Oil from Coal --- Free!
The Karrick LTC Process

by

Robert A. Nelson

North America contains over a quarter of the coal on Earth, but the environmental hazards of mining and burning coal limits its use, as China has demonstrated. Dozens of processes exist to burn coal in a cleanish manner, but coal mining never will be a green industry, and underground gasification has not been sufficiently successful. Technocrats hope to save the day with cool tools such as microwave plasma drills, but such niceties are not yet in widespread industrial use.

Already, as the Bell curve of petroleum production oozes its way downward, we have resorted to the abominable practices of fracking and tar sands, and still more nuclear steam boilers. Thus it is certain that desperate humans will continue to mine coal as long as possible. Technocrats hope to save the day with cool tools such as microwave plasma drills, but not today, nor anytime soon.

Fortunately for our possible future, an elegant solution already exists, awaiting your attention for several decades. Explanations are in order:

In 1980 President Carter gained Congressional approval of a $20 billion synthetic fuel (synfuel) program to manufacture oil from coal and shale. The US Dept. of Energy placed great emphasis on the Bergius process -- direct liquefaction by hydrogenation -- to produce synfuel. No matter how you engineer it, however, the Bergius process is extremely expensive, impractical, dangerous, consumes lots of water, and generates waste.

The Bergius process combines heated hydrogen with coal at 3000-5000 psi pressure to produce oil. The synthesis requires about 7000 cu. ft. hydrogen per barrel of oil it produces, plus 1500 cu. ft. of hydrogen per 1000 cu. ft. of synfuel it produces.

It is ironic that the major source of chemical hydrogen is natural gas. In terms of industrial chemical requirements and economics, natural gas has served well as a source of hydrogen, but a much less costly and more abundant source must be found for synfuel production. The logical choice is water, but electrolysis is not yet economical for purposes of synfuel hydrogenation.

Meanwhile, oil can be produced from coal in a clean, safe, profitable manner: Karrick Low-Temperature Carbonization (KLTC). The technology of LTC has been around for a long time, but it was perfected for us by Lewis C. Karrick, who was an oil shale technologist at the U.S. Bureau of Mines in the 1920s.

LTC involves heating coal, shale, lignite, or any other carbonaceous material to about 800^{o} F. in the absence of oxygen. Thus the natural oil distilled from the material, rather than burning as it would if oxygen were present.

After being treated by KLTC, a ton of coal will yield up to a barrel of oil, 3000 cubic feet of rich fuel gas, and 1500 pounds of solid smokeless char (semi-coke). The economics of the process are such that the oil is obtained for free!

Smokeless char is an excellent substitute for coal in utility boilers and for coking coal in steel smelters. It yields more heat than raw coal, and it can be converted to water gas, which can be converted to oil by the Fischer-Tropsch synthesis. The coal gas produced by KLTC yields more energy than natural gas because it contains a greater amount of combined carbon, and there is less dilution of the combustion gases with water vapor. The phenolic wastes are used by the chemical industry as feedstock for working up into plastics. Finally, the process produces no pollutants other than carbon dioxide.

In addition to coal products, electrical energy can be co-generated at minimal cost. A Karrick-LTC plant with a daily capacity of 1000 tons would produce enough steam to generate 100,000 KW-hours of electrical power at no extra cost other than the capital investment in electrical equipment and steam temperature losses in the turbines.

No such claims can be made for any other coal or shale oil project in practice or in theory. No one can demonstrate any other process that is manufacturing oil, gas, and semi-coke from coal commercially and

