PHYSICS

Action of Steel Under Stress Revealed in Writing on Sand

HOW solid steel softens and flows like wax when compressed or stretched is being shown to the naked eye by Dr. A. Nadai at the Research Laboratories of the Westinghouse Electric and Manufacturing Company, at East Pittsburgh, Pa.

A new branch of engineering is growing out of the realization that when hot steel is rolled or when a steel structure under stress yields and collapses the metal becomes, in places, soft like clay. In these cases after the disturbing force has been removed the steel "stays put."

A material showing this behavior is said to be "plastic." Ordinarily steel undergoes "elastic" deformation, that is, the steel returns to its original form after the removal of the strain. Dr. Nadai is a leading investigator of the phenomena of plastic flow of metals.

Strange patterns of great regularity are found on the surface of pieces of materials subjected to severe stressing. Dr. Nadai has devised a method of investigating these patterns optically.

In his new apparatus a beam of light is reflected from a highly polished surface of the metal specimen which is being compressed or twisted. Definite markings called "slip lines" appear.

Studied Intensely

These slip lines are now the object of intense study by engineers and mathematicians, as they indicate how a machine part of this shape is stressed in its interior. They can also be detected by etching with acid the surface of the metal which is undergoing strain.

Dr. Nadai has now also ingeniously shown that the formation of these strain lines can be studied or imitated by models. He makes a thin card of the same shape as the cross-section of the bar which is being twisted. This is then dipped into fine sand and raised in a horizontal position so that a neat pile of sand is left on top of it. The slopes of this sand cake give a picture of the stresses within the bar and can be used to test theories of the strength of such a bar under torsion.

Old rocks found on the top of mountains of much younger rocks are probably to be accounted for by the same general principles, Dr. Nadai believes.

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One layer of rock probably slips over another along definite surfaces of slip when the stress exceeds a certain amount.

The science of plasticity has many problems to face in geology. The results of engineering laboratory tests will be used, says Dr. Nadai, to test Prof. A. Wegener's interesting idea that the continents are not firmly anchored but drift slowly away from each other in the course of ages.

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PLANT PHYSIOLOGY

Coal in Small Doses Stimulates Plant Growth

EXERTING a mysterious stimulating action on plants causing them consistently to increase their yield by more than a fourth, coal may find wide use as a fertilizer. This is the belief of Dr. Franz Fischer, director of the Kaiser Wilhelm Institute for Coal Research and noted authority on coal and its uses, as expressed before the Third International Conference on Bituminous Coal at Pittsburgh.

"As the result of experiments that have already been made," Dr. Fischer declared, "it is beyond doubt that fertilizing with coal may play an important part in the near future."

"A particularly favorable example may be given," he continued. "Tobacco seedlings were planted in groups of three in pots, each containing three kilograms of earth. As a fertilizer each pot received, in addition to potash and phosphorus, two grams of ammonium nitrate; and, in addition to this, the second pot received seven-thousandths of one gram and the third pot seven-hundredths of one gram of dissolved brown coal. The weights harvested amount to 55 grams in the first case, more than 92 grams in the second case, and nearly 130 grams in the third case.

"Of course, such increases in yield can be obtained only in exceptional cases," Dr. Fischer explained, "but cases where this increase amounts to thirty to forty per cent. are frequent."

Scientists cannot account for the stimulating action of coal on plants, Dr.

Fischer said. He dismissed both the possibility that the coal might be a source of carbon and the suggestion that mineral substances in the coal might act as fertilizers. While pulverized brown coal may speed up plant growth, subsoil strata of brown coal retard growth, it was pointed out. Thus coal seems to be a poison in high concentrations but a stimulant when applied in small doses.

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ZOOLOGY

Lean Indians to Eat Surplus Park Buffaloes

BLACKFOOT Indians will eat buffalo meat this winter. The "strong food" on which their warlike ancestors fed has been denied Indians as well as white men ever since the near-extermination of the bison at the end of the "Wild West" days. Now, however, the government-protected herds in Yellowstone National Park and elsewhere are more numerous than their natural range warrants, and surplus animals have to be disposed of every year. This year the Blackfoot on the reservation near here are facing a lean winter because grasshoppers and drought took too heavy a toll on their lands last summer. So Supt. Aven Scoyen of Glacier National Park has arranged to have 100 old bison supplied to the Indians, to be killed for meat.

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INVENTION

Artificial Limbs Made From Seamless Metal Tube

CHARLES H. DAVIES, mechanical engineer of Philadelphia, lost his leg in a mine accident when he was eleven years old. Today his ideas, which have been recently patented, are revolutionizing the manufacture of artificial limbs.

Shortly after the war, a report in the trade journal, *American Machinist,* discloses, Mr. Davies started making artificial legs of wood. He found them clumsy and ill-fitting. Then he tried using various metals, but the riveted or welded joints were unsightly.

Finally, Mr. Davies conceived the idea of using an aluminum alloy, made into a light, seamless tube. He invented a type of hydraulic press to "blow up" this tube to take the desired shape. Now the cost of metal legs is cut in half, and labor and time of production are greatly reduced.

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