# engineering sciences

COAL

## Better boiler coming

A coal furnace for industry being worked on in the U.S., Europe and Australia promises reduced air pollution and lower capital cost of boilers due to its smaller size. The heart of the boiler is the fluidized bed, where coal is intermixed with inert ash and jostled about by an upward current of air.

Still at least three years away from commercialization, the fluidized bed combustor is an improvement over conventional boilers because it employs heat transfer from the fluidized coal bed directly to the water for the making of steam. This cuts down size requirements. A steel water jacket is encased around the fluidized bed, and the heat is conducted through the jacket.

The fluidized bed is so designed that limestone can be added to react with sulfur in the coal, thereby reducing emission of sulfur dioxide, a major component of pollution.

The Australian fluidized bed combustor employs a copper coil containing the water to be heated buried in the bed. It has attained a maximum rate of heat transfer of 124,000 British Thermal Units an hour to the cubic foot of combustion. Conventional furnaces produce 5,000 to 40,000. England and Czechoslovakia are two other countries developing the furnace.

In the United States, research is being sponsored by the Office of Coal Research of the Department of the Interior and the National Air Pollution Control Administration.

HOVERCRAFT

## Two hulls for the price of one

An economic problem with present hovercraft is that they must operate ultimately as regular sailing vessels and as flying ships. The manufacture of the dual-purpose hull is expensive.

When out of the water, the craft poses no problem, simply riding on a cushion of air. Compressed air from the motor passes through an inflatable understructure and out a series of openings just above the water to raise the craft on a cushion of air.

However, by channeling the compressed air passing through the inflatable understructure against a flexible diaphragm, the British Hovercraft Corporation can make the craft float by preventing the air from escaping. Instead the blocked air inflates the understructure and the craft floats.

MINING

## Sensor allows deeper mines

A new device may allow mining operations to be carried out at greater depths, according to South Africa's Council for Scientific and Industrial Research. The device measures rock stress in three dimensions instead of two as previously. This information in turn enables the mining engineer to predict how given strata will behave under stress.

A mine excavation then can be designed to take into account pressures in the surrounding rock. This should reduce the possibility of a hazardous rock-burst underground. The safety factor would permit deeper mines.

The triaxial cell is a more sophisticated relative of the so-called doorstopper strain cell developed for the quick measurement of stress in rock and named for its squat, round shape. When the doorstopper is used, however, three boreholes have to be drilled into the rock to determine the state of stress.

RUBBER

## Used tires reused

A one-million-ton rubber reservoir is being tapped as a source of chemicals and fuels. Discarded tires—100 million of them—are the targets of researchers at the Coal Research Center of the U.S. Bureau of Mines in Pittsburgh, who are distilling valuable chemicals from them as well as gas for heat and power.

Scientists have obtained large quantities of chemicals, oil liquids, gas and tar from scrapped tires by heating them in a closed vessel. Shredded tires are fed into the reactor; as they are heated, they break down.

A series of tests at 500 degrees C. produced 140 gallons of liquid oils and 1,500 cubic feet of gas per ton of tires. The gas was comparable in heating value to natural gas.

Scientists of the Firestone Tire & Rubber Company originally conceived the idea, which is now undergoing tests to determine the temperature for the maximum yields of valuable products.

The chemicals obtained from the tires are similar to those produced from coal carbonization (the heating of coal without air), including benzene, toluene, xylene, and naphthas.

HIGHWAYS

## Computer controls traffic

The tense and sometimes fatal decision on when to enter a highway from an entrance ramp is being taken out of the driver's hands by a computer operation in Houston, Tex., Texas A&M University reports. Detectors on a 6½-mile-stretch of the Gulf Freeway relay information about the speed and distance of an approaching car to a computer. Then, taking the average acceleration capability of the car waiting at the entrance ramp and the length of the ramp, and comparing these factors with a theoretically safe gap, the computer determines if the gap is big enough. If it is, the computer actuates a green light. This method is called the gap acceptance mode.

An extension of the method is the demand-capacity mode, which could lead to the prevention of highway traffic jams. By getting a picture of the total traffic movement on a highway, a computer could, by controlling traffic inflow at the ramps, prevent a highway's capacity from being exceeded. With stable traffic flow, the regulation of individual on-ramps based on the size of a set minimum critical gap could accomplish this purpose. With unstable flow, such as a bottleneck at one end and free-flowing traffic further up, the demand-capacity mode would be needed.