THE SLACKLINE CABLEWAY AS USED IN ENGLAND

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INTRODUCTION

The author spent the winter of 1962 in the British Isles. Visits to river gauging stations, as part of a general interest in hydrological activities, gave rise to the following impressions of the British type slackline cableway (for structural data refer Schnackenberg, 1953).

On inspection, the English equipment seemed a trifle makeshift and not by any means up to the New Zealand standard. However, this statement must not be interpreted as meaning that British designers are unaware of its faults, but rather that it is considered satisfactory for the required task. An explanation of this outlook requires a commentary on the British "way of hydrology".

APPROACH TO HYDROLOGY IN ENGLAND

A report published in 1959 by the Central Advisory Water Committee of England on "The Growing Demand for Water" has this to say:

> "If the best use is to be made of water resources, the requirements of public water undertakers, industry, agriculture, etc., need to be looked at as a whole and hydrological surveys to be carried out involving a comprehensive examination in each river basin of rainfall and runoff, public and private sources of supply, effluent discharges, re-use of water and potential storage sites."

On receipt of the above report, the Ministry of Housing and Local Government, which had appointed the committee, proceeded to establish the Surface Water Survey.

The Survey consisted of a few engineers who acted as a centre for the analysis of data provided by existing bodies. The River Boards were responsible for river flow data, the Meteorological Office for rainfall and Geological Survey for hydrogeology.

For hydrological survey purposes, the country was divided into hydrometric areas comprising river basins, as distinct from administrative areas which are unsuited to hydrological considerations. The Survey Centre was mainly concerned with the problem of storing surplus winter surface-runoff for summer use by means of reservoirs and, also, when the data indicated extensive ground water losses, means of recovery were investigated. The Centre, having decided on the data required to solve the problems of a river basin where the demand for water threatened to exceed the supply, proceeded to concentrate the attentions of the above bodies to the task.

The procuring of rainfall data presented few problems as the national average of one rainfall station per square mile is well maintained except in the most sparsely occupied regions. Geology was in the same satisfactory position.

River gauging stations, considerable numbers of which were in operation long before the formation of the Survey Centre, were not up to the required concentration for specific investigations and more were requested.

RIVER GAUGING STATIONS

The River Boards, faced with the task of establishing automatic gauging stations and producing flow records, for the most part favoured the rated structure. The Crump type weir of triangular cross-section with 2 : 1 upstream slopes and 5 : 1 downstream slope is the popular choice. Rated structures of 2,500 cusecs capacity are fairly common.

The rather casual type of slackline apparatus frequently encountered owed its existence to the economic impossibility, in certain situations, of using a structure capable of rating all stages. Such cableway sites are to be found in the flat sloped lower reaches of a river. Here a river reach will be found, which is stable, although cut in erodible material simply because it is either by-passed or completely inundated by floods. A rated structure will satisfactorily deal with the low to medium stages, while a cableway at an adjacent site which contains all floods, will be used to extend the structure rating to the flood stages. The infrequent usage expected of the cableway is thus partly the explanation of its limited mechanical merit.

SLACKLINE CABLEWAYS

Fig. 1 shows the operative end of the cable, well housed, with the fixed and traversing cables emerging to the river through the right-hand steel shuttered window. The moving parts of the equipment, those most easily damaged by weather or human agency, may be withdrawn to safety through the window, as shown in Fig. 2. Here a comparison with a parallel type of equipment developed by the Nelson Catchment Board may be of interest (Fig.3). The difference in type of housing used can of course be ascribed to the New Zealand idea of just sufficient of permanent structure to permit the use of standard portable equipment - easily moved to alternative river stations. The British equipment is designed to suit a particular station and requires only the addition of a meter and sinker to be operative.

Fig. 4 shows a cable used by the Thames and Yorkshire River Boards; this photograph was taken at a gauging station on the Thames River near Maidenhead. Low flows are in the order of 1,000 cusecs, floods 10,000 cusecs and the cableway span is 300 feet. A 15lb. weight only was used as a sinker and this on a site where velocities reached 7 f.p.s. However, multi-point velocities coupled with a known cross-section made the adjusted discharges fairly reliable.

Aspects of the English apparatus which call for comment are the wooden suspension cable reel (Fig.5) and also the traversing clothes peg type of fitting for depth sounding (Fig.6). The use of a wooden reel, considering the availability of the Watts reel, seems somewhat absurd. However, the Watts reel holds but 100 feet of $\frac{1}{10}$" Ellsworth cable, a length insufficient for most rivers. Furthermore, Ellsworth cable (made in U.S.A.) is almost unknown in England and it is only recently that an English cable approaching the small diameter and the performance of the Ellsworth cable has been developed. The overall specifications of this cable, developed by Hilger and Watts, are 0.15" outside diameter and 1,500lbs. breaking strength as against the Ellsworth $\frac{1}{10}$" cable of 800lbs. breaking strength - obviously the fact that danger may lie in strength has not, as yet, become apparent in England's hydrological circles.

