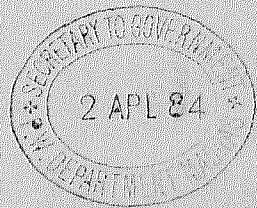


March 1943

Gobt. of (1884) Madras.
REVENUE.



Issued

Recd.

Encl.

G.O., 10th March 1884, No. 338.

MARCH.

Rain-gauges.

Expressing pleasure with Mr. Michie Smith's communication regarding —, and requesting information with regard to his suggested improvement on Mr. Hutchins' instrument.

Last copy sent to Mr. Smith

IMPERIAL
(OTHER SERVICES)

N.W. P. AND OUDH.

No 1029 was 22 April 1884

Communicated to
Superintending Engineers
for information.

Cy
2.4.84

llh
2-4-84

J.C.
No. 1122 W. 6-5-84.
" - 1810 W. 24-7-84.

S. Engineers 25/4

14-5-08 ✓
10TH MARCH 1884, No. 338, REVENUE.

GOVERNMENT OF MADRAS.

REVENUE DEPARTMENT.

READ—the following letter from C. MICHIE SMITH, Esq., Professor, Physical Science, Madras Christian College, to the Chief Secretary to Government, dated 28th February 1884 :—

I have the honor to enclose a short notice of a method of measuring rainfall in forests and out-stations, where the rain-gauges can be attended to only at considerable intervals of time. I understand that a satisfactory gauge for this purpose is much wanted, and that those at present in use do not give reliable measurements. Under these circumstances, I have thought it well to send you the enclosed, and to ask you to lay it before the proper authorities, if you think it is of sufficient importance.

ENCLOSURE.

Rain-gauge for Forests and Out-stations.

The importance of obtaining an accurate record of the rainfall in forests is so generally admitted that it is not necessary to discuss the question here. Hitherto, however, I believe that no thoroughly efficient system of allowing for the loss by evaporation has been devised.

2. In Hutchins' rain-gauge there are three large bottles into two of which rain can pass through funnels of different sizes, while the third is protected from the rain. Into each some water is put, and it is assumed that the evaporation from each of the bottles will be the same. This, I think, is not likely to be the case, for the apertures through which connection is made with the outer air are differently situated, and this must affect the circulation of the moisture-laden air. I consider it essential that the bottles should be placed in all respects in as nearly similar circumstances as possible. This can be done by simply using two gauges with collecting funnels of different sizes, but similar in all other respects. That this is all that is required will be at once seen from the following equations :—

Let A be the quantity of water placed in each vessel,

F and F' be the areas of the two funnels,

E be the evaporation from each in any period.

Then, if X inches of rain fall and Q and Q' are the quantities of water found in the bottles, we have—

$$\begin{aligned} Q &= A - E + F X \\ Q' &= A - E + F' X \end{aligned} \therefore Q - Q' = X (F - F').$$

Here $Q - Q'$ is measured and $F - F'$ is a known quantity hence X is determined. The simplest arrangement is one in which the one funnel is double the other: in this case the difference between the quantity of water in the two vessels is the rainfall in the smaller gauge. The chief advantages of this system are its simplicity and the almost exact similarity of the conditions under which the evaporation will take place in the two bottles. The only possible difference arises from the difference in the depth of the water in the two, but even this will be less than in Hutchins' gauge.

In Hutchins' gauge two collecting funnels of different sizes are used to afford a check on the results, and from the readings from these independently I believe a better result would be obtained than by taking into account the evaporation from the third bottle. In the system which I have suggested three funnels—A, B, and C—of different sizes may be used if it is thought desirable, and a double check will then be obtained by taking the results from each pair—A and B, A and C, and B and C.

(Signed) C. MICHIE SMITH,
Professor of Physical Science,
Madras Christian College.

23th February 1884.

ORDER—dated 10th March 1884, No. 338, Revenue.

Miscellaneous.

The Government are much obliged to Mr. Michie Smith for his interesting communication. His suggestion in getting

rid of the evapometer in Mr. Hutchins' rain-gauge effects a considerable improvement on that instrument.

2. The less the difference between the funnel areas, the less the error arising from difference of depth in the bottles, but the greater the risk of error from inaccurate measurement of the contents. Mr. Michie Smith is requested to state what relative dimensions of the funnels would, in his opinion, work best in practice, and what should be the diameter of the bottles.

3. On receipt of his reply, a sufficient number of gauges will be made up for experiment in the forests and at the observatory during next rainy season.

(True Extract.)

