

medes defended the city of Syracuse by setting fire to the invading navy of Marcellus, using "a burning glass composed of small square mirrors moving every way upon hinges, which when placed in the sun's rays, directed them upon the Roman fleet, so as to reduce it to ashes at the distance of a bow shot."

Lenses were used to concentrate great heat more than a couple of centuries ago. In 1695 a large burning glass was used to decompose a diamond previously considered unalterable. Metals and other substances that had resisted the heat of the strongest fires were melted with the sun's heat concentrated by large lenses. Lavoisier, the French chemist, in 1774 built a large double-lens furnace and he was nearly able to melt platinum, at a temperature that must have been close to 1,750 degrees Centigrade (3,182 degrees Fahrenheit).

### Various Losses Cut Temperatures

Although it is possible, in theory, to obtain temperatures up to 4,500 degrees Centigrade, various losses cut the practical attained temperature to 3,500 degrees Centigrade, or about 6,300 degrees Fahrenheit. This corresponds to an equilibrium heat flux absorbed by the target of about 1,000 watts per square centimeter, if conduction and convection losses, about one-third of all losses, are disregarded.

The basic principle behind the solar furnace is that the sun's intensity yields from 0.8 to 1.1 kilowatts of energy per square meter at the earth's surface. These figures, rough approximations applying to many parts of the United States, will vary according to the season, altitude, latitude, clearness of the atmosphere and other factors. Gathering this energy and concentrating it at a focal point is the job of the solar furnace.

As the solar furnaces multiply and do more work, there will be better alloys for use in atomic reactors and in jet and rocket engines. At the point where the sunlight is concentrated so effectively in the solar furnace, it is possible to create little "hells" with controlled atmospheres, confined in refractory quartz containers. Out of these bits of sun on earth will come new knowledge for our technologic future.

Science News Letter, February 2, 1957

### AERONAUTICS

## Bombers' Fueling in Air Unneeded by Airline Jets

► MID-AIR REFUELING is not likely to be adopted by civilian airlines.

Experts in Washington were inclined to agree on this, despite the historic non-stop globe-circling flight of three B-52s.

"It is not efficient," one authority said. Another called it "uneconomical." A third said it did not look practical.

All thought that jet airliners would be able to handle fast transportation jobs cheaper and more efficiently.

The safety factor, also, is a prime con-

sideration. Mid-air refueling is a highly dangerous operation.

The B-52 refueling in the historic flight was done by KC-97s, planes similar to Pan American's stratocruisers. Eventually, this work will be carried out by another model, the KC-135. This latter, also known as the Boeing Airplane Company's model 707, has been dubbed the stratotanker.

In the operation, the tanker planes first had to rendezvous in mid-air with the bombers they were to refuel. After maneuvering into position, these tankers dropped hoses which were hooked into the bombers' intake receptacles. Then, for many nervous minutes, the pilots of both planes would "ride out" the refueling until it was completed.

Science News Letter, February 2, 1957

### VETERINARY MEDICINE

## Deer's Antlers Studied to Aid Man's Broken Bones

► COLORADO SCIENTISTS are attempting to find out what makes a buck deer grow a new set of antlers every year, and if human bones can mend the same way.

Heading the research work are Dr. Robert Davis, chairman of the department of veterinary anatomy at Colorado A & M College, Fort Collins, Colo., and Dr. Ben Eiseman, associate professor of surgery at the University of Colorado School of Medicine.

The five-year project will be supported by a \$44,500 grant from the National Arthritis and Metabolic Diseases Council, a division of the National Institutes of Health.

"The tremendous rate of true bone deposition in the antlers of deer is unique," said Dr. Davis. "Some factor, either general or local, must produce such a bone growth. If by these studies such a factor can be isolated, it is possible that it or a related substance can be used to increase the rate of fracture healing in man."

Science News Letter, February 2, 1957



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### HOME ECONOMICS

## More Honey Seen in Future Baking

► **CAKES** with honey, as well as honey cakes, are in store for the American housewife. Research at Kansas State College, Manhattan, Kans., shows that more and more honey will find its way into baked goods in the future.

Researchers, working with 15 different types of honey, have found that:

Substituting honey for all or part of the sugar in some baked goods adds to their flavor and color.

It is now possible for the first time to use honey alone to sweeten cakes commercially.

Cakes with a high concentration of honey stay moist and fresh-tasting longer than honeyless cakes.

Honey noticeably added to the flavor and color of some cookies, particularly sugar cookies, vanilla wafers, fruit bars and brownies.

Honey substituted for six percent of the sugar in white breads and 12% of the sugar in dark breads imparted a rich flavor and aroma to both.

The work was done in cooperation with the U. S. Department of Agriculture.

Science News Letter, February 2, 1957

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