THE MEASUREMENT OF SNOW*

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MEASUREMENT of precipitation falling as snow involves so much more difficulty than the measurement of rain as to deserve some special consideration. While an ordinary overflow can of the ordinary Weather Bureau rain gauge is commonly used to catch snow, the amount of which is determined in terms of equivalent water depth, this procedure is far from satisfactory.

The deficiency in catch of a rain gauge is much greater for snow than for rain. The effect of a combination of wind and snow on the catch of an ordinary rain-gauge overflow can is shown by Fig. 2. In the storm in which this sketch was made, and which occurred December 26, 1913, at Albany, N.Y., the amount of precipitation as determined from the snow caught in the gauge can was 0.43 in., whereas the actual precipitation as determined from a sample of the undrifted snow on level ground was 1.41 in.

To avoid errors of this kind, the United States Weather Bureau recommended that, in case of snowfall or windy days, "the true quantity must be found if possible by measuring a section of the freshly fallen snow cut out by forcing the overflow mouth downward through the layer, and then slipping a thin board or sheet of metal underneath so as to separate and lift up the section of snow thus cut out." Needless to say, the sample should be taken in a protected place where drifting does not occcur. (Measurement of Precipitation, Instrument Division, U. S. Weather Bureau, Bulletin No. 13, p. 9.)

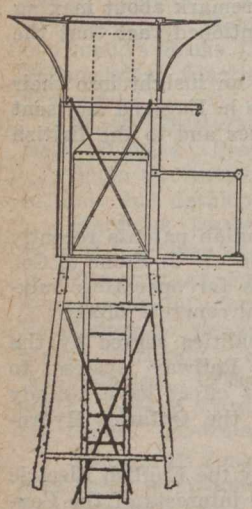

Fig. 1
Shielded Seasonal Snow Gauge

Modified methods and a special form of overflow can, for use in taking samples of snow on the ground, have been devised by the writer. The snow sampler is illustrated by Fig. 3.

The edge of the galvanized rain-gauge can is not sharp or stiff enough to retain its circular form with certainty when thrust down through deep snow. A special can with a reinforced cutting edge chamfered on the outside and inserted in the mouth of the can will reduce the friction and facilitate obtaining an accurate sample. This can should have a brass drain cock at the closed end, this cock to be opened when taking a sample so as to permit air to escape and prevent the snow being forced out while taking a deep sample by the compression of air in the can. Another advantage of a can with a drain cock is that when the sample is melted with hot water it can be drained out, thus avoiding the difficulty of pouring water from the large can into the brass tube without spilling. The closed end should preferably be made funnel-shaped, with a large, straightway water cock similar to the bottom of the Friez tipping rain gauge. A tight-fitting cover for the open end is also desirable. This may be placed on the can immediately after the hot water is added, and the can set in a warm place, if necessary, to complete the melting of the snow. Cover will prevent appreciable evaporation loss.

This snow sampler can be used either for freshly fallen or accumulated snow. It is also intended to replace the ordinary overflow can of the rain gauge, but when so used the bottom ring of the gauge funnel must be enlarged to fit over the brass cutting edge of the sampler. When used as an overflow, the drain cock prevents loss by spilling, and is a great convenience. The conical base reduces danger of breakage by freezing.

Select a level space surrounded by shrubs or sparse trees. The open space or clearing should be 50 to 100 ft. or more in diameter, depending on the height of the shrubs or trees. As a rule, snow will not drift nor be blown away near the middle of such a park or open space. In selecting the spot for snow measurement it is preferable to observe the conditions for a year in advance of its use. When snow falls at an angle, as it commonly does, a tree shadows the ground for some distance to the leeward and prevents the full depth of snow from reaching the ground. The spot chosen for making measurements must be sufficiently remote from all trees to avoid an error from this source.

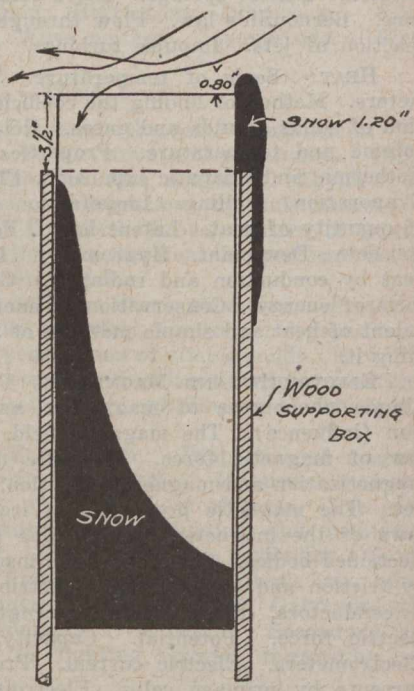

Fig. 2
Action of Snow Gauge, Arrows Showing Path of Snowflakes

Before the first snowfall, place on the ground a sheet of very thin board—plaster board or beaver board answers well. On the upper surface there should be secured by thumb tacks at the corners a sheet of white cloth with a rough surface—white flannel is good. The position of the board may be marked by two or three stiff wires stuck into the ground at a little distance from the board. When the first snowfall comes, a special snow can, described above, may be inverted over the cloth and pressed down firmly, rotating it slowly as it is pressed down. Then the remaining snow should be brushed off from the cloth, the board lifted, at the same time lifting and inverting the can with the board over its mouth. Having shaken the snow down into the galvanized can, the sample may be reduced to slush or water by adding a measured volume of hot water and then measuring in the brass rain-gauge tube in the usual manner used for rainfall and deducting the equivalent of the hot water added.

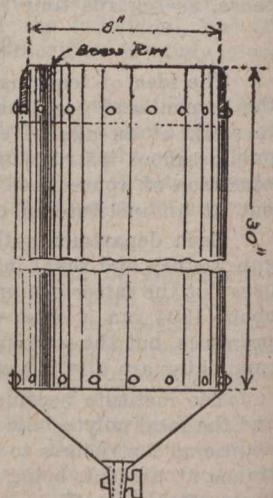

Fig. 3
Section of Horton Snow Sampler

After a measurement, the flannel cloth is, if necessary, dried, retacked on the snow board, and the snow board placed on the surface of the newly fallen snow where the snow is undisturbed, the board being pressed down just sufficiently so that the cloth surface is flush with the snow surface. The snow board should be inspected every day whether it snows or not, so as to keep its surface flush with the snow surface at all times.

The use of a cloth is twofold. (1) It provides a surface with friction conditions much more closely resembling those of snow than could be obtained by the use of the board alone. (2) It provides a surface as nearly as can readily be obtained, equivalent to a snow surface in its capacity to absorb and radiate heat, and so prevents loss by melting when snow falls in relatively warm air.

*From "The Measurement of Rainfall and Snow" in the March proceedings of the New England Water Works Association.