ENGINEERING

Gas from Unmined Coal

Burning underground layers of coal too thin for mining has yielded good fuel gas. This new process is undergoing its second experimental trial in the U. S.

By A. C. MONAHAN

➤ WHY dig coal when it can be made to yield fuel gas merely by burning it underground as it occurs in nature? The answer is simple. The burning process is uneconomical where ordinary operations can be carried out but it seems worthwhile with coal layers too thin for mining.

The process is new. In America it is now undergoing the second experimental trial. In the first, it was proved that gas suitable for firing boilers can be obtained. The gas is also suitable for a source material from which to make synthetic liquid fuels. In this second trial the objective is to find ways to get more gas, better gas and cheaper gas than produced in the first tryout.

This experiment in burning underground coal as it occurs in its natural layers is a joint undertaking of the U. S. Bureau of Mines and the Alabama Power Company. It is being carried out on coal property at Gorgas, Ala., owned by the latter. The first trial was made during 1947. The results are so encouraging that a second testing is now underway.

It is not the thought of the government officials or of the coal operators that underground burning will replace the present types of mining. It is a process for application with coal seams too thin for economical mining and with coal veins too difficult or uneconomical to mine for other reasons.

Combustible Gases

Basically, the scheme used to obtain combustible gases from coal burning deep in the earth consists of drilling down from the surface through the layer of coal. Fire is started by dropping an incendiary bomb down one or more drill holes. Air, under considerable pressure, is forced down the same hole or holes to feed the fire. The same pressure forces the gases of combustion into other drill holes and up to the surface.

There the gases are captured and stored, and then may be shipped by pipeline to fire furnaces or used near the location of production to develop electricity. One highly desirable utilization is for the production of synthetic fuels. The process involved is almost identical with that now followed in making heating fuels and gasoline from natural gas.

The 1947 trial was made in a three-foot layer of coal about 30 feet under the surface of the ground. The second trial is to be made in another thin layer, but one that is about 100 feet underground. The earlier experiment showed that the underground combustion can be maintained and controlled, that coal in place can be gasified completely, and that the roof rock settles behind the burning face without cutting off the air or gas.

The gas obtained is a cheap source of carbon monoxide and hydrogen. However, it had a lower heating value than desired. This was thought to be due to leakage of gas and air pressure through cracks and breaks in the 30-foot layer of earth over the burning seam. A leakage is not expected in the second trial because the 40-inch seam to be burned is 100 feet below the surface.

In the 1947 experiment, not only air under pressure was used to support the combustion. Various mixtures were tested. An oxygen-enriched air blast gave excellent results as did also oxygen-steam-air blasts and oxygen-steam blasts. All will be tried again in the new trial. It is thought that better-quality products will be obtained with the use of oxygen and steam.

Coal Burning

To many it might seem that if the coal underground is actually burned, the gases obtained would have no value for heating and power. If complete combustion occurred this might be true, by complete meaning what takes place in a properly managed furnace where both solids and gases are consumed. Plenty of oxygen is essential for complete combustion. Otherwise gases formed, or distilled out of the coal by the heat, are burnable.

In the manufacture of coke from bituminous coal great volumes of combustible gas are obtained as a by-product, and this gas has high heating value. The carbon monoxide from the household stove, responsible for many deaths, is a combustible gas from the coal, a result of incomplete combustion.

Manufactured gas, widely used in America in locations in which natural gas is not available, is another example of gas from coal. Two kinds are used, coal gas and water gas, but both are made from coal. In the first, coal is heated in retorts in the absence of air. The so-called water gas is made by passing steam through coke that has been heated white hot. A chemical action takes place, which produces a mixture of carbon monoxide and hydrogen. Coal gas is largely methane and hydrogen. Natural gas is largely methane.

