inoculation it was found that the number of necrotic lesions was reduced 31 per cent. on the right halves which were wiped twice in comparison with the left halves which were wiped only at the time of inoculation.

If trichomes were of major importance as points of entrance for inoculum, their destruction would be expected to cause a greater reduction than 6.8 per cent. in the number of local infections when leaves were inoculated later. The importance of the ordinary cells as points of entrance for inoculum is evident, since severe injury to some of them reduced the number of local infections 25.2 per cent. as compared to the 6.8 per cent. reduction when practically all the trichomes were severely injured or destroyed and little injury was observed in the ordinary cells.

Pepper and *Nicotiana sylvestris* leaves have approximately 16 and 346 trichomes per square centimeter, respectively. When pepper leaves were inoculated by wiping in the usual manner, 82.4 per cent. of the local infections showed no relation to trichomes. In contrast on leaves of *N. sylvestris* 39.87 per cent. of the lesions showed no relation to trichomes, 20.26 per cent. of the lesions had a broken trichome in the periphery of the lesion and 39.87 per cent. had a broken trichome in the center of the lesion.

It was pointed out earlier in this note that 35 per cent. of the expected number of lesions resulted on leaves of *Nicotiana sylvestris* when all the trichomes on small areas were inoculated without injury to other epidermal cells. This 35 per cent. is consistent with the 39.87 per cent. of the total lesions observed to have trichomes in their centers on the wiped leaves, and for this reason these lesions on the wiped leaves are considered to be the result of inoculation through broken trichomes. The 20.26 per cent. of the lesions having a broken trichome in their periphery are considered to be the result of an inoculation through an epidermal cell near to the trichome.

It is evident that many ordinary epidermal cells serve as infection centers and that the larger percentage of infections through trichomes of *N. sylvestris* is due to the greater number of trichomes on a given leaf area as compared to pepper.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A SIMPLE DEVICE FOR MEASURING THE ABSORPTION RATES OF SOILS

A FUNDAMENTAL factor in determining the extent of run-off and erosion from western watersheds in times of torrential rain or rapid melting of snow is the rate at which the soil will absorb surface water and conduct it into underground channels, where it ceases to be an erosive agent but percolates to the vast soil and rock reservoirs which feed the springs. Recognizing the important rôle played by this soil function in watershed management, the Intermountain Forest and Range Experiment Station has developed an apparatus to measure the rate of absorption with a minimum of disturbance to the soil. The unit is inexpensive to construct, simple to operate, and its small size and light weight permit the study of soils in their undisturbed state on areas accessible only by foot.

The apparatus includes a water reservoir (Fig. 1 *a*), made by grinding the bottom from a quart bottle, and a distributor (*b*), built of ¼-inch brass pipe and fittings, which delivers water in a thin sheet to the upper side of a one-square-foot plot enclosed by suitable baffle plates (*c*). As the water flows over the plot some is absorbed at a rate determined by the nature of the soil, the steepness of the slope and the kind of vegetation present; and the excess passes into the run-off trough (*d*) and a manually operated tipping bucket (*e*), where its rate of flow is measured. The difference between the rate of application and the rate of run-off is the rate at which water has been absorbed by the soil.

The rate of application is controlled by a globe valve and is determined by observing the time required for successive measured portions of 300 cc each, contained in cans (*f*), to pass through the distributor. At the start of a run, the reservoir is filled to the level of the pointer (*g*) and one measured portion is added. When, after the application is started, the water level again drops to the tip of the pointer, the delivery of one measured portion is indicated and the elapsed time is recorded. Another measured portion is then added and the run continued. The variation in head caused by the intermittent addition of portions of water has no significant effect upon the rate of flow through the system.

At the termination of each time interval during which a measured portion of run-off has been applied to the plot, the tipping bucket is tipped so that the run-off from the next 300 cc application is caught in a separate container. Subsequent measurements of these run-off portions indicate the rate of run-off, and by subtraction from the rate of application, the rate of absorption is determined.