The Department of Agriculture for Scotland uses a wire rope of breaking load 940lbs. and diameter $\frac{3}{32}$" as a suspension cable. A two-way electrical circuit is provided by means of a separate unloaded cable. This Department, however, uses 100 and 150 lb. weights as sinkers, therefore, their slack-line cableway is of necessity a considerably improved version of those shown in the photographs.

The Bristol Avon River Board uses a wire rope suspension, breaking strength 575 lbs. and $\frac{1}{8}$" diameter. The winch is insulated and an "earth" return used.

Note that these different bodies use the slackline cableway - the cable and cablecar to carry personnel is not used in the United Kingdom.

DISCUSSION

A review of the merits of the slackline cableway would seem a fitting closure to this article. Impressions conveyed so far appear somewhat uncomplimentary so it is hoped that the following listed assets of the cableway will serve to achieve desirable neutrality.

In view of the discomfort suffered, not uncomplainingly, by New Zealand field hydrological staff, the slackline cableway has undoubted merit. In England it is not uncommon for one man, well dressed, to undertake a flood gauging. Admittedly English floods draining, as they do, comparatively low country and produced by sustained low intensity rains, lend themselves to a protracted leisurely gauging. Stage heights are comparatively steady and velocities low.

The safety factor, at present causing considerable embarrassment and worry in our hydrological and mechanical circles, is a problem which dies not arise during a slack-line cableway gauging.

Gauging precision from a slackline cableway is dubious due to sounding difficulties but, as Nelson Catchment Board has demonstrated, a simple back-stay is a feasible arrangement and provided that sufficiently heavy sinkers can be traversed (here the British 2 to 3 turns of wire on the traversing winch is a superior arrangement to the Nelson single turn), satisfactory gaugings may be achieved.

With respect to sediment samplings - herein lies the true field of the slackline cableway. No other form of gauging equipment is so suited to erection at difficult sites.

Finally, the slackline cableway and its successful adaptation to the severe New Zealand gauging conditions provides a challenge which it is hoped our engineers and hydrologists will not be slow to accept and overcome.

REFERENCE

Schnackenberg, E.C. 1953: General Note on Slackline Cableways. Hydrology Annual No.1. Publ. by S.C.R.C.C. Wellington.

