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

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**America** has been called the Saudi Arabia of Coal because it contains 28% of Earth's known reserves, enough to last more than a thousand years. Coal accounts for 90% of our national energy reserves, but only 30% of our energy consumption. Coal is a logical target for a national effort to achieve energy independence. The environmental hazards of burning coal limits, however, its use in raw form. It is therefor urgent that we develop the production of synthetic liquid fuel from coal. America alone of the major industrial nations has increased its reliance on Middle East oil since the OPEC embargo of 1973.

Early in 1980, President Carter gained Congressional approval of a $20 billion synfuel program including an Energy Mobilization Board to cut bureaucratic red tape and speed the approval of high-priority projects including plants to manufacture oil from coal and shale. The U.S. Department of Energy placed great emphasis on the Bergius process (direct liquefaction by hydrogenation) to produce synfuel. The Bergius process has been justly criticized by ecologists and economists; it is impossibly expensive, impractical, and dangerous, consumes a lot of water, and its waste products pose a grave threat to the environment.

The Bergius process combines heated hydrogen under 3000-5000 psi pressure with coal 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 this need well. But where hydrogen is considered as a means of conserving fossil fuels or producing synfuel, a much less costly and more abundant source must be sought. The logical choice is water, and an intensive search is underway to find economical ways of splitting that molecule to generate hydrogen and "hyfuel".

A far superior method exists to manufacture oil from coal. It is a little-known but very attractive, proven method called Low-Temperature Carbonization (LTC). The process was perfected by Lewis C. Karrick, an oil shale technologist at the U.S. Bureau of Mines in the 1920s.

LTC is a pyrolysis process that involves heating coal, shale, lignite, or any other carbonaceous material, including garbage) to about 800º F. in the absence of oxygen. Oil is thus distilled from the material, rather than burning as it would if oxygen were present.

After treatment by the Karrick process, a ton of coal will yield up to a barrel of oil, 3000 cu. ft. of rich fuel gas, and 1500 lb. of solid smokeless char (semi-coke). The economics of the process are such that the oil is obtained for free! The 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. That gas can be converted to oil by the Fischer-Tropsch synthesis-process. The coal gas produced by Karrick-LTC yields more BTUs 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, etc.. The process produces no pollutants other than carbon dioxide.

Electrical energy can be co-generated at minimal cost, in addition to coal products. 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 theory. Nor can anyone demonstrate any other process that is manufacturing oil, gas, and semi-coke from coal commercially and without government subsidy, as is 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, the company 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).

Lewis Cass Karrick did not invent LTC of coal; he perfected it. In America before 1860, more than 50 plants were extracting oil and gas from coal. Boston had five LTC plants that produced oil and gas for heat, light, axle grease, and paraffin. But by 1873, the surfeit of Rockefeller's then-cheap petroleum had forced the last coal-oil plant to shut down. Free enterprise could revive the art, for the Karrick process is most amenable to private enterprise initiative. Oiligarchists fear this possibility and have very nearly entirely suppressed this elegant technology. According to Webster, suppress means "to keep from public knowledge --- to refrain from divulging."

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. One, covering the

underground distillation and gasification of coal and oil shale, was held jointly with brother Samuel, and another with Douglas Gould. All of the patents have expired since then. Karrick died in 1962. 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 (plus gain major yield of gas and semi-coke), the government stopped all work on the processes at the pilot plants in Rifle, Colorado, and dismantled them.

Why? The major companies that mined coking coal for use 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 comprise 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 process for making synthetic liquid fuel from coal by hydrogenation. But 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." The German corporate directorate concluded that in order to ensure the development of the Bergius process, their best course of action was to cooperate with Standard Oil.

After months of talks between Karrick and patent broker Leo Ranney (and on the very day in 1929 that Standard Oil announced that it had

paid $35 million for the Bergius process), SO officials tendered Karrick the positioned of vice-president and chief engineer, plus 1/3 of the stock in a chartered subsidiary entitled 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 methods of converting coal into oil: Bergius hydrogenation 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 implement Karrick's LTC technology, particularly the underground gasification of coal.

Karrick was advised to return to Utah to teach and develop his methods at the University of Utah. He founded the Utah Research Foundation for the endowment of the University of Utah, and several student theses were written about the research they developed. In 1934, one of Karrick's students, S. Clark Jacobson, received the Mechanical Engineering Honor for the best undergraduate thesis of the year, bestowed by the Utah Chapter of the American Society of Mechanical Engineers. The thesis, co-authored with George Carter, was abstracted in several scientific and industrial journals. **(1)**

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. **(2)**

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 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 Rexco process was patented by Wallace, and is not to be confused with that of Karrick.