(Signed) H. E. STOKES,
Secretary to Government.

To C. Michie Smith, Esq.
„ the Board of Revenue.
„ the Meteorological Reporter to Government.
„ the Public Works Department.

Exd. W. H. French.

60 Copies.
20 „

Govt. of (1884) Madras.

REVENUE.

No 1029 W of 22-4-84

Com m ? to Superintending
Engineers for information

By J.S.

Issued

Recd.

Encl.

G.O., 10th March 1884, No. 338.

No 1029 W of 22-4-84

MARCH.

Rain-gauges.

Expressing pleasure with Mr. Michie Smith's communication regarding —, and requesting information with regard to his suggested improvement on Mr. Hutchins' instrument.

Supg Engineers

With order

10TH MARCH 1884, No. 338, REVENUE.

GOVERNMENT OF MADRAS.

REVENUE DEPARTMENT.

READ—the following letter from C. MICHIE SMITH, Esq., Professor, Physical Science, Madras Christian College, to the Chief Secretary to Government, dated 28th February 1884:—

I have the honor to enclose a short notice of a method of measuring rainfall in forests and out-stations, where the rain-gauges can be attended to only at considerable intervals of time. I understand that a satisfactory gauge for this purpose is much wanted, and that those at present in use do not give reliable measurements. Under these circumstances, I have thought it well to send you the enclosed, and to ask you to lay it before the proper authorities, if you think it is of sufficient importance.

ENCLOSURE.

Rain-gauge for Forests and Out-stations.

The importance of obtaining an accurate record of the rainfall in forests is so generally admitted that it is not necessary to discuss the question here. Hitherto, however, I believe that no thoroughly efficient system of allowing for the loss by evaporation has been devised.

2. In Hutchins' rain-gauge there are three large bottles into two of which rain can pass through funnels of different sizes, while the third is protected from the rain. Into each some water is put, and it is assumed that the evaporation from each of the bottles will be the same. This, I think, is not likely to be the case, for the apertures through which connection is made with the outer air are differently situated, and this must affect the circulation of the moisture-laden air. I consider it essential that the bottles should be placed in all respects in as nearly similar circumstances as possible. This can be done by simply using two gauges with collecting funnels of different sizes, but similar in all other respects. That this is all that is required will be at once seen from the following equations:—

Let A be the quantity of water placed in each vessel,
F and F' be the areas of the two funnels,
E be the evaporation from each in any period.

Then, if X inches of rain fall and Q and Q' are the quantities of water found in the bottles, we have—

$$\begin{aligned} Q &= A - E + F X \\ Q' &= A - E + F' X \end{aligned} \therefore Q - Q' = X (F - F').$$

Here $Q - Q'$ is measured and $F - F'$ is a known quantity hence X is determined. The simplest arrangement is one in which the one funnel is double the other: in this case the difference between the quantity of water in the two vessels is the rainfall in the smaller gauge. The chief advantages of this system are its simplicity and the almost exact similarity of the conditions under which the evaporation will take place in the two bottles. The only possible difference arises from the difference in the depth of the water in the two, but even this will be less than in Hutchins' gauge.

In Hutchins' gauge two collecting funnels of different sizes are used to afford a check on the results, and from the readings from these independently I believe a better result would be obtained than by taking into account the evaporation from the third bottle. In the system

which I have suggested three funnels—A, B, and C—of different sizes may be used if it is thought desirable, and a double check will then be obtained by taking the results from each pair—A and B, A and C, and B and C.

(Signed) C. MICHIE SMITH,
Professor of Physical Science,
Madras Christian College.

28th February 1884.

ORDER—dated 10th March 1884, No. 338, Revenue.

Miscellaneous

The Government are much obliged
to Mr. Michie Smith for his interesting
communication. His suggestion in get-

ting rid of the evapometer in Mr. Hutchins' rain-gauge effects a considerable improvement on that instrument.

2. The less the difference between the funnel areas, the less the error arising from difference of depth in the bottles, but the greater the risk of error from inaccurate measurement of the contents. Mr. Michie Smith is requested to state what relative dimensions of the funnels would, in his opinion, work best in practice, and what should be the diameter of the bottles.

3. On receipt of his reply, a sufficient number of gauges will be made up for experiment in the forests and at the observatory during next rainy season.

(True Extract.)

W. C. Smith
Secretary to Government.

To C. Michie Smith, Esq.
„ the Board of Revenue.
„ the Meteorological Reporter to Government.

the Public Works Department

Exd. A. Aubert.

60 Copies.