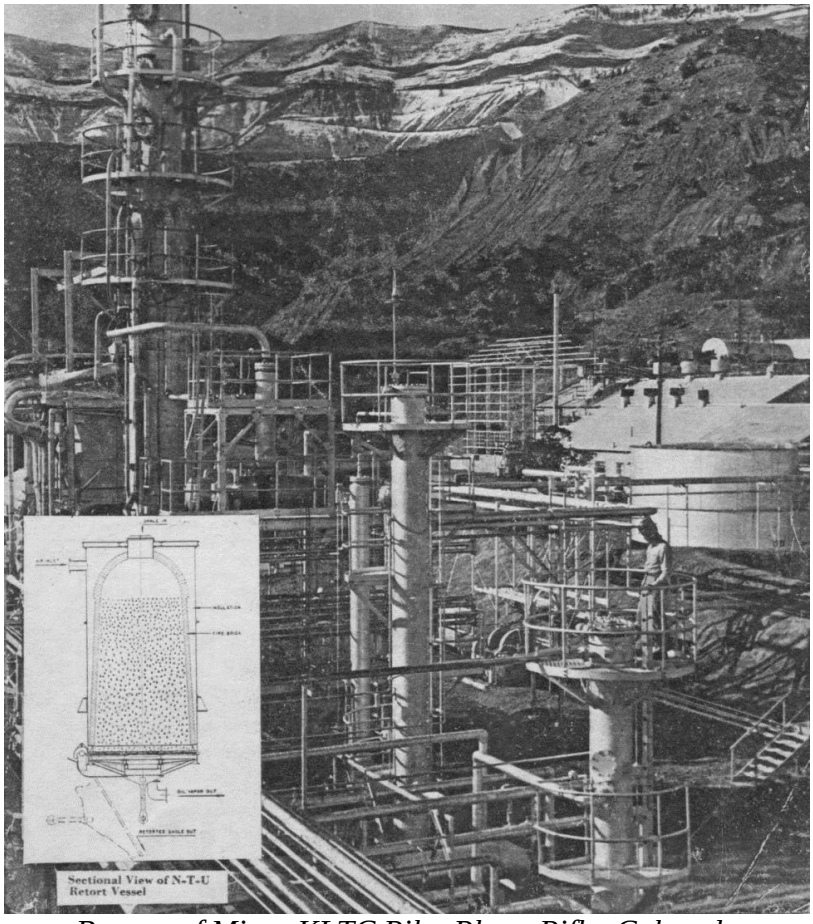
without government subsidy. That was done in England by the National Coal Carbonizing Co., Ltd. For 40 years, until the NCCC became catastrophically involved in North Sea oil in the 1970s. NCCC operated five LTC retorts producing Rexco-brand smokeless fuel (plus oil and gas) for use in England's official clean air zones. Other LTC plants have been operated in Estonia and a few other countries, but they are obsolete or are over-managed (as in India).

Free enterprise could revive and modernize the Karrick LTC process, but oiligarchists have entirely suppressed this elegant technology. According to Webster's definition, suppress means "to keep from public knowledge --- to refrain from divulging". The oil industry has done just that with Karrick LTC and with hundreds of carburetor and engine designs.

Before 1860, more than 50 plants were extracting oil and gas from coal in America. Boston alone had five LTC plants that produced oil and gas for heat, light, axle grease, and paraffin. But by 1873, Rockefeller's cheap petroleum had forced the last coal-oil plant to shut down.

In 1926, Secretary of Commerce Herbert Hoover (who later became President) made Karrick custodian of the government's coal-oil research data. Hoover advised Karrick to file patents, thus rendering the broadest public service and giving the government full credit. Sixteen patents were issued to Karrick outright. All have expired since then. The patents now are in the public domain.

As soon as Karrick and his associates proved they could produce oil from coal cheaper than the oil wells could pump it -- and gain major yields of gas and semi-coke -- the government stopped all work on the processes at the pilot plants in Rifle, Colorado, and dismantled them.



Bureau of Mines KLTC Pilot Plant, Rifle, Colorado

Why? Money, of course!

The major companies that mined coking coal (used by the steel-smelting industry) pressured the Bureau of Mines to suppress Karrick's LTC process. It was feared that the cheap semi-coke char would replace coking coal and thus devalue hundreds of thousands of acres of coking-coal reserves, held by the coal-mining industry and worth billions of dollars. Coking coal cannot be used for LTC processing because it agglomerates upon heating and plugs the retort. Coking-coal comprises less than 5% of our national coal reserves and are in short supply. The other 95% are non-coking coals.