In the Alabama underground coal-burning experiment the combustion is under control. Cutting its supply of oxygen extinguishes it. However, there are many underground coal fires that are not under control. They may be called accidental fires, man-made but through carelessness. They originated at coal outcrops from bush fires, or in abandoned mines from burning debris. Many have been burning for years. Air enough to supply oxygen for combustion keeps them alive. No attempts have been made to capture and harness the gases given off, but it may be tried when the Alabama experiments are completed.

Swedish Experiment

Underground fuel without mining is being obtained in Sweden in an experiment paralleling the Alabama undertaking, but it is from heat, not fire. Electrical heaters, in deep drill holes into layers of oil shale, are distilling the oil from the shale, permitting it to escape in gaseous form to the surface for capture, refinement and use.

The electrical resistance heaters dropped into the holes require some three months to warm up the oil shale. This is followed by a two-month oil vapor production period. The process is pronounced by American scientists to be feasible here but too costly. Sweden has cheap hydroelectric energy close to its oil shale deposits. Underground coal-burning is an easy process.

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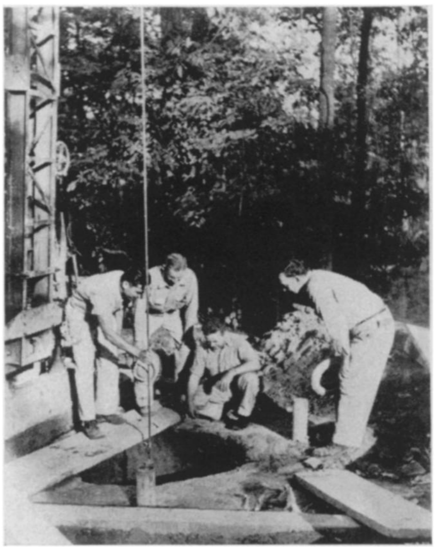

GASIFYING COAL—A large-bore hole is sunk to the coal seam in the second trial at the Alabama underground coal-burning experiment.

SEAM TO BE BURNED—Project officials discuss the operation in an entry driven into coal seam in the present experiment.

ENGINEERING

Recommend Cinders on Ice

➤ CINDERS are better than sand to aid automobile traffic on icy roads, the Highway Research Board of the National Research Council in Washington indicates in a bulletin. Cinders are sharper than sand and cling to tires and cut into ice better than sand particles, it says.

The melting or embedding action of cinders with their greater porosity is better than sand because of the larger quantity of moisture and chloride held at or near the surface of the cinder particles, the report continues. Due to their dark color cinders absorb more heat than sand when the sun is shining, which results in greater embedment.

The title of the bulletin is RECOMMENDED PRACTICE FOR SNOW REMOVAL AND TREATMENT OF ICY PAVEMENTS. It was prepared particularly for public officials whose duties include keeping highways and streets clear for winter travel. It presents recommendations for organizing the road-clearing program, drift control, markers for drainage and structures, use of weather reports, night patrols, types of equipment, and aids to traffic such as abrasives and the chemicals.

Abrasives, whether cinders, sand or washed rock screenings, should be chemically treated with common salt or calcium chloride when put in storage to be available for winter use. Such treated abrasives become anchored to the ice or packed snow and do not blow away as easily as untreated materials. Either of these chlorides, when completely dissolved and uniformly mixed with the abrasive, prevents freezing and the abrasive is ready to handle in extremely cold weather.

Stockpiles of cinders, sand or other materials, placed along highways for ready use when needed, should be protected by some type of covering from wet weather. Otherwise, there is danger of their freezing. While the treatment with chloride prevents freezing for a period, the chemicals will leach out in time if not in watertight storage.

Dry chloride can be applied directly to the road surface. This is done mostly on city streets where heavy traffic compacts the snow before it can be removed. An application of from 300 to 500 pounds per mile of two-way highway, spread for about two feet along the center line, is usually sufficient. On portland cement concrete, these salts should be used sparingly, because they may cause surface pitting in the paving.

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Automobiles of today may look bigger than prewar types but few actually are; they have more interior room, without significant change in over-all dimensions, by moving engines forward and widening bodies to cover former fender space.