The conveying and processing part of the plant involves the services of three men and a supervisor per shift. All were easily trained from scratch. Adding a few more retorts in line would not require any additional personnel. NCCC's Snibston plant originally was designed for six retorts, but the sixth was not installed because the British government limited NCCC's coal allocations. Unfortunately, NCCC became involved in Britain's North Sea oil project and was forced to cease its LTC operations in the 1980s due to political and economic machinations. The coampany's coal gasification plant now is a toxic cleanup site.

The official DOE position on LTC maintains the 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." If the char is no better than the original coal, then why is it that in Britain's industrial centers, where

the burning of non-smokeless fuel is prohibited, birds and plants that have not been seen for 100 years have returned?

The DOE and oiligarchists discourage private enterprise and venture capital by issuing absurd, false statements about the technical and economical feasibility of Karrick's LTC technology. The DOE has suppressed the truth about the commercial capability of KLTC and its environmental advantages. Meanwhile, the major oil companies have been subsidized with billions of dollars to hydrogenate coal, even though the Bergius process and its variations will cost the public at least twice as much per barrel as OPEC charges.

Enter Harlan Trott, who for more than 20 years was a staff member of the *Christian Science Monitor*. He also served as chief of the *CSM*'s San Francisco bureau,. His articles also have 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*."

The perceptive and challenging story aroused so much attention and controversy, the Bureau of Mines felt obliged to publish a 5,000-word statement, full of misinformation, in which emphatic mention was made of 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 set the record straight when he testified at a Congressional hearing on the future use of the Minnesota peat bogs as an energy resource:

"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 (700º-800º 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..."

And yet, 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, then 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 about the Karrick process, Trott 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."

In 1952, the governmental suppression of the truth about the Karrick process precipitated a crisis of confidence within the Bureau of Mines. In an effort to clarify the technical controversy over the relative merits of hydrogenation and LTC of coal, Dr. Eugene Ayres (Director of Research of the Chemical Division of Gulf Oil and the foremost fuel economist on President Eisenhower's cartel-stacked Paley Commission) 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 proceeded to refute every point of the Bureau's position against Karrick's work in no uncertain terms:

"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 by means of both the Bergius process and LTC of coal.

Harlan Trott located documents recording the opinion of Dr. Adolf Thau, Germany's leading synfuel expert. In 1945, Dr. Thau told Dr. Frank Reed of the U.S. Technical Oil Mission, which went to Germany to study the Nazi's synfuel technology, that 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 told Dr. Reed that, "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 assiduously ignores 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, and foolish enough to exploit in this pork-barrel fashion. The 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 with this writer in March 1980 at radio station KPFA (94.1 FM, Berkeley CA), 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, Biard Anderson, was interviewed on a tv program at the NBC studio in Salt Lake City. The moderator asked, "Do you envision this [Karrick-LTC] 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."

Lewis Karrick's patents have expired and now are in the public domain. 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!

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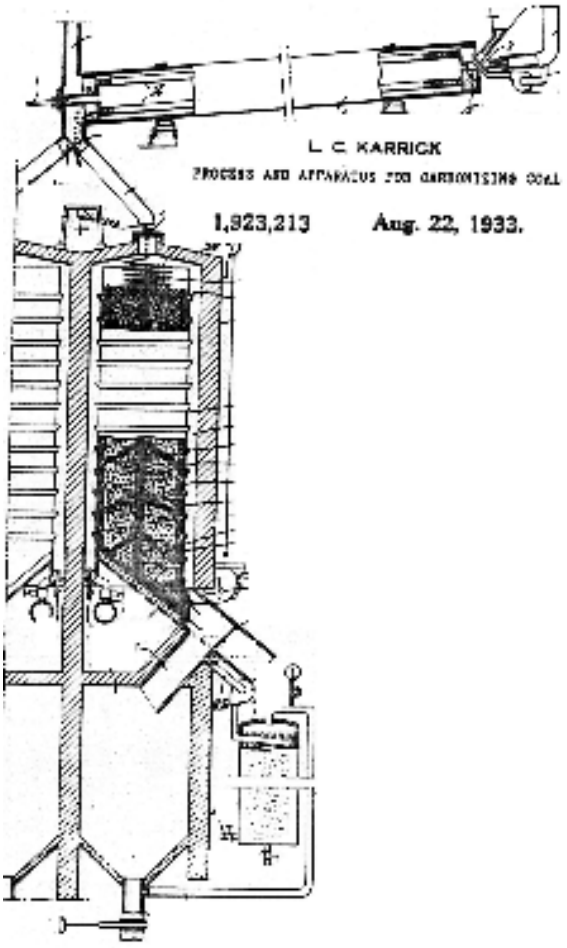