In 1926, Germany's I.G. Farben chemical combine announced the invention of the Bergius synfuel process, but concluded that in order to ensure the development of the Bergius process, the best course of action was to cooperate with Standard Oil (SO). As Farben's president explained to a committee of the Reichstag, "The field of petroleum industry is so tremendous, and is so absolutely under the command of

three large concerns, that the consideration of a new production in the fight against these concerns would have been very difficult... and the financial needs... beyond any expectation."

On the very day in 1929 that Standard Oil announced that it had paid $35 million for the Bergius process, SO officials also offered Karrick the positioned of vice-president and chief engineer, plus 1/3 of the stock in a chartered subsidiary, the Oil & Gas Development Company. In exchange, Karrick was to relinquish control of his patents and supporting data. Thus, the oil cartel was on the verge of controlling both the Bergius hydrogenation process and Karrick LTC.

Federal anti-trust lawyers advised Karrick not to sign with Standard Oil. They believed that the cartel intended to suppress his patents until they had expired and the country had run out of oil. Only then would they introduce Karrick's LTC technology.

Karrick returned to Utah to teach and develop his methods at the University of Utah. He founded the Utah Research Foundation at the University of Utah, and several student theses were written about the research they developed. One of Karrick's students, S. Clark Jacobson, received the Mechanical Engineering Honor in 1934 for the best undergraduate thesis of the year, bestowed by the American Society of Mechanical Engineers.

So-called experts have criticized that a commercial-scale plant designed according to the principles established by Karrick would not be practical or mechanically feasible. Yet in fact, no difficulty whatsoever was encountered with the successful operation of the pilot plant built by Karrick and his students at the University of Utah, as they showed in their graduate theses.

A witness for the Bureau of Mines told the Senate Interior Affairs Committee that the Karrick retort is fundamentally different in construction and operation from any other design. The retort was used to process large amounts of bituminous material, and appeared to have the best record of performance of any available retort that had been developed. Every variety and mixture of shale available was used, and all types of charges were retorted successfully. The last run was made with the worst coking shale available. Although two-thirds of the spent shale was in the form of large clinkers, the retort was discharged easily.

The KLTC retort is self-cleaning, has no moving parts, is automated, and is continuous feeding.

It is further possible to make watergas in the Karrick retort. The LTC char is especially well suited for the purpose. In other LTC processes, the feedstock must be brought to an incandescent state in a separate operation. The charge in a Karrick retort is in an incandescent state at the end of a run, and means of removing the water-gas are an integral part of the design.

In 1947, after completing commercial-scale runs on Appalachian coal, Karrick presented the Keynote address to the Convention of the Ohio Society of Professional Engineers. He said:

> "Great coal-oil and shale-oil industries have existed and do now exist in foreign countries, and many successful plants have existed in the state of Ohio and other states. Recent studies have shown that oil from coals of Ohio can be manufactured by distillation, not hydrogenation, at less than the average price of petroleum."

Ohio bituminous coal then was selling for $3.50/ton, and natural crude was selling at the Persian Gulf for 34 cents per barrel, and domestic crude for around $2.53. The economics of the Karrick process were such that he was able to claim:

> "If the solid smokeless fuel residue from the LTC process was assumed to sell at the same price as the average price of prepared sizes of raw coal, then the cost of the crude oil would be zero dollars per barrel. This condition now exists in Ohio, and there can be made available plenty of low-cost fuel, excellently suited for domestic uses and industrial plants as a by-product of the manufacture of oil from coal. Also, the gas made from coal by these distillation methods is of about the same heating value as average natural gas."

The economic claims for LTC coal-oil processes have been demonstrated on a commercial scale in England by the National Coal Carbonizing Co., Ltd., which manufactured the Rexco brand of char in its Snibston plant at Coalsville, Leicestershire. The Rexco process was patented by Wallace, and is not to be confused with that of Karrick.