After the first one or two minutes of the run, the absorption rate of the plot becomes nearly constant, and can be compared directly with corresponding rates on other plots. Replicate determinations on the

same or adjoining plots are easily made, and consistently accurate results are obtained. The unit has proved its worth in two recent studies by this station. In a comparative study of plots supporting a single range plant and adjacent barren plots, use of the unit

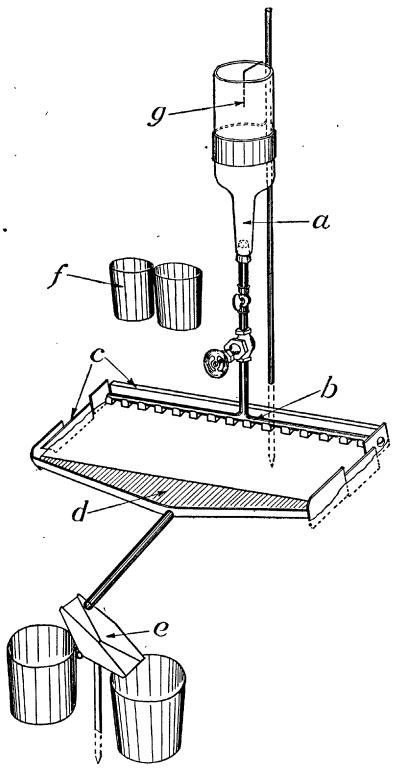

FIG. 1

has indicated that fibrous-rooted plants, such as grasses and mesophytic forbs, are approximately 2½ times more effective in promoting absorption of surface water than are tap-rooted species typical of depleted range.[1] Another study indicated that the rate of absorption by the granitic soils of the Boise River watershed was influenced much more by organic matter content than by either moisture content or textural variations. Such studies emphasize the importance of an adequate plant-cover in range-watershed management, both directly in promoting absorption and indirectly in building up the soil organic matter.

A limited supply of complete specifications for the construction and operation of the above apparatus, for use by persons interested in this technique, are available upon request to the Director, Intermountain Forest and Range Experiment Station.

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[1] C. Kenneth Pearse and Samuel B. Woolley, *Jour. Forestry*, 34: 884–887, 1936.

BOXES FOR STUDY SKINS

DOUBTLESS many laboratory instructors in mammalogy and ornithology have felt the need for a protective cover for the study skins, which received rough treatment by careless and awkward students. This need is greater when the skins that must be used are record skins. Such was our problem when we discovered that two new products, Plastocele and Pyralin, can be cut or sawed and cemented.

Providing a skilful student with this material, acetone and study skins he made 26 boxes for mammals ranging in size from mice to marmots at an average cost per box of 35 cents for material and 25 cents for labor. The cement made by dissolving small waste pieces and the sawdust in acetone sealed the sections firmly together, making airtight containers that are light, transparent and durable. Additional boxes made for mammal and bird skins and the entire set used during our winter quarter show only the inevitable finger marks and light scratches, and the latter do not obstruct the view of the snug-fitting, fully protected skin within.

Plastocele and Pyralin are practically identical for these boxes, the former costing slightly more. We learned about these two products of the du Pont Viscoloid Company at Arlington, N. J., from Dr. Shillinger, of the United States Department of Agriculture, who suggested their use for museum jars.

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BOOKS RECEIVED

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HEATH, DAISY W. *Comprehensive Index of the Publications of the American Association of Petroleum Geologists, 1917–36.* Pp. 382. The Association, Tulsa, Okla.

MCCLUNG, C. E., Editor. *Handbook of Microscopical Technique; For Workers in Animal and Plant Tissues.* Second edition, revised. Pp. xvii + 698. 82 figures. Hoeber. $8.00.

OSGOOD, WILLIAM F. *Functions of a Complex Variable.* Pp. viii + 257. $3.00. *Functions of Real Variables.* Pp. xii + 399. $4.00. University Press of National University of Peking, China.

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Travaux de l'Association Internationale de Géodésie. Tome 13, Fascicule 1. *Rapports Nationaux sur les Travaux Exécutés dans les Différents Pays. Établis à l'Occasion de la Sixième Assemblée Générale, Edimbourg, 14–25, Septembre, 1936.* Secrétariat de l'Association, Paris.

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