

IMPROVEMENT OF SIPHONING ACTION IN NATURAL-SIPHON RAINGAUGES

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ABSTRACT

Difficulties have been experienced in maintaining the siphoning action of natural-siphon raingauges. A solution to the problem has been found, in which a ground-glass cap is substituted for the polished plane-glass cap at the top of the discharge tube of the raingauge.

INTRODUCTION

One of the most important points in the routine maintenance of a natural-siphon rain recorder is regular cleaning of the polished glass cap of the discharge tube (Fig. 1). If this is not done, then the accumulation of dirt or grease on the glass surface will inhibit proper siphoning action and dribbling will occur (Fig. 2), resulting in the loss of valuable and irreplaceable records.

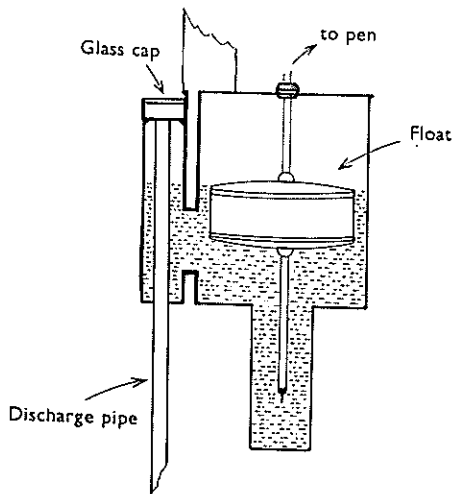


FIG. 1 - Main components of a natural-siphon rainfall recorder.

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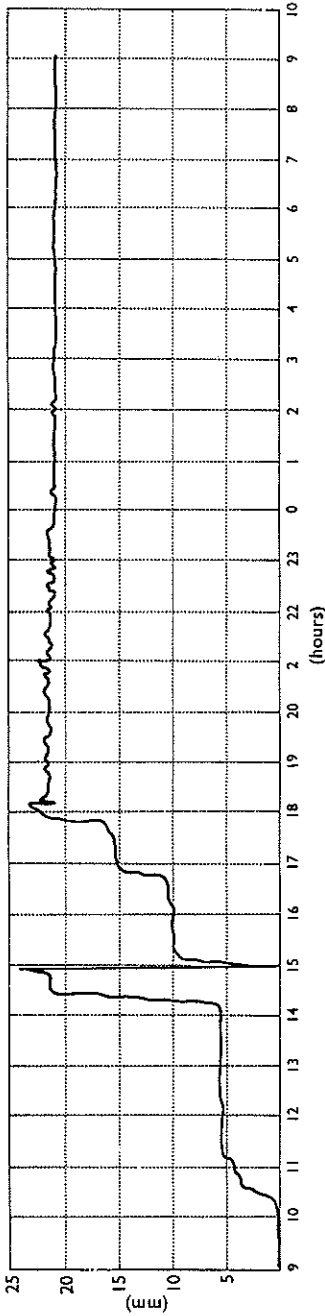


FIG. 2 - Rainfall record showing dribbling after 1800 hours.

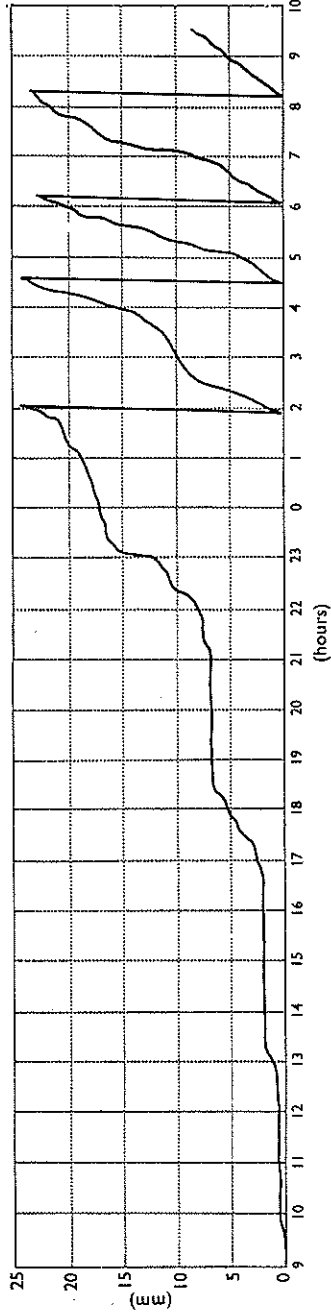


FIG. 3 - Record made using a ground-glass cap.

In Hong Kong, the local network of precipitation stations is equipped with more than 15 natural-siphon raingauges in addition to over 100 raingauges of other types. These stations are usually visited about once every two months, and the glass caps of the natural-siphon raingauges are thoroughly cleaned at each visit. Nevertheless, dribbling has remained a common fault, and might take place even on the second or third day after cleaning of the glass cap.

INVESTIGATION

One of the manufacturers of siphoning gauges provided a concave glass cap which was intended to improve siphoning, but it proved to be little better than the flat one. Experiments were carried out in the workshop of the Royal Observatory using caps of different shapes and materials – such as a convex glass cap and a flat one coated with teflon – but the gauge simply refused to siphon with these new gadgets. Then a piece of flat ground glass was tried, and it proved very successful in enhancing siphoning action.

This method involves no moving components, nor does it require a power supply. Tests under operating conditions have confirmed that the ground-glass cap is much more reliable than the polished plane-glass cap. The only drawback is that siphoning often occurs before the pen has reached the top of the chart (Fig. 3), particularly when the ground glass is wet after the first siphon. However, siphoning has never occurred more than 3 mm from the top of a chart with a full scale of 25 mm.

Middleton (1969) has stated that the fundamental problem in design of a siphoning raingauge is ensuring that the siphon empties the chamber at some definite water level and that dribbling does not occur. However, even if the siphoning level varies by about 3 mm, any inconvenience in analysis should be more acceptable than loss of records.

METHOD

A polished plane-glass cap can be converted into a ground-glass one by the following simple method. Sprinkle some grinding powder (preferably carborundum polish No. 220) on to a flat piece of glass and add enough water to make a paste. Put the glass cap on top of the mixture and grind with a random movement. Wash the grinding paste away and the ground-glass cap is ready for service.

REFERENCE

Middleton, W. E. K. 1969: *Invention of the Meteorological Instruments*. p. 148. John Hopkins Press, Baltimore.