



Inches of Rain

MEASURING precipitation in terms of depth to which it would fill a straight-sided can or crock can be recommended for its convenience, but not for very much else. Even in its own terms, the record may falsify itself, because frequently the water that falls in a shower may evaporate and then be immediately re-precipitated as another shower in practically the same place. Thus the same inch of rain may be recorded on the rain-gauge as two or three inches.

In terms of water actually supplied to growing vegetation, measurement in terms of simple depth means even less. Of any given shower, a part may run off as surface drainage, part seep down through the ground into subterranean drainage, and at least a minor fraction will be intercepted by the foliage of the plants themselves and immediately evaporated back into the air. There is also a good deal of evaporation from the moist surface of the earth. Since all these fractions are highly variable, there is no possible formula for calculating the remainder that is retained by the soil at root-tip level.

The only way to gauge the amount

of moisture actually available for plant growth would seem to be to dig down to the level of the absorbing roots and find out how much water is there. But even then, difficulties of measurement are not ended. Calculation in terms of percentage by weight means little, unless the character of the soil is taken into account. A coarse, sandy soil containing 10% of its weight in water may be wet, even saturated, while a fine-grained clay or loam with the same moisture percentage would be desert-dry, so far as availability for plant needs is concerned.

The most practical method of measuring actually available soil moisture would seem to be to devise some kind

of absorbing instrument to be placed in root-like contact with the soil at root level, and let it operate more or less as roots operate. The amount of water it could absorb under such conditions might then be taken as an approximation of the water-supplying power of the soil at the moment. As a matter of fact, a number of such soil-moisture-measuring instruments have been devised. Some of them are moderately successful but none of them entirely so. This is a problem so complex and difficult that scientists will have to work on it a good many years before they find a really satisfactory solution.

Science News Letter, July 26, 1941

METALLURGY

X-Rays With Microscope Reveal Hidden Flaws in Metals

A NEW method of studying metals, with the microscope and X-ray in combination, that may yield useful information in connection with their use in guns, airplanes, engines and other defense needs, was described by Dr. George L. Clark of the University of Illinois, and Dr. William M. Shafer, of Iowa State Teachers College to the American Society of Metals meeting in Cleveland.

Though X-rays are similar in nature to light waves, their waves are much shorter, and they cannot be bent by lenses the way light can. Thus, no one has yet found a way to focus them, which would be necessary to magnify X-ray images directly.

Instead, the method used is to take an X-ray picture the same size of a thin sliver of the metal being tested. Then, with light, a magnified photograph of the tiny X-ray negative is taken through a microscope. To get best results, it is essential to use a film with extremely

small grains, otherwise they would be magnified as well, and would mask details being studied in the metal. By using a special emulsion imported from Belgium, Drs. Clark and Shafer have found it possible to magnify the finished result as much as 200 diameters, without losing detail.

Ordinary photographs of metallic specimens through the microscope are made of the surface, by light reflected from it. With the X-ray methods, it is pointed out, a three-dimensional view is obtained since the X-rays pass through the specimen. This shows better the internal irregularities of structure. Cracks and voids inside the piece are revealed. With the ordinary microscopic picture, the specimen must be carefully prepared and polished, but this is not necessary with the X-ray method.

Also, in some cases, it is stated, the usual treatment does not differentiate between different materials in the metal, but whenever the two materials have a different density, they are shown up by the X-rays.

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The first *highway* across the Isthmus of Panama at the Canal Zone is scheduled to be finished by next spring.

Brown University is having thousands of books and documents on early Latin-American civilization copied on *microfilm* from archives in Latin-American libraries.

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