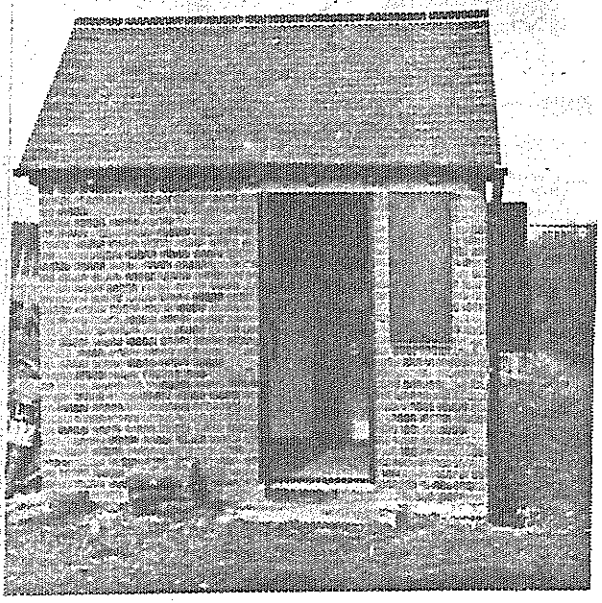

Fig.1. English cableway housing

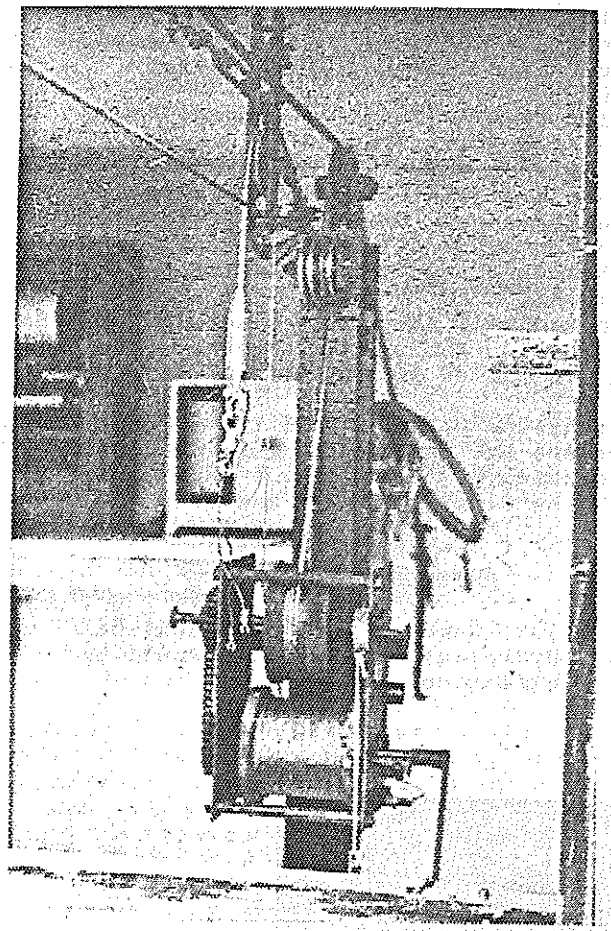

Fig.2

Interior of English

cableway housing

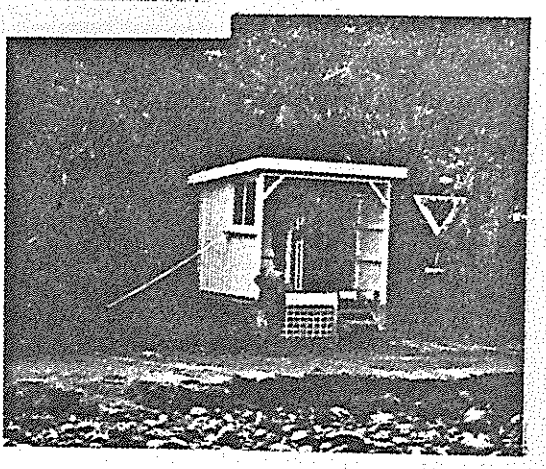

Fig. 3 Cableway housing and traversing system, Nelson N.Z. A Watts reel handles the suspension cable.

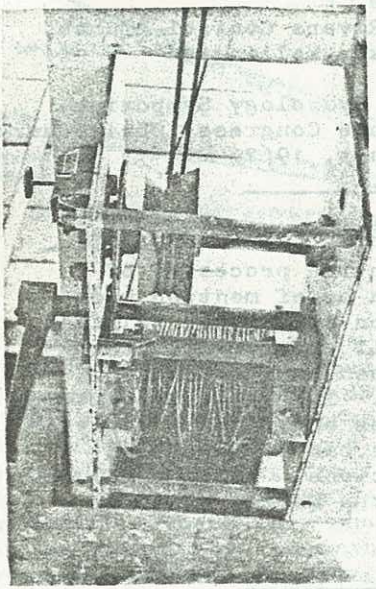

Fig. 4.

At Maidenhead on the Thames. Note the 2½ turns of cable on the traversing winch.

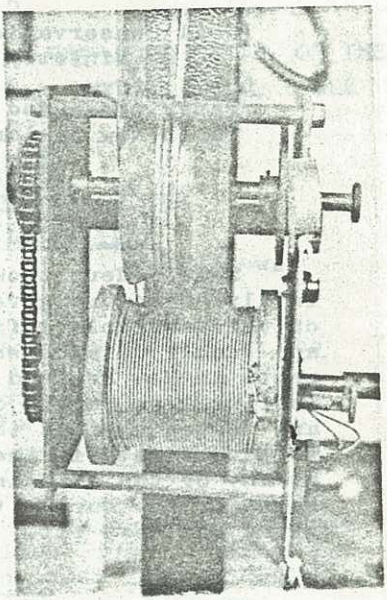

Fig. 5.

A wooden suspension cable reel, shown at the bottom, is typical of English installations.

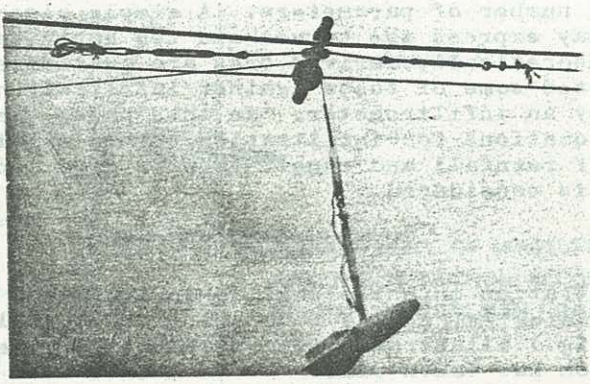

Fig. 6. English traversing system with simple type of fitting for carrying the suspension cable. A sinker, or streamlined lead weight is attached.