The NCCC developed five LTC plants in Scotland and England, producing smokeless fuel for industrial and domestic use in England's official clean-air zones. The highly-efficient plants carbonized 1,000 tons of coal daily, 750 tons of which a recovered as smokeless char. The NCCC's 35-ton capacity retorts also produced 3 million cubic feet of fuel gas and between 650-700 barrels of oil daily. No smoke or odor were discernible. The tars and phenol wastes were sold to the chemical industry as feedstock for plastics.

The conveying and processing part of the plant involved the services of three men, easily trained, and a supervisor per shift. The NCCC became involved in Britain's failed North Sea oil project and was forced to cease its LTC operations in the 1980s due to political and economic machinations. The company's neglected plant now is a toxic cleanup site.

The official mealymouth DOE position on LTC maintains the blatant lie that "about 50% of the energy in feed coal remains in the total residue or char, and this residue is no better than the original."

Luckily for Britain, that dog don't hunt, nor does the pathetic DOE pony it rode in on. England prohibits the burning of non-smokeless fuel, and thus has enjoyed the return of clean air, birds and plants that had not been seen for 100 years.

The mendacious oiligarchist minions in the Department of Energy discourage private enterprise and venture capital by issuing absurd falsehoods about the technical and economical feasibility of Karrick's LTC technology. The DOE has long suppressed the truth about the commercial capability and environmental advantages of Karrick LTC.

Meanwhile, the major oil companies have been subsidized with billions of dollars to hydrogenate coal, even though the Bergius process and its variations cost more than OPEC or shale oil.

The only reason we know about Lewis Karrick today is thanks to Harlan Trott, who was a staff member of the *Christian Science Monitor* for more than 20 years, and served as chief of the San Francisco bureau. His articles also appeared in such journals as *The American Banker*, *The London Observer*, *The Economist*, and others. Harlan Trott met Lewis Karrick in 1949:

> "Mr. Karrick was calling our home office, protesting and claiming that the Bureau of Mines was suppressing this technology, this cheaper and more efficient method to produce coal-oil. The editors picked me to talk with Mr. Karrick and see if we could sort out the facts. I thought it wouldn't take very long to do this, so I made arrangements for Mr. Karrick to come into the office around 3:30 in the afternoon there in Washington. I figured he'd be out of the way by four o'clock and I'd get ahead of the crowd going home to Alexandria. Mr. Karrick came in at the appointed time and we started talking. And then I suddenly noticed the city lights had come on and the office was deserted. We discovered it was about eight o'clock. I had been spellbound by this story he had to tell about oil from coal and the way he alleged it had been suppressed. We went out and had a quick bite to eat and came back to the office and talked until about 11:30 that night. And then I made a report, evaluated and sorted out the information, and suggested to the editors that we write a story about it. So the *Monitor* gave me about three months to concentrate and dig into this thing from all angles, and then we went to press and came out with a full-page copyright story in the March 20, 1950 issue of the *Christian Science Monitor*."

Because the challenging story aroused so much attention and controversy, the Bureau of Mines felt obliged to publish a 5,000-word statement, riddled with misinformation about the supposed "high cost of first producing the high-temperature steam to be used in carbonizing the coal and then condensing it to recover the tar product."

On May 12, 1950, two months after the publication of Trott's article, Lewis Karrick testified at a Congressional hearing on the future use of the Minnesota peat bogs as an energy resource. He set the record straight in no uncertain terms:

> "The simple and relatively inexpensive processes developed by me in the government service during the 1920s were designed for use as adjuncts to steam power plants so that there would be no need to invest new capital to produce steam. The LTC process would use off-peak steam from the power plant.
>
> "When you heat coal just to the temperature we call 'destructive distillation', oils form. If you don't let the temperature rise above

that point, which is the same temperature used in cracking petroleum (700°-800° F.), you get oil from coal, not tar."

"If the Bureau of Mines recognized this as oil instead of appearing dumb and calling it tar, then it should have been developed under the Synthetic Liquid Fuels Act. We can crack it into 50-odd percent gasoline, which is very good gasoline. It is better oil than you can get out of shale oil. It gives you as much oil per ton and gives you valuable by-products of smokeless fuel, which makes it cheaper than shale oil. So by not calling it oil, which it is if shale-oil is oil, its development has been obstructed.