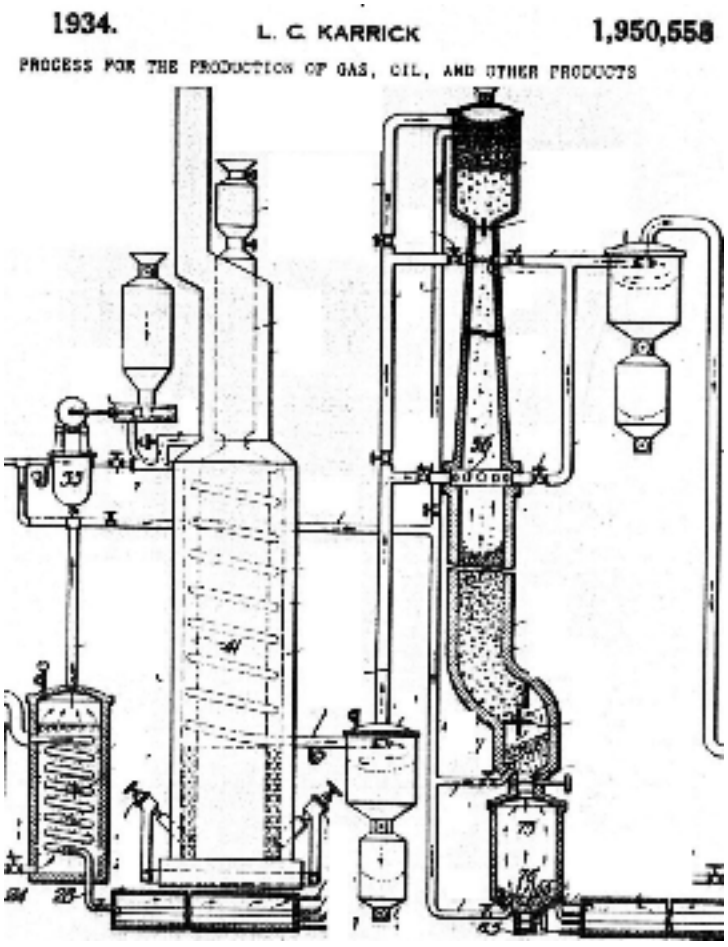
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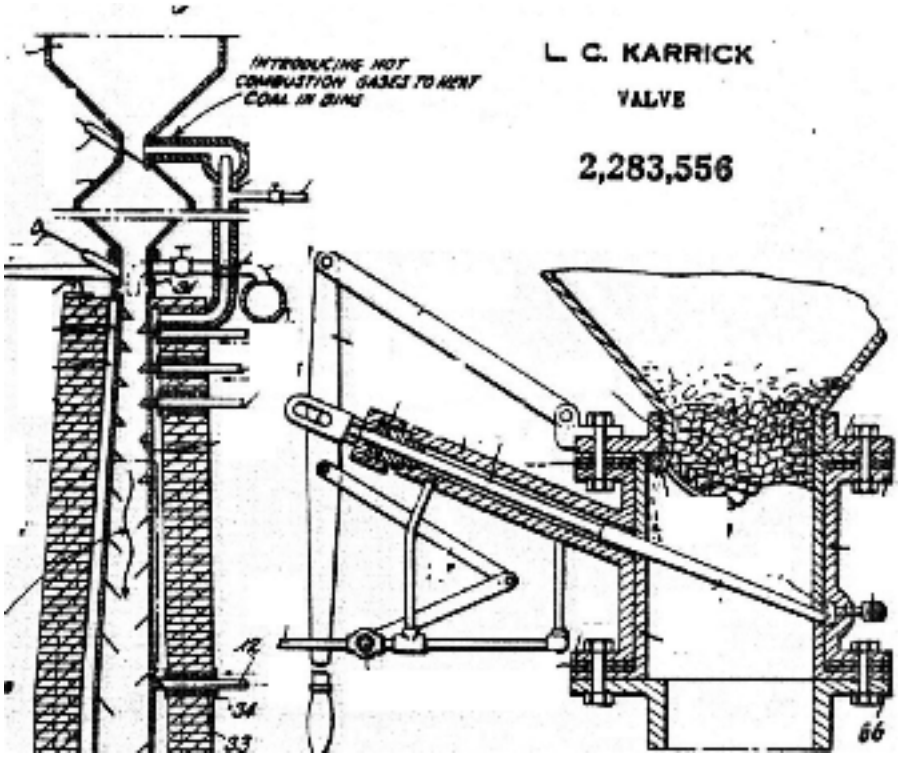
INTRODUCING HOT COMBUSTION GASES TO HEAT COAL IN RETORT
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