradient.

15. The method according to claim **13**, wherein the thermal ranges of the extraction pipe are isolated with a drain collecting the condensed hydrocarbons in the segment collecting the highest temperature evaporating (condensing) hydrocarbons in barrels or vessels storing them as liquid at normal temperatures and collecting the lower temperature evaporating (condensing) hydrocarbons that are gaseous at normal temperatures in gas collection drums.

16. The method according to claim **15**, wherein the condensed liquids are divided at the thermal point between the neighboring segments at the defined thermal point as defines the types of hydrocarbons, molecules, and atoms using an adjustable barrier so the cooler condensation goes to the first drain and the hotter segment condenses and flows to the second drain of the two materials.

17. The method according to claim **13**, wherein the gases that condense at higher temperatures than Nitrogen and are of smaller molecular weights are allowed to escape from the extraction tube by rising in a vertical tube topped with an inverted container that allows transfer to transport-capable containment.

18. The method, according to claim **13** of extracting water from the material condensed by using a secondary separation in the thermal range of water condensation where water being denser than hydrocarbons, will sink to the bottom and the hydrocarbons condensed in that section float on the water and increasing the separation stability with a float riding on water but sinking in hydrocarbons that is slightly smaller than the cylinder and has many holes allowing small regional separation and less splash and mixing as condensed material is added to the cylinder.

19. The method according to claim **18** whereby the water is further purified by slow freezing so crystal structure of water formed forces out contaminates making water that is welcome to a clean environment from the extraction process.

20. A method of clearing the extraction tube of its remaining gas after cooling to minus 162° C., which condenses methane gas and possibly Argon at—185.7° C., allowing release of the rare gases and then releasing the remaining Nitrogen to the atmosphere, and cutting the Nitrogen clouding with a fan causing air mixing at wind speeds exceeding five miles an hour to insure any resulting Nitrogen cloud is dispersed, insuring that people or animals do not breathe the pure Nitrogen gas and succumbing to Nitrogen Asphyxiation or Coma.

21. The method according to claim **8** which uses a large heater, electric using a heating element in the lower section of the boiling can or fuel gas heating of the liquid using extracted fuel gas with cooler liquid drained to the flame heater at ground level with one-way valves keeping the fluid rising and the heated liquid proceeding upward with one one-way valve keeping the heated fluid going down to enter the boiling can through a funnel in the middle of the can releasing the hot liquid upward with all fluids passing through insulated hoses, with higher boiling point liquid transferring the coil heat to the outside and radiating the heat to the gases in the shaft and drillings and though the coal, shale, peat, or landfill seams evaporating the hydrocarbons designated for extraction.

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