"The present Bureau of mines won't recognize this cheap source of oil. They will spend vast sums of money on the German methods, but not a cent on distilling oil out of coal by the way we made oil in the U.S. once.

"In fact, all the oil in the U.S. was made out of coal up to the time of the first oil well in 1859. There were 55 companies at one time, all listed in one of our government publications, manufacturing all of the oil used in the U.S., and it was not coal tar, it was oil!

"When I was in the shale oil work and had the title of shale oil technologist for the bureau of Mines, we estimated that we could distill the oil shales underground and produce oil for a good deal less than a dollar a barrel, or if we used either of the two commercial plants that we built at Rifle, Colorado (1920-1926), we could make oil for $1.50 or $2 a barrel with either of those processes. Those are the figures, and we can prove it now. Since then, I have directed research at the School of Mines and Engineering in Utah for 8 years to prove these things, to offset information put out by the Bureau of Mines and others to the effect that you can't do it.

"Capital costs would be somewhere around $2,000 to $2,500 per ton of daily capacity, present prices [1950]. When we first figured this back in the Bureau of Mines, way back in 1927 to 1930 when we finished this study, it was as low as $800.

"Rocky Mountain coals... all yield from 35 to 45 gallons of oil per ton. You could get from 2,000 to 2,700 cubic feet of gas out of it, but we learned to heat until just the last trace of oil is out. Then it

can't be made to smoke under any conditions. It burns with a very long, clear blue flame. The gas yields can be varied. The more gas you drive out of this smokeless fuel, the lower the BTU of the gas; so you can boost it up to 6,000 cubic feet of 800 BTU gas per ton of coal processed.

"Then it was demonstrated that all of the solid smokeless fuel could be made into water-gas. In that case you could get about 40,000 cubic feet of 300 to 350 BTU gas from a ton of processed coal. And out of that water-gas you could make four barrels of oil by the Fischer synthesis process.

"If you use some other gas such as hydrogen, rather than steam to distill oil from coal, that gas will be permanently mixed with the gas you make from coal and will make the new gas very low in BTU's and probably not salable. If you were to use a gas in place of steam, it would take power to compress the gas to force it to circulate through the coal. The power used to compress the hydrogen probably will be steam, and you would use nearly as much steam just to circulate the gas as you would if you used steam in the first place.

"The thing to do is to distill the oil out of the coal, while making a smokeless fuel and high-BTU gas. In a national crisis you would quickly go to converting this reactive, solid smokeless fuel to oil... Those who have been using this smokeless fuel (i.e., industries and power plants) will then go to burning raw coal for the duration of the emergency. That's the way we think the national fuel economy ought to be handled..."

Even after such explicit and unarguable testimony, the Bureau of Mines refused to change its position which defines coal-oil as tar.

Harlan Trott's article in the *Christian Science Monitor* was read by Hubert Humphrey, a freshman Senator from Minnesota. In testimony at a Congressional hearing on July 13, 1950, Humphrey stated that he had read Trott's article and discussed it with eminent scientists at the University of Minnesota and at the School of Mines at Rapid City, South Dakota. Humphrey said that he had come to be dissatisfied with the attitude which the Bureau of Mines held toward the Karrick LTC process:

> "Mr. Karrick believes that the merits of his cheap, domestic oil-from-coal process are unlikely to interest oil companies, or the Department of the Interior for that matter, until the companies run out of sources of cheap foreign oil."

Shortly after the *Monitor* published Trott's article, he received a hand-written note from Watson Snyder, the Justice Department's chief oil investigator, saying, "The world oil cartel prevents the cheap production of oil from coal as it might bring about a reduction in prices in the U.S."

The governmental suppression of the Karrick process precipitated a crisis of confidence within the Bureau of Mines in 1952. In an effort to clarify the technical controversy over the relative merits of hydrogenation and LTC of coal, Dr Eugene Ayres was invited to address 30 members of the Bureau of Mines coal research staff over dinner at the Cosmos Club in Washington DC.

