ENGINEERING

Mining Drill Makes Five-Foot Hole 1125 Feet Straight Down

Device Cuts Eleven-Ton Cores From Rock; At Level 1,125 Feet Down, the Drilling Can Be Repeated

EVERY small boy, when he first learns that China is approximately on the other side of the earth, probably thinks "some day I'm going to dig a hole and go there." The nearest thing to the small boy's fantasy of digging to China was described at the meetings of the American Institute of Mining and Metallurgical Engineers in New York.

J. B. Newsom, mining engineer of the Idaho Maryland Mines Corporation, told of his success in drilling a hole 1,125 feet deep with a core five feet in diameter. The future possibilities of this method are enormous, says an official statement of the society. When the 1,125-foot level is attained a chamber can be hollowed out and operations repeated for another 1,125 feet and so on. Maybe the small boy's dream was not too wild after all.

Mr. Newsom's device works on the principle of the old-fashioned cooky cutter in the kitchen except that it carves out a cylindrical section of rock weighing some eleven tons, instead of dough. From a little shack a 40 horsepower motor rotates a core barrel by means of a vertical shaft. The cutting is done on the bottom rim of the barrel by cutting teeth. As sections of rock are cut they are hoisted up the shaft.

River Pollution

Each day the coal mines on the Ohio River's headwaters pour some 20,000,000 pounds of concentrated sulphuric acid into the beautiful Ohio, it has been estimated. The engineers are seeking some way to prevent this great menace to downstream cities' water supply, navigation and public health.

Here is how abandoned coal mines—greatest potential source of the corrosive acid—affect stream pollution on a major scale. The abandoned mine contains much iron sulphide, or pyrite, which the layman knows best as fool's gold. The oxygen in the atmosphere combines with this mineral. Several chemical steps take place but the final reaction production is the important one. Iron oxide, or rust, and sulphuric acid are produced during its course.

The acid seeps off in the drainage water from the mine and enters streams which ultimately form the Ohio. The Monongahela River, for example, is distinctly acid in its character because of such mine acid seepage. Only when it meets the alkaline Allegheny River at Pittsburgh is the situation improved by the partial neutralization of the acid.

At the mining meeting E. D. Tisdale, director of the division of sanitary engineering of the West Virginia State Health Department, told how that state, through relief projects, has been employing miners to seal abandoned mines that are believed to contribute more than 50 per cent to the pollution of the Ohio River. The idea behind such sealing is to cut off the free supply of oxygen and decrease the sulphuric acid production.

Discussing the health problem raised by mine acid contamination of streams, Mr. Tisdale said:

"In public health significance we observe two distinct roles played by the acid water. It causes an acid condition in the Monongahela River for the summer and fall periods and during this time of low flows in the Ohio Basin the acid zone appears to creep farther down the Ohio with each drought spell. This makes difficult the operation of water purification plants, and when rains come, changing the river water from acid to alkaline and washing the accumulated sewage sludge in the river quickly down stream, heavy pollution loads come suddenly upon downstream public water supplies in West Virginia and Ohio, running up the *B. coli* pollution index to a dangerously high figure. Thus the city water supplies down stream are detrimentally affected."

Costly

It has been calculated, pointed out Mr. Tisdale, that on a single 50-mile stretch of the Monongahela River industry, public and private water supplies pay in taxes, because of acid water, the total of some $801,000,000 a year.

Navigation suffers greatly from the acid water and especially is this true on the Monongahela which has the highest concentration of river-borne traffic of any river in the nation. Docks, dams, locks and even vessels themselves suffer excessive deterioration. U.S. Army engineers estimate, said Mr. Tisdale, that the annual cost of navigation from

GIANT COOKIES

Using a boring device like some giant cooky-cutter, engineers have just completed a 1,125-foot mine shaft with a five-foot diameter. Sections of rocks weighing up to 11 tons each have been lifted from the smooth-walled shaft, as shown here.

this cause is greater than the entire amount so far spent in sealing abandoned mines to prevent the hazard.

An additional benefit can be secured if all surface water is led immediately to streams and not allowed to enter the old, no-longer-used mines.

Uses for Lodestones

One of the first scientific observations of the ancients was the discovery of the lodestone, a rock that had the baffling ability to attract other similar stones and transfer their magnetic properties to certain other materials. From this simple fact originated the magnetic compass and the resulting exploration that gave the Americas to the then-known world.

Lodestones are special examples of the mineral called magnetite. Magnetite's unusual properties have long made it a plaything of science and engineering; hardly a plaything though, for it finds valuable, practical uses both as a raw material and as an industrial mineral.

At the New York meeting, magnetite had its own special session and a wider usefulness of the strange red mineral was discussed.

Because it is largely iron, magnetite's widest use is in the production of steel, and H. M. Roche, New Jersey engineer, told how magnetite ore from the east might be mixed with the much more widely known iron ore from the Great Lakes region to yield a superior iron concentrate. Freedom from importation of foreign iron ores would be only one advantage of a greater development of the billion and a half tons of magnetite reserves estimated to exist in New Jersey and New York alone.

From the U.S. Bureau of Mines in Washington came R. S. Dean and C. W. Davis to suggest new uses for this long-known mineral other than its raw material utilization.

Because of its red color and inert properties it could be employed in paints in quite the same way that red lead is used today, they suggested. The difficulty of grinding magnetite finely without having it cluster by agglomeration has previously prevented this use but the Bureau of Mines scientists have found that a continuous shaking of the magnetite by an alternating magnetic field circumvents this handicap.

Because of its high density, they pointed out, magnetite has been employed where a very heavy concrete is desired as in the counterweights of lift bridges and in anchorages.

Heat Value

A new experimental method by which scientists can look at a piece of coal and tell how much heat it will generate was announced at the meeting.

But don't rush down to your own coal pile and hope to tell whether the present delivery is better than the last one. The new method is relatively simple, but not that simple.

Two midwestern geologists, L. C. McCabe of the Illinois Geological Survey, and Prof. T. T. Quirke of the University of Illinois, described the secrets of coal analysis in their technical paper, "Angle of Polarization as an Index of Coal Rank."

Tiny cubes of coal are polished and brightly illuminated with a small lamp. The light reflected from the polished surface becomes polarized and is studied with Nicol prisms to determine the angle of polarization. By a fundamental rule of optics known as Brewster's Law, the angle of polarization of the reflected light can be related to what scientists call the index of refraction. This last is the degree of bending which a material will cause as light passes through it.

Final and significant step in the research was the discovery that the amount of heat in B.T.U. (British Thermal Units) which a unit amount of coal can produce is related by a simple straight-line relationship with its index of refraction as measured in the apparatus.

Using the wide range of different kinds of coal found in Illinois, from woody lignite to soft bituminous and so on to harder bituminous, it was found that as the heating qualities of the coals increased, so too, did their index of refraction.

The method, pointed out Mr. McCabe and Prof. Quirke, is still in the experimental stage and the accuracy of the technique could be increased ten or one hundred times with better equipment.

"This investigation," they declared, however, "with improvised equipment, imperfect in many particulars, has discovered what appears to be a physical criterion for rank identification (of coal)."

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GOT A FEVER?

With flu, grippe and colds going the rounds, the clinical thermometer is pressed into service as a medical aid. The best, or "certified," of these instruments are sent to scientists at the National Bureau of Standards in Washington where each one is checked to insure its merit. By the thousands they come, numbered in series, for their test. They are arranged according to number (center) and then are placed in convenient holders in small groups. Helen Tyler (right) places a thermometer unit in a controlled water bath where they are automatically rotated to insure an even temperature for checking readings.