

INSTRUCTIONS FOR RAIN FALL OBSERVERS

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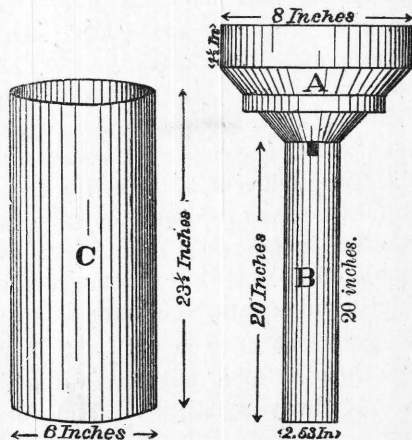
U. S. GEOLOGICAL SURVEY.

In the prosecution of the general "survey of the arid lands for purposes of irrigation," authorized by Congress to be undertaken by the U. S. Geological Survey, a determination of the amount of water supplied by the natural rain and snow fall in different localities is of fundamental importance. To obtain this knowledge the Geological Survey must depend in large measure upon the residents, to whom the benefit of the work will accrue, for their voluntary cooperation in making the necessary observations.

The accepted manner of determining the depth of water deposited in rain or snow over any area of territory is by locating a vessel or gauge of known accuracy at some convenient point in the area under consideration, and making accurate measurements, in accordance with prescribed rules, of the depth of the precipitation caught by this vessel.

The Geological Survey solicits observations of this kind, and to a resident who will volunteer faithfully to carry out such a system of observations and regularly to report the results, the necessary rain-gauge and blanks will be supplied.

Description of gauge.—The standard rain-gauge (shown in diagram) consists of three parts, viz, the collector A, the receiving reservoir B, and the overflow attachment C. The collector is funnel-shaped, having a turned brass rim 8 inches in diameter at the top. The receiver is cylindrical, 20 inches deep and 2.53 inches in diameter, making the area of base one-tenth the area of the collector. The overflow is 6 inches in diameter and 22 inches deep. A measuring rod graduated to inches and tenths of inches is furnished with each gauge.



Position of gauge.—(1) The gauge should be placed in an open space, preferably over grass sod. To obtain a free exposure to the rain it should be at least thirty feet from a building, and at a distance from any other object, as a tree or a fence, not less than the height of the object. The best location is in a spot where the outlook is unobstructed to within ten degrees of the horizon. It is evident that the gauge should not be tampered with by unauthorized persons, or injured by animals, and to prevent this it is frequently desirable to place a barbed-wire fence around the gauge for protection. In this case a space about eight feet square should be inclosed.

(2) The gauge should be encased in a close-fitting box made of three-quarters or inch stuff, and sunk in the ground to such a depth that the upper rim of the gauge shall be one foot above the surface. The box should contain holes in the bottom to allow any rain that enters to pass off readily; and the top of the box should be even with the surface of the ground.

(3) The upper rim of the gauge must be horizontal; care should be taken that its horizontal position is maintained.

Measurement of rain-fall.—The rain-fall should be measured as soon as practicable after a rain has ceased.

To determine the amount of rain-fall, insert vertically the measuring-rod into the receiver until it touches the bottom, allow it to remain a moment, and then withdraw it and read the number of inches and tenths of inches that the water has wetted. It is necessary that the measuring rod should be perfectly dry before the measurement, and also not oily, in order that the wetted portion may be sharply defined.

The gauge should be emptied after each measurement, and then securely replaced in position.

For security the amount should invariably be written down before emptying.

To provide for very heavy rain-falls, the overflow attachment is designed to collect any excess over the capacity of the receiver. Whenever an overflow has taken place, the rain in the receiver must first be measured, and after this has been poured away, the amount in the overflow attachment must be poured into the receiver, similarly measured, and added to that found in the receiver.

The sectional area of the receiver being only one-tenth the area of the collector, the depth of water measured is ten times the true rain-fall. Ten inches of water in the receiver are equal to one inch of actual rain-fall, hence the depth of rain is *one-tenth* that wetted on the rod (thus 1.3 inches on the rod equals 0.13 inches of rain). Provision is made on the blank forms for recording the original reading and the reduction in separate columns.

Measurement of snow-fall.—(1) The measurement of snow requires special precautions, and even when these are taken satisfactory results are not always possible. The funnel-shaped collector is not well

adapted to retain snow-fall during high winds, and it is too shallow for heavy snow-falls. For these reasons the funnel and the receiving tube may well be taken out at the beginning of a snow storm, and the overflow attachment used alone as the collecting vessel. If so used, it should be raised so that its top shall be a foot above the surface of the ground, otherwise surface snow will be blown in.

The snow collected should be measured after being melted. The melting may best be done by plunging the cylinder into hot water, and allowing it to remain until the snow has entirely melted. When the overflow attachment is used as the collecting vessel, the amount of melted snow, measured therein, needs no reduction.

(2) If the wind has blown hard, or if for any other reasons the full amount of snow has not been collected, the following course is to be pursued:

(a) Select a spot where the depth of snow is an average of that in the vicinity.

(b) At this place invert the overflow (or any perfectly cylindrical tin can with flat bottom) and lower it carefully in a vertical position until the rim has reached the full depth of the newly-fallen snow. Then slip under a flat piece of tin or other suitable material, and lift out the gauge.

(3) The *section* of snow obtained, of the size of the cylinder, will then be melted, and measured as melted snow. The observer is advised to measure the snow by this method of *section* as well as to measure that collected in the gauge whenever more than two or three inches of snow-falls, especially if there is any wind.

General instructions.—After a long drought the gauge should occasionally be visited to ascertain its condition, and to keep it free from leaves and dirt.

Record of observations.—A supply of blank forms will be provided for recording the observations.

The duration of rain or snow fall should be recorded to the nearest half hour. If the beginning or ending occurs in the night, and the time has not been noted, the duration may be roughly estimated, and this fact should be stated opposite the proper date in the column of "Remarks." The direction of the wind during the rain-fall is also a valuable addition to the record.

In case of snow the amount collected should be given in the column "Amount of melted snow by gauge," or in the column "Amount of melted snow by section," according to the method used in determining the amount. In the column "Depth of snow" is to be recorded the observer's measure or estimate of the depth of snow which falls during the storm. Whenever the amount of rain or snow is less than one hundredth of an inch, i. e., not enough to wet one division on the rod, it will be recorded by the letters *Inap.*, meaning inappreciable. When-

ever rain or snow falls, and for any reason the amount is not determined, this fact should be noted. Every observation should be recorded on the form immediately after it is made.

Early in each month (the first day of the month if convenient) a copy of the observations for the preceding month, together with the *original record*, should be mailed in addressed envelopes that will be furnished. A copy should also be retained by the observer.

WASHINGTON, D. C., *July 1, 1889.*

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