Dr. Ayres was Director of Research of the Chemical Division of Gulf Oil, and the foremost fuel economist on President Eisenhower's cartel-stacked Paley Commission. In his address, he refuted every point of the Bureau's position against Karrick's work:

> "The hydrogenation of coal is unnecessary and too expensive in terms of dollars and coal, and the process uses much precious water. About half of the thermal value of coal is destroyed in the Bergius process. Hydrogenation need not be used to any large extent in the future because there exist simple, continuous LTC techniques (such as the Bureau of Mines developed) in which moderate yields of oil are accompanied by major yield of char (smokeless fuel). The oil can be converted to liquid fuels while the char is an excellent fuel for steam boilers in electrical generating plants. The Karrick-LTC method --- including the conversion of oil to motor fuel -- destroys only 25% of the thermal value -- half as much as the Bergius hydrogenation process."

According to Dr. E.R. Mellinger, a leading expert on LTC, the Karrick process has a cyclic efficiency higher than 90%.

In 1933, Germany imported 85% of its oil, but Hitler then instituted the most intensive synfuel program ever attempted. By the end of the WW2,

Nazi Germany produced 75% of its own fuel from coal by the Bergius process -- and LTC.

Harlan Trott located documents recording the opinion of Dr. Adolf Thau, who was Germany's leading synfuel expert. In 1945 the U.S. Technical Oil Mission (USTOM) went to Germany to study Nazi synfuel technology. In the opinion of Dr Thau, the Bergius process was "very expensive and accident-prone due to hydrogen explosions... Based on the coal introduced, only a very small amount of oil was obtained. Far better results were obtained by the simpler LTC methods." Dr. Thau produced a copy of a statement made in 1944 by British Minister of Fuels David George, disclosing that "oil from coal produced at home during the war had displaced fuel oil to a large extent in Great Britain... Further development of LTC is expected by the coal industry as a result of the experiences gained during the war, while the prospects for the hydrogenation of coal are judged less positively." Dr. Thau said to Dr. Reed of the USTOM, "The facts stated by the British government are fully confirmed by the experience gained in Germany."

Despite all the facts to the contrary, the DOE continues to ignore the Karrick LTC process:

> "A major emphasis... is being placed on the hydrogenation of coal because [the DOE believes] this type of process can produce the maximum yield of liquid fuel products. Hydrogenation promises to be the most efficient and economical means of making synfuel..."

The Federal government built a $10 million, 30,000 barrel/day pilot plant to test the Bergius hydrogenation process, but the Secretary of the Interior ordered the plant dismantled in 1953, saying it was "useless to keep trying to get more than a quart of water in a quart jar." Yet again, in 1978, Congress awarded a $75 million grant to Gulf Oil Company for development of the Bergius process, which cannot be made to stand on its own financial feet. Much more public money has been wasted on the same folly since then. Oiligarchists insist that the public must subsidize the program, which only the largest corporations are sophisticated, experienced, greedy and foolish enough to exploit in this pork-barrel fashion. The megalomanic oil cartel finds it easy and profitable to obtain Federal funds for the Bergius process, rather than institute the free Karrick-LTC technology.

During an interview at radio station KPFA (94.1 FM, Berkeley CA) in March 1980, Harlan Trott said:

> "You see, the threat here, to the oil cartel, is decentralization. Karrick-LTC lends to independent local control. Any co-op in this country wherever there's a coal mine can do this. In effect, every coal tipple can be an oil well."

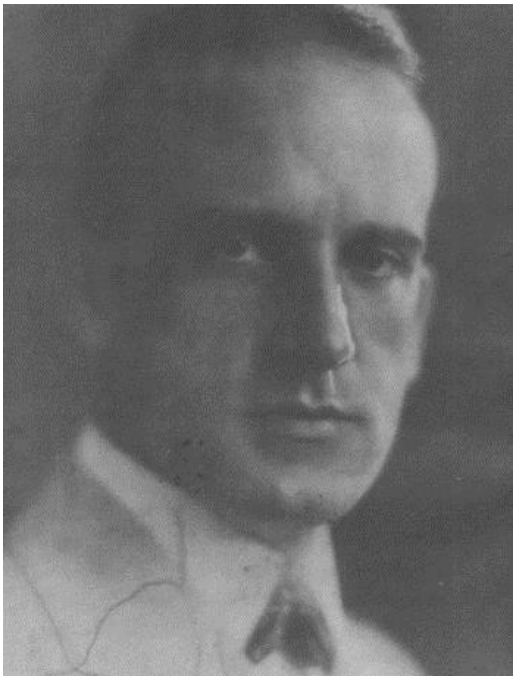
To illustrate the point, Mr. Trott told of a group of merchants in Sydney, Australia, who cooperated during World War 2 to make shale oil to supply their needs. Australia was then on strict gasoline rationing. The group selected the Karrick-LTC process and purchased for $10,000 the 30-ton capacity retort developed by Karrick for the Santa Maria Railroad at Casmalia, CA. The group began distilling oil from shale near Sydney, and they were so successful that they installed two more retorts without employing extra help. The co-op also developed adapters to allow the use of shale-oil on their fleet of trucks. In England today, some trucks are operated by char-fueled steam power at one-fourth the cost of gasoline. During the 1930s, Karrick's students at the University of Utah drove their cars on gasoline made from coal in their campus pilot plant.

In 1979, one of Karrick's students, Baird Anderson, was interviewed on a television program at the NBC studio in Salt Lake City. The moderator asked, "Do you envision this [KLTC] process being used in conjunction with power generating plants?" Anderson replied:

> "I can see that somebody like Utah Power and Light could take coal on its way to the generating plant, process and take the oil and gas out, and then send the smokeless coal on, and burn that. And I believe that they could sell the oil and gas at a profit. In other words, it could be that they can't afford to burn the raw coal anymore."

Karrick died in 1962, and his patents have expired as well. They can be used by anyone, and no one can monopolize them. The process is relatively cheap, and does not need to be subsidized. The construction of a Karrick-LTC plant would cost only a quarter as much as a Bergius hydrogenation plant. Yet the technology lies utterly dormant today, no thanks to its suppression by oiligarchists.

Let them eat coke. Give us oil for free, thanks to Lewis Cass Karrick!



Lewis Cass Karrick

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How to KLTC

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Larsen, William A. : Design of Plant for Low Temperature Carbonization of Utah Coal by Karrick Process
Thesis: College of Engineering; Civil & Environmental Engineering (1932)

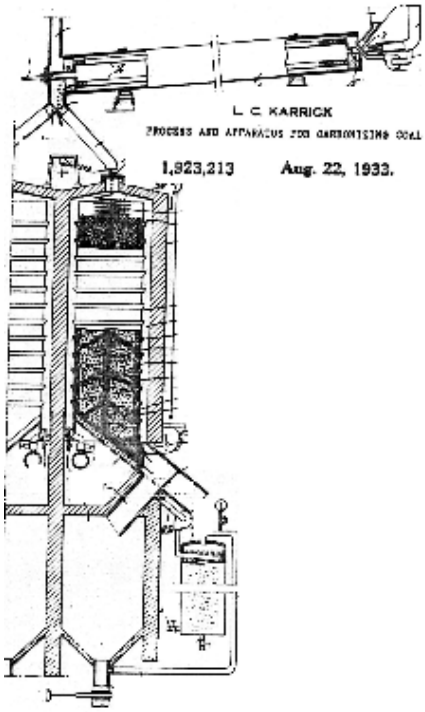
Description -- Coal is undoubtedly one of Utah's most important natural resources, there being about 200 billion tons of good bituminous coal available in the State. It cannot be said that too much attention is being paid to the scientific utilization of coal. With that in mind as well as the present day problems such as the smoke menace, the future need for a state oil supply and industrial growth we are compiling this thesis.

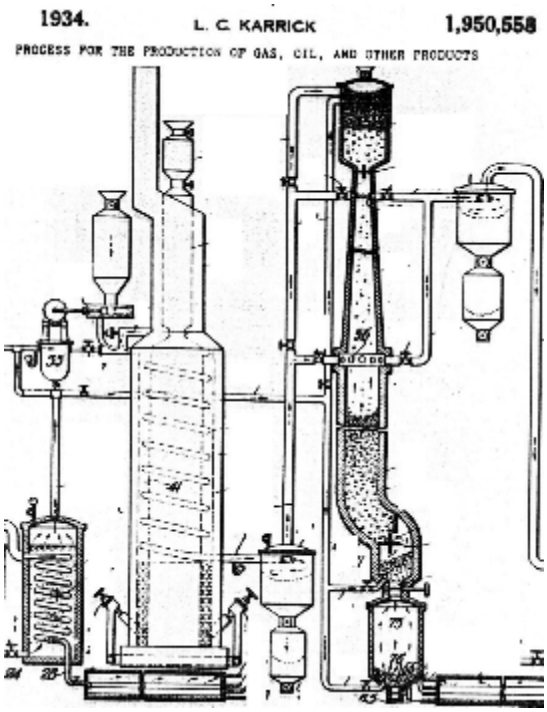
http://digicoll.manoa.hawaii.edu/techreports/PDF/USBM-530.pdf
Manual of Testing Methods for Oil Shale and Shale Oil: Bureau of Mines Bulletin 249 (1926)

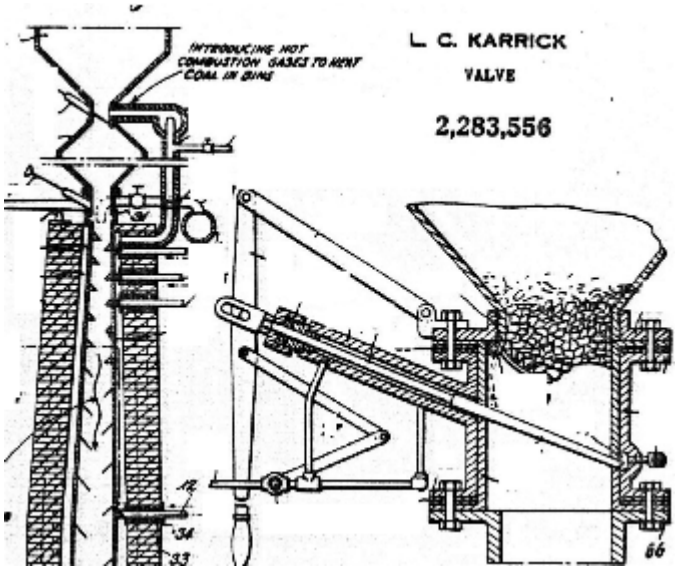
US Patents Issued to Lewis Karrick for LTC of Coal

US1835878 -- Leaching & Treating Apparatus
US1894691 -- Destructive Distillation of Carbonaceous Material

US1899154 -- Valve
US1901169 -- Distillation of Carbonaceous Material
US1901170 -- Gasification of Carbonaceous Material
US1906755 -- Method of Improving the Properties of Solid Fuel by LTC
US1913395 -- Underground Gasification of Carbonaceous Material-Bearing Substances
US1919636 -- System of Mining Oil Shales
US1923213 -- Process & Apparatus for Carbonizing Coal
US1938596 -- Retort
US1942650 -- Apparatus for Coking Bituminous Coal
US1945530 -- Destructive Distillation of Solid Carbonizable Material
US1950558 -- Process for the Production of gas, Oil & Other Products
US1958918 -- Process of Destructively Distilling Solid Carbonaceous Material
US2011054 -- Process of Destructive Distillation of Carbonaceous Material
US2268989 -- Process for Improving Fuel
US2283556 -- Valve







About the Author : Robert A. Nelson is a 10th grade dropout with no credentials. He established Rex Research in 1982 to archive hard-to-find information about suppressed, dormant, and emerging technologies and therapies, &c